

CHAPTER 3

A THEORETICAL BREAKDOWN OF FULFILMENT

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3 A THEORETICAL BREAKDOWN OF FULFILMENT

3.1 Introduction

Many companies outsource some of their non-core business activities, be it their warehousing requirements, the assembly process, physical distribution or any other function, often to different companies that specialise exclusively in one of these activities. It is here where fulfilment houses are uniquely differentiating themselves from the competition: fulfilment houses offer a one-stop shop. It is known as a cradle-to-grave approach, since they take over the whole process of delivering the product into the market, over and above its initial development. Much of this value that can be added, is expressed in shared performance based on an educated perception and an intuitive understanding and recognition of the emerging value patterns connected to total outsourcing. There are some common denominators among the players who are performing and delivering this sustainable value, and these will be discussed in detail in the last chapter. This chapter will introduce the concept of complete outsourcing by comprehensively studying, describing and evaluating the six fulfilment steps briefly mentioned in the previous chapter.

3.2 Creating a new product

3.2.1 Design of the new product

The most important factor to understand when trying to define the word *product*, is being able to appreciate what it is not. A new product is not just its physical characteristics, attributes, or ingredients. A product has a much more complex meaning, which can be understood by referring to the product *concept*.

3.2.1.1 Reasons for the development of new product concepts

The improved political situation in the 'new' South Africa brought with it international acceptance and the potential for increased international trade. As these barriers are lifted, so too is there an increase of entrants into our local markets. New and improved product concepts are fast becoming essential for the survival and long-

term growth of any company. As product life cycles continue to shorten for computer software and hardware products, the manufacturers of these items are focusing their resources on their core business and are outsourcing all non-strategic, non-core activities. According to the management of the international multi-million dollar fulfilment company *Modus Media*, the main benefit of outsourcing is that it enables the manufacturer to focus on its core business and improve its time-to-market (www.modusmedia.com).

When a new product concept is introduced, initial market awareness might be minimal and market acceptance might be slow. All efforts must be geared toward stimulating primary demand (demand for the product itself). The introduction stage is the period of initial success or failure for new products. The product will begin to make rapid sales gains as the rate of market acceptance accelerates. It will become easier to obtain distributors, but competition will also increase as imitators introduce their versions of the product to the market (Monroe 1990: 273). Eventually the rate of market acceptance will then decrease as the number of potential new customers diminishes.

Tying in with this statement, there are many other reasons why new product development is so vitally important to any company. Hisrich & Peters (1991: 7 - 9), listed the following:

i. Growth stimulation.

Probably the most important reason for developing new products is to stimulate growth. Growth or increased market share is regarded by many as the ultimate goal of the organisation, since growth may ultimately reflect higher profitability and cash flow. The South African Reconstruction and Development Programme (RDP), as well as the economic empowerment of the informal sector, are both aimed at developing and supporting economic growth in previously under-developed or disadvantaged areas in South Africa. For those organisations embracing a competitive logistics strategy geared toward achieving improved results through growth, technology is found to be a key enabler in achieving the required levels of internal and external integration.

ii. Response to competitors.

Often new products are developed in response to competition, since companies need to react to the innovator in the market place. Product lines need to be extended to protect the competitive position, and achieve a sustainable competitive advantage. Companies 'bundling' their products with others, is a new trend fast catching on in the South African Information Technology market place.

A good example of bundling is the South African ISP (Internet Service Provider) *MWeb*, who made the strategic decision to bundle their software with the compatible goods of another suitable market player. They chose *MMW* (Multimedia Warehouse), who imports hardware (such as modems, cables, adapters and lightning protector units) as well as other components needed to install and connect to the internet. The two companies, working together with a fulfilment partner who brings all the components together as a final end-item, are now selling much more of their combined stock, known as the 'Big Black Boxes' to the public, than would have been the case if they were each selling their components separately.

iii. Excess capacity.

The development of new products is also sometimes stimulated by excess capacity. Machinery, warehouse space and labour all require certain fixed expenses regardless of whether they are utilized fifty or one hundred percent of the time. To enhance effectiveness, new products are developed to productively utilise this existing excess capacity.

iv. Lower demand.

In competitive markets, when resources become scarce, competition intensifies or demand drops, companies must find alternative means to support this inevitable downturn in business. More often than not, these companies then *outsource* some or all of their business segments to a strategic partner or fulfilment house, which will then take over the operational processes from the struggling client company.

In a combined study by Andersen Consulting and the University of Pretoria (Franz, Cilliers and Andrews 1994: 16), this appearance is supported by the following statement:

'Logistics in South Africa has, until recently, not been treated as a source of value creation or as a competitive advantage. Due to increased competition both locally and abroad, and the erosion of traditional product related sources of competitive advantage, a new source of competitive advantage will have to be found. Integrated logistics management offers huge potential as a new source of competitive advantage through cost reduction and improved customer service.'

v. Changes in consumer needs.

When consumer preferences change, which happens with sometimes alarming regularity in the information technology market, companies must seek and develop new or alternative products or concepts to fulfill this demand. These rapidly changing customer requirements are driving suppliers to differentiate between their product and those of others, based mostly on quality and other value adding features.

Consumers often 'trade up' as their needs change, and this stimulates the sale of other items. In the information technology market, the development of the personal computer has enhanced sales of larger systems. Manufacturers of small computer systems, such as *Siltek* (manufacturing *Xylo* computers), *Mustek* (manufacturing the South African top-seller *Mecer*), and *Pinnacle* (manufacturing the *Proline* computer brand), are now also developing larger systems to integrate with the smaller computers in a data communication network.

Delivering large quantities of customised products require superior levels of flexibility. This in turn requires a comprehensive view of the supply chain with differentiation and customisation being added as late as possible to retain the benefits of economies of scale throughout the major portion of the logistics

pipeline. Franz *et al* (1994: 22 - 23) accentuates the fact that adding value will be the source of differentiation, which in many cases, will not be achieved from the core-product, but from an extended product or service offering.

vi. New technologies.

In the beginning of 2000, Microsoft introduced BIOS-Locking technology. This new requirement stipulates that all Microsoft OEM customers (Original Equipment Manufacturers), will receive BIOS-locked recovery media instead of the generic Operating Systems (OS) disk. Edge Bisset, former IT specialist at *Bowline Fulfilment*, explains that a BIOS-locked disk is a CD that has been created in such a way that it will only work on a certain machine, or range of machines. This means that a BIOS-locked recovery CD from a *Mecer* machine will not work on a *Xylo*, *Acer* or *Pinnacle* system. This new requirement has opened a gap in the information technology market. While some fulfilment houses may see it as a threat to their current business operations, it can open the door for countless new opportunities and new business development.

vii. New innovations.

Many new innovations may be designed to reduce the cost of an existing product. In this new millenium, technology is evolving at an ever-increasing pace. A good example can be seen in the way computers have been redeveloped and bettered over and over again, to reduce them from the huge operating systems they once were, to the much smaller, user-friendly personal computers, notebooks and laptops being used today.

viii. New potential.

The innovativeness and creativity of managers or even other employees in a company can never be overlooked as an important stimulus to new product development. Most companies have some kind of new business development division, whose sole responsibility is to identify or create new potential, find new business and expand current operations.

3.2.1.2 Product components

Business analysts are using the term product *concept* to define the total meaning of all a product's attributes or characteristics. A product concept consists of three product *components* which will be discussed in detail.

Figure 3.1 Product components



Source: Hisrich RD & Peters MP. 1991. Marketing decisions for new and mature products: 6.

i. The core component.

This element is what many refer to as the 'product', being the physical product or its functional features. For a computer, the core component might be its

operating system, speed, ease of use, or memory capacity. These characteristics or attributes relate directly to the physical product and/or its functional features.

ii. The packaging component.

Since many products are so similar, differences are perceived based on the company's ability to reflect some other diversifying qualities in its product. This usually entails having a different or unique packaging component, which consists of factors such as price, perceived quality, the package itself, the brand name, or the overall image of the product.

iii. The support services component.

This component is also used to reflect various differences in the product. Lifetime guarantees of workmanship, on-time delivery, quality repair and free installation are some of the support services that are important in reflecting the meaning of a whole product or end-item.

Understanding these factors is important when a company decides to develop and design a new product, manage a mature product, or reposition an existing product. If, for instance, a company wants to introduce a new multi-media game into the market, the first step will be to develop the physical concept. A compact disk or CD-master of the game has to be developed, as well as all other information-material, such as user guides or manuals that has to be written and their content finalised. All artwork (e.g. for the CD itself, the CD inlays or booklets, manuals and outer carton design), then needs to be created by an artist.

Fulfilment houses usually only assist their clients during these above-mentioned processes by providing ideas, samples or information on prescribed specifications, such as:

i. The best materials to be used for the product itself, as well as in the packaging. Goods transported over long distances need to be re-inforced to protect them from damage caused by handling and freight. Fulfilment houses can also advise on ink and print types.

- ii. The format in which information (such as for the compact disk master and all artwork) needs to be supplied in. Some suppliers can only print from hard copies, others need diskettes, compact disks, positives or some other digital format to produce the final replicated item.
- iii. Because of their extensive knowledge, fulfilment houses can also provide information and specifications on sizing of components, like the size of CD labels and jewelcases, or the dye on which artwork for outer cartons must be designed.

3.2.2 Creating the Bill Of Material

3.2.2.1 Assigning part numbers to components

After the new product concept has been designed, all the single components that will be making up this end-item, must be determined. Individual part numbers need to be assigned to each separate component. These unique part numbers are necessary in order for each individual item of inventory to be identified in the Management Information System (MIS) that is in use. According to De Villiers (1988: 38), some elements to take into consideration when assigning these part numbers, are:

- i. Expandability of categories, which means that as many components as needed, must be able to be added to the number sequence. This means that categories must be flexible so that an almost unlimited amount of new items can be added.
- ii. The ability to sort components into required categories, which necessitates an almost unlimited range of not only individual items, but also of categories.
- iii. The minimum number of characters (alphabetic or numeric) required by the MIS must be taken into account, since some information systems require at least one alphabetical and one numerical digit in order to register a new component code or part number.

- iv. Convenience in use will always be important. This will help to reduce human error by making components more easily identifiable. Pickers and workers in the assembly lines can more easily and correctly ‘pick’ or choose the correct component if its part number offers an indication of what the specific component is that must be used to ‘build’ the specific end-item.

If any changes are made to an item (*e.g.* changing some wording or the packaging or the colour, or adding a sticker etcetera), it must immediately be regarded as a completely new item and therefore the part number already assigned, must be changed (or a new one created). In other words, any modification of an item that makes it somehow different from others of the same type, requires that the different item be identified by assigning a separate identifier or part number. All items, including raw materials, sub-assemblies, finished goods (end-items) and spare parts must have individual, identifiable part numbers. It is important to note that the assignment of sub-assembly identities are determined by the way in which the product is being manufactured or assembled on the production line, and not by the design of the product (De Villiers 1988:50 - 59). This means that, if a number of components are assembled at a workstation, and then forwarded as a complete task to be used in further assemblies, this sub-assembly will need its own unique part number.

3.2.2.2 An indented Bill Of Material dissected

The multi-level or indented Bill Of Material (BOM) system is used in order to give a listing of all components in the product structure. Sub-assemblies are differentiated by offsetting or indenting either the part number or the description or both. The different levels (or sequences) are also identified by a number, which may or may not be indented.

Some or all of the following information are displayed in an indented BOM:

- i. Location.
The location where the component is housed, is especially important when the fulfilment house owns and operates from more than one warehouse. Different

locations are also created to separate components housed in raw materials, from completed end-items in customer stock or finished goods.

ii. Quantities in stock.

The quantity on hand of each component is reflected on the BOM. This is especially important to the procurement team who has to re-order goods when quantities are insufficient to complete orders.

iii. Quantities on order.

The quantity of the component that is currently on order, if any, is displayed. This gives an indication to the specific account manager working on the client's account, whether or not new buying orders on components have actually been placed, as well as what the relevant quantities are. In order to benefit from economies of scale, buying orders may be placed for bigger quantities than what is needed to fulfill a single current order. Apart from the cost-effectiveness achieved, ordering more than what is necessary will also lead to a safety stock being built up.

No fulfilment house willingly runs out of stock. The result is not only lost sales, but also customer dissatisfaction together with the administrative cost of raising and eventually delivering the balance of the customer's order. A small reduction in stockholding can produce a disproportionate reduction in the level of service. The reverse is also true, meaning that there is no point in stocking up on components to meet a hypothetically possible order of several times normal demand levels. However, most fulfilment houses alleviate this potential problem by only procuring or manufacturing on order. It is interesting to note that there is usually a relationship between mean order size, the standard deviation of the distribution of the orders around this mean, and safety stock levels (Fawcett, McLeish & Ogden 1992: 73 - 74).

iv. Quantities allocated.

Quantity of the component allocated, to this end-item as well as to all other products on the production schedule, is also displayed on the BOM. If an account manager sees that there is a quantity of, for instance 200 units in the

warehouse, with another 300 already on order, and he needs only 400 units to complete a specific order, this does not automatically mean that he will have sufficient components on hand for his order. Some of these same components may already be assigned to be used in other end-items using the same generic component.

v. Quantities for this order.

Quantity of the component to be used in this specific end-item, which is usually one, but may be two or more, for instance when two or more of the same stickers, labels or logo's are used to complete one end-item.

vi. Reference designators.

References are usually added to components, to indicate and relay important information or instructions regarding the specific item, to be followed when assembling the end-item.

Page 54 contains a table which is an example of an Indented BOM created for a fictitious multi-media study guide, consisting of 8 components with 1 sub-assembly. The client is *Genius* and the name of the product or end-item is '*Easy Study*'. The order is for three thousand units. A combined alpha-numeric system is used to assign part numbers.

Discussion on sample BOM:

- I. Firstly the end-item (the complete product or finished good) is assigned a parent-item number, usually easily identifiable and consisting of a combination of alpha- numerics. In this case, the parent-item code is *EASY-1000*. Follow-on products or new versions can then be allocated the part numbers *EASY-2000*, *EASY-3000* etcetera.
- ii. A sequence number is automatically assigned to the components. These numbers are usually a power series with the same exponent, in this example 10, 20, 30 etcetera. Each sub-assembly is regarded as a separate item on its

Table 3.1 Sample indented Bill Of Material

Parent-item: EASY-1000

EASY STUDY FULL PACK

SEQ.	PART NO.	DESCRIPTION	QTY ON HAND	QTY PER PARENT
			QTY ALLOCATED	QTY ON ORDER
10	GENIUS-1000	GENIUS GENERIC	7800	1
		OUTER CARTON	3000	0
10	EASY-100	EASY STUDY	6000	2
		VERSION 1 STICKER	6000	0
		<i>Ref: apply to outer carton and registration card</i>		
20	GENIUS-2000	GENIUS GENERIC	1500	1
		REGISTRATION CARD	3000	5000
30	EASY-200	EASY STUDY MANUAL	3000	1
			3000	0
				0
40	EASY-300	EASY STUDY CD SET	0	1
			3000	3000
10	EASY-301	EASY STUDY CD ONLY	0	1
			3000	3000
20	EASY-302	EASY STUDY INLAY SET	0	1
			3000	3000
50	SHRINK-606	SHRINKWRAP	9675	1
			3000	0

Source: Own research.

own, and is therefore also assigned the same values, i.e. 10 and 20. The sub-assembly is identifiable because of its indentation.

- iii. Codes (part numbers) are assigned to each component. Characteristics of these numbers were discussed above. Components used exclusively in the 'Easy Study' end-item, will be named as such for easy identification. Generic *Genius* products (such as the outer carton and sticker), are named to be identified as generic *Genius* components.
- iv. A short description of the component is then given, to help reduce human error by making the component more easily identifiable and the BOM more easily readable.
- v. Quantities on hand for each component are displayed. If there are not enough units available to fulfill the total order (three thousand units in this case), more will have to be procured. Where components will be used again for future orders, more than what is needed at the moment may be procured in order to benefit from economies of scale and to build up a safety stock.
- vi. The quantity of each component allocated, is the sum of the quantity needed to fulfill this order, added to the quantity of these items to be used for each other order using this same component. This quantity will always be at least three thousand (since that is the order quantity in this example), unless where less than one unit is to be used in each finished product.
- vii. Quantity per parent means the number of times a specific component will be used to create the finished product or parent item. Note that 0.1 shippers (boxes or containers) are to be used per parent. This means that one shipper will be used for ten end-items, or in other words, ten end-items will be packed into one shipper.
- viii. The quantity on order simply means the quantity that has already been ordered by the procurement department on that specific component.

- ix. As mentioned above, reference designators can be added to relay important information to all users of the BOM, especially the production team working in the assembly lines. In this example, the reference: ‘apply to outer carton and registration card’ has been added to the *Genius* generic sticker component.

3.2.2.3 Aspects related to the use of a Bill Of Material system

- a) The company’s database.

According to Plossl (1983: 94), the primary intent of using a BOM is to facilitate planning and control activities. When a BOM is entered on the MIS database, all parties involved will immediately be able to see the structure of the new product. Procurement will know the type and quantity to order on each component, the production team will be able to plan ahead and reserve space on their assembly line for building the new product, and the despatch department will know to reserve delivery space and time for the consignment to be shipped.

It is thus clear to see the importance of entering correct information on the new item to be built in order to keep the fulfilment house’s MIS database one hundred percent correct and up to date. Dr. Gordon C. Everest of the University of Minnesota offers the following definition:

“A database management system (DBMS) is any computer-based system that will define, create, retrieve, update, revise and maintain the integrity of the system.”

Simply put, a DBMS is a software package that assists the user in the managing of the computerised database. CODASYL (Conference on Data Systems Languages) is a voluntary group of people supported by their respective organisations, who are interested in the development of database techniques and languages. The essential objectives of a BDMS, as derived from the CODASYL, are to:

- i. Provide instant access to all transactions related to the Management Information System (MIS). This feature is especially important when different

- people are working on the same system, receiving and issuing components, reporting work in progress, or generating sales orders and invoices. When a stock status history report is printed, it should accurately reflect all past transactions relating to the specified item.
- ii. Eliminate redundancy by structuring data suitable for all applications. Stock or systems becoming obsolete and that has to be written off, will inadvertently lead to capital losses.
 - iii. Allow multiple concurrent updatings and retrievals, once again important when more than one person is working on the same system network.
 - iv. Provide a system that offers revolutionary growth by the possible addition of data and programmes. As mentioned before, especially in the IT industry new products are created or changed and improved all the time. The database must be able to cope with the addition of new component- or end-item part numbers.
 - v. Provide a description of the database entries not tied to any particular processing language (alpha-numeric codes).
 - vi. Reduce application programme maintenance and provide on-line maintenance of databases. In the fast-paced IT world, system hold-ups can lead to huge losses. It is unacceptable that stock is held up in a warehouse (or in any other part of the supply chain), because orders can not be inputted on a broken-down or off-line system.
 - vii. Provide protection against unauthorized use and invasion of privacy of specified files. The programme usually prompts for a password in order to allow only authorised personnel access to the system.

Murdick (1980: 488 - 491) explains how an organised collection of all records in a MIS forms the database. A record is kept of all inventory. Records on each end-item

include all components and sub-assemblies of the finished product, as well as all the part-numbers, descriptions, quantities and costs of all stock.

Unlike records in a file-orientated data processing system, the logical relationship among records in a database is not formed by programmes or programmers. Rather, records in a database are related to one another in an exceedingly complex fashion in advance of their creation. It is like a giant map showing all record types in the database together with the name of the record (the part-number and description) and the fields it contains (e.g. quantities and costs of components and end-items).

The actual input/output operations in a database system are far too complex for any single individual to comprehend, let alone control. This leads to another fundamental constituent of a database management system: the Data Management Programme (DMP). The DMP will control all access to and from the database. Typically this programme is the nucleus of a database system and is provided by the computer manufacturer or a vendor of computer software.

b) Database solutions.

The South African company *Idion Technology Holdings* is a developer, importer and vendor of such inventory or database system programmes. According to Corné Arnold, Group Marketing Director of the company, *Idion* shares achieved the overall best performance in 1999 on the JSE (Johannesburg Stock Exchange). In February 2000, they acquired one hundred percent of US-based *Vision Solutions* for \$62.5 million (R394 million), which will drastically improve their global presence. *Idion* CEO, Nicolaas Vlok (in Kausch 2000: 1), expects the company to derive seventy-five percent of its income in the next year from international operations.

Idion specialises in the development and implementation of applications for specific business needs. They have a wide array of database solution packages available, two of them being:

- *Mercury/RMA* which is designed to assist operations personnel with performance and capacity management.

- *CATSe Resource Manager*, which is designed to bridge the gap between management and technical support. It significantly reduces the manpower, time and costs of conducting performance and capacity audits, whilst improving the reliability and accuracy of results.

It is easy to see how these solutions can add value to the operations of any business. They form part of the organisation's MIS and MRP (Material Resource Planning) system.

c) Advantages of using the Bill Of Material system.

When planning the development and production of a new product while using the MRP system, the BOM has a primary role in initiating the procurement process. It will entail getting material ordered at the proper time so that it will be available when needed to produce a parent- or end-item.

Other advantages of implementing the use of a BOM and the accompanying component codes (part numbers) in the MRP system, include (Small 1987: 14 – 15; Jessop *et al* 1994: 25 - 31):

- i. The code system avoids the repeated use of long descriptive titles.
- ii. Bills Of Material are accurate, and therefore they are used exclusively to portray the content of an end-item. This is why they are used by the assembly team in the warehouse to assemble or 'build' the correct end-item. Codes assist standardisation and the reduction of varieties.
- iii. All users work from the same set of numbers and descriptions, making it easier for all parties involved to communicate and differentiate between components. This eliminates misunderstandings, discrepancies and inaccuracies to a great extent. Codes accurately identify all items.
- iv. Making use of the BOM-system ensures that the customer receives the product exactly as he ordered it, since most fulfilment houses demand that the client

signs off all final BOM's before components are procured or assembly can start.

3.3 Component procurement

When procuring components needed to produce an end-item, there are three possibilities available to the fulfilment house:

- Total buying situation.

Buy the finished product (usually to then be used as a sub-assembly), from an external source/supplier.

- Buy-and-manufacture situation.

Only procure certain components or materials from an external source, then manufacture some in-house, and do final assembly within the fulfilment house's warehouse.

- Total manufacturing situation.

Manufacture the total finished product or end-item in-house.

3.3.1 In-house manufacturing

This option is only available to the fulfilment house when they have the necessary facilities and equipment available to produce or manufacture goods. Usually fulfilment houses do not see this as their core business, and will therefore only manufacture a limited range of components in-house (such as CD-R replicating or the printing of stickers and labels). This will also only be done when small volumes of components need to be manufactured, which means that outsourcing to strategic suppliers are not economically viable.

3.3.2 Procuring components from strategic partners

The buying of the best product at the best price is one of the main functions performed by the fulfilment house on behalf of its clients. Lately, this purchasing

effort has introduced more responsibility for the IT buyer than ever before, especially as technology becomes more entwined in a company's overall business strategy. Over time, fulfilment house buyers have experienced their role in IT purchasing becoming more important as their companies come to rely more on technology to achieve their strategic business objectives (Avery 1999: 50).

The use of technology will become a great competitive tool in the new millenium – many fulfilment houses are already using the internet to communicate with suppliers or to buy raw-materials or components on behalf of their clients on-line. The most obvious costs incurred from buying include paying the cost price of the component, the transport costs, receiving and inspection costs, as well as paying for insurance. Even though electronic procurement is a great cost cutter, the cost of this type of purchasing does not have a high level of visibility in many corporations. Jarvis (in Berry 2000:1) explains that, as a result, the price a company pays for said goods and services quite often grows insidiously within the enterprise, ultimately claiming a significant portion of operational costs.

The newly formed company *e.com Institute* is helping companies use internet technologies to transform their supply chain and procurement procedures and then use it to their strategic advantage. Automation and web-enablement of the procurement process provides an opportunity to increase productivity and reduce costs. Many new ventures, such as *e.com Institute*, can automate the entire procure-to-pay cycle, from product selection and catalogue management to receiving and final settlement. This closed-loop approach, with immediate interactive business controls, allows the fulfilment house to take information from every corner of the enterprise, view it real-time, and proactively take action through the system itself.

Important aspects when procuring components, as seen from the fulfilment house's point of view (Hisrich *et al* 1991: 7 – 9; Hugo & Van Rooyen 1991: 3 – 9; Jessop & Morrison 1994: 9 – 10; Hines 1994: 271 – 288), include the following:

- i. Rather procure components (instead of manufacturing) when the necessary facilities to manufacture are not available in-house, and money can be invested more productively somewhere else. Fulfilment houses are not manufacturers.

They must rather concentrate their efforts on their core business, which is offering a complete supply chain *management* solution to their clients.

- ii. Usually firms in other business sectors, such as specialised manufacturers, will go to great lengths to produce all goods in-house, and only buy those components for which the demand is low and only temporary. Since fulfilment houses are not manufacturers, they follow the complete opposite policy. They outsource buying, and will procure all components if possible. Only when the prices offered by the suppliers of these goods are too high because of very small volumes, the fulfilment house may consider producing it in-house.
- iii. Fulfilment houses must procure when suppliers can manufacture at a better price (usually because of the learning curve effect and manufacturing through economies of scale), than what the fulfilment house can do it for themselves in-house.
- iv. When making use of third parties to provide the necessary raw materials or components needed to manufacture the clients end-item, it might be wise to order more than what is needed to fulfil the current order. This safety stock (also referred to as buffer stock) is maintained to prevent an excessive number of stock-outs. Marginal analysis is generally used to determine the optimum level of safety stock to be kept (Johnson 1996: 321 – 322). This mathematical calculation involves the calculation of the relationship between the number of units in the safety stock, their total value and their carrying costs. Costs derived from stock-outs must also be calculated and then taken into account when procuring.
- v. Sometimes patent- or copy rights exist, which prohibits own manufacturing. This automatically leads to a forced buying situation.

The amount of components used in end-items that were not manufactured in-house, but bought from a strategic partner (supplier) is much higher than what most uninformed people think. In Hines (1994: 133), Mitsubishi Motors (MMC) stated that:

“We depend on the outside firms which cooperate with us, for items which comprise about 70 percent of the cost of a vehicle.”

Most of the parts making up a Japanese motor car are in fact not even made in Japan. Likewise, the American computer a lot of people think they own, is actually made up out of components manufactured and produced from all over the world.

3.4 Assembly

3.4.1 Building the new product in a warehouse

In order for the warehouse staff to receive components into the warehouse, the company's inventory management system must conform to some basic requirements. Because the functions performed by a fulfilment house are so diverse, a very specialised MIS needs to be in place to effectively manage the goods of all their diverse clients.

When components are procured, they are immediately assigned unique part numbers. These goods are then received and booked into the fulfilment house's warehouse. After a production order has been captured on the material MIS, goods can be issued to the assembly team in order for them to start 'building' the finished product.

Picking is the term used to describe the process of extracting goods from the bins and racks in a warehouse to collect all the items required to satisfy any particular issue note (generated by a production order on the MIS) or any other demand (Jessop *et al* 1994: 84). There are two main ways of doing this: (1) the storekeepers together with their appropriate issuing staff are in charge of particular sections of the warehouse and will collect only the components which are housed in their particular section of the warehouse, or (2) by the method of travelling picking, where one storekeeper is responsible for collecting all the items appearing on the issue document wherever they may be located in the warehouse.

The product is then physically assembled or 'built' by a picking line (or 'working cell') in a warehouse, always according to the predetermined Bill Of Material, and

using the manufactured/procured components. The process can also include serialising and bar-coding. Worker cells are assigned to individual jobs, with each worker being responsible for a specific task, such as inserting components into an outer carton, sticking on labels or shrink-wrapping the final end-item.

3.4.2 Just-In-Time manufacturing

Manufacturing or assembling only on demand is especially important in the competitive IT market. Technologies change and are improved constantly - these improvements are made to products faster than ever before. If a product is not introduced into the market as quickly as possible, the technology used may already be obsolete by the time it reaches the retail shelves.

This is where the well-known JIT (Just-In-Time) philosophy comes into play. JIT is the concept of meticulously planned logistics and distribution operations, which helps reduce stocks, lead times and therefore, costs (Fawcett *et al* 1992: 82 - 84). With the increased pressure on supply chain management for greater efficiency, it is crucial that materials, components and end-items are at exactly the right place at exactly the right time.

JIT creates a *pull* mechanism in the supply systems, whereby goods are drawn through the chain by demand and orders for products, rather than being pushed through to form work-in-progress or safety stock. The main prerequisites for its implementation are short, dependable lead times and high levels of quality (Hugo *et al* 1991: 58 - 61; Johnson *et al* 1996: 69 - 73, 173, 327 - 328). These ingredients remove the need for stockholding for reasons of unpredictable demand, interrupted or delayed supply and poor quality.

IT systems which entrench JIT manufacturing disciplines will help all South African industries weather the onslaughts of a slow economy, low customer spending and cheaper imports. At the same time, IT will also help to open doors globally. The industry needs to operate smarter and leaner, and must be flexible to meet customer demands (Clague 2000: 1 - 2). This can only happen with the support of IT systems that have been developed to meet all customer requirements. When IT is implemented

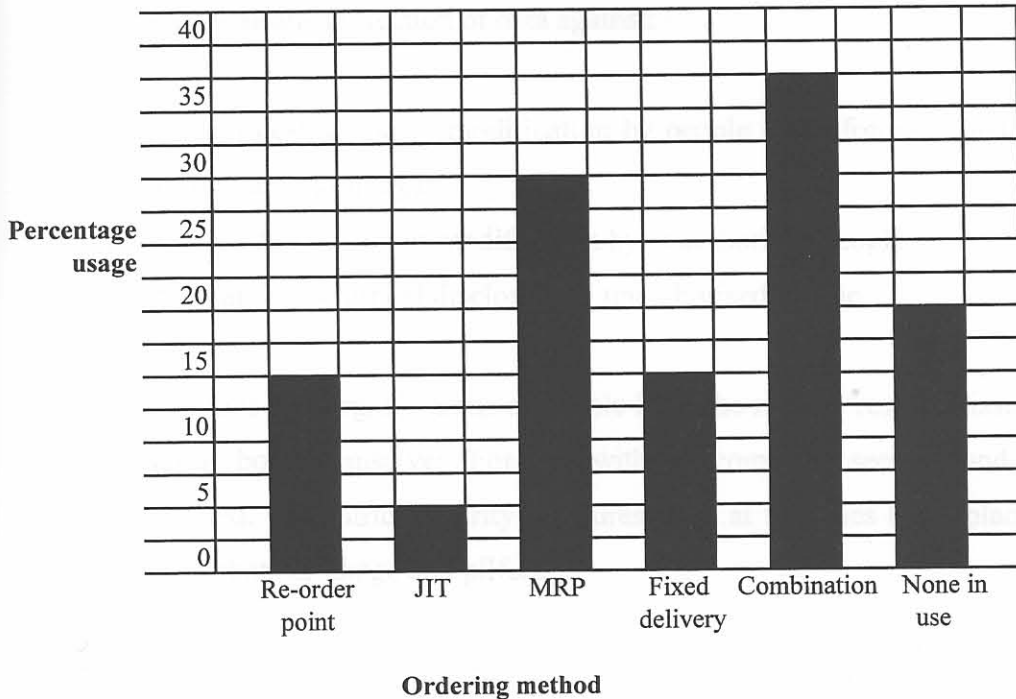
to facilitate the JIT operation, the whole communication chain will become far more dynamic and reliable. Some players in the IT market have had their fingers burnt because they have tried to adapt generalised manufacturing systems to their needs, rather than opting for a specialised system. The key concerns are manufacturing and delivering on-time to customers' specifications with tightly defined cost criteria. One of the main causes of loss to a fulfilment house is late delivery to the customer, since goods are then returned or sometimes not even received. It is thus imperative that goods be assembled and despatched on time – Clague believes that this can only be achieved if management at all levels in the fulfilment house have accurate information on which to base their dynamic just-in-time decisions.

It is important to note that JIT can not be applied to every single product being assembled, particularly where the demand is seasonal. It is however still used in many areas of procuring or purchasing raw materials or components, as well as in general inventory management and distribution. Refer to figure 3.2 on page 62 for a percentage breakdown of the most common ordering methods used in South Africa.

The basic principle of JIT is to have goods delivered exactly where and when required, literally just in time to make the next move along the supply chain, whether it be for production and assembly, or for distribution. This can only be achieved by detailed forward planning and extensive use of information systems. It is not merely a particular method of distribution, but a total logistics concept which, if conscientiously implemented throughout a supply chain, means drastically reduced inventory and costs as well as an improvement in levels of service. The application of the JIT principle to the IT industry has definitely brought along these afore-mentioned considerable benefits. All fulfilment houses need to recognise that JIT is an extremely useful business technique, and should use it accordingly, in order to improve their value-added service offering to their clients.

JIT is, however, by no means the only ordering method used in South Africa. The following figure shows the ordering method most commonly used is MRP (Materials Resource Planning), while the JIT-system is used only about five percent of the time.

Figure 3.2 Ordering methods and their percentage usage



Source: Franz P, Cilliers W & Andrews D. 1994. Logistics Excellence in South Africa: 44.

3.4.3 Quality control and protection of intellectual property

Having absolute control over the quality of all goods that leave the warehouse to be delivered into the market, already started with the fulfilment house's strategic choice of suitable suppliers. Components of exceptional quality are needed to deliver finished products of the same exceptional, uncompromisable quality. In the competitive IT industry, nothing than absolutely the best is good enough. Products are of high monetary and intellectual value, with a high standard of technological advancement. They are expected to perform perfectly every time.

Tying in closely with the principle of ensuring and adhering to high quality standards, is the principle of protecting intellectual property. Fulfilment houses often have competitors as clients (e.g. ISP's like *MWeb*, *UUNET*, *IAfrica*, *World-Online*

etcetera.) The fulfilment house should be able to guarantee each and every one of its clients that the technological and intellectual content of their products are safe.

Data security means protection of data against:

- Accidental destruction or modification by people or by forces of nature (such as flood, fire and lightning).
- Intentional destruction or modification by unauthorised people.
- Accidental or intentional disclosure to unauthorised people.

Privacy implies that organisations or people have the right to restrict dissemination of information about themselves. For data within a company, security and privacy are closely related. Very strict security measures must at all times be in place to protect data and combat shrinkage and pilferage.

Microsoft SA reported that during February and March 2000, calls coming into the company's customer care and call centers from individuals and companies wishing to find out if their software is legal, increased by forty percent (Reynolds 2000a: 1 – 2). This statement was made by Mark Reynolds, manager in charge of Microsoft SA's anti-piracy and legislation drive. He adds that, judging by the content of the recent distress calls, people and companies are starting to become more aware about piracy – and the fact that, in the final analysis, it amounts to criminal conduct. Often, piracy is a result of not keeping proper track of software usage and then falling behind on the licensing agreement and its payments. Companies should view their software as assets and carefully track and record its usage.

Mr. Reynolds further stressed that there was an 'obvious and flagrant disregard' for the copyright laws of the land, and that concrete steps would be taken to 'expediently resolve matters'. The reason for this harsh action is obvious: 'Although the provisional figures provided by the Business Software Alliance reveal that software piracy in South Africa has decreased from forty-nine percent to forty-seven percent during 1999, there is still a long, long way to go. At 1998 software piracy levels, the cost to the economy was put at more than R550 million.'

In an attempt to further clamp-down against software piracy, Microsoft has recently hand-delivered warning letters to a number of as yet unnamed flea market stalls in the Johannesburg and East Rand area (Reynolds 2000: 1). All of these stalls were allegedly selling counterfeit Microsoft games as well as computer games from other software vendors.

3.5 Warehousing

3.5.1 Materials handling

At the interface between procured/manufactured raw materials and components, and their distribution as finished goods or end-items, there must invariably be some kind of handling operation and, in many cases, a storage facility. The handling operation was discussed previously (assembling components into finished goods) - this handling operation or assembly process usually occurs in the warehouse owned by the fulfilment house.

The extent to which assembly and warehousing occurs is determined by the relationship between raw material sources (suppliers), production or assembly units, as well as the quantity, geographic spread, concentration and specific requirements of the fulfilment house's clients. If it was a case of merely handling supplied components from the supplier's vehicle straight through the assembly process, or from the assembly line straight to the distribution vehicle for final delivery, then only a need for handling operations would exist in the scope of services managed by the fulfilment house. However, as a continuous flow of goods along the supply chain, without resorting to any kind of storage option, is still a target to be achieved, then some kind of storage or warehousing option will remain as part of many logistics and distribution operations, and a service offered by the modern-day fulfilment house.

Distribution resource planning (DRP) is an inventory method helpful in determining inventory requirements in warehouses. Whereas materials requirement planning (MRP) deals with production inputs, DRP involves finished products (Johnson *et al* 1996: 345 – 346). The key to DRP is centralised order processing by the fulfilment house, especially when the fulfilment house owns or operates more than one

warehouse. The receiving of raw materials and components at regional warehouses or distribution depots, can easily result in an unbalanced inventory of these components or even finished goods throughout the firm's regional warehouses. With DRP all client orders are processed at one location, and then the end-items or finished products are sent to the appropriate warehouse in order to be delivered to fulfil the order, as well as to replenish the inventory that was just sent out on the client order. The result is that all stock is then balanced throughout the warehouse system. The central inventory planner, in conjunction with the procurement department, can then ensure that, if shortages do occur, they can be evenly spread among warehouses, so that no client needs to accept complete stock-outs while others are receiving almost all of their requested shipments.

The whole process of materials handling can be seen as being dependent on some interrelated and dependent functions, three of them being packaging, unitisation and the handling of goods (Fawcett 1992: 94).

a) Packaging.

This function is vital to the most effective materials handling processes, and the need for it depends on the basic state of the item to be handled (being raw materials, components, sub-assemblies or end-items). Packaging performs many functions (Jessop *et al* 1994: 286 – 287; Johnson *et al* 1996: 147 – 155), such as:

- i. Containment of the item, which should ensure that the finished product reaches the client and ultimately the end-user in a convenient form and quantity. Goods need to be enclosed, both to protect them and protect other items from them. Protection of the goods is an important aspect in meeting high customer demand expectations as far as product quality and condition are concerned. Especially in goods of a technical nature, or containing a great amount of specialised intellectual capital, total protection of its quality should be the ultimate goal of the fulfilment house. Goods must be tamper-proof to the extent that evidence of tampering can be noticed.

- ii. Another way in which packaging can be seen as a function of the materials handling system, is through the provision of information to the end-user, but also to all those involved in handling the product along the supply chain. Packaging provides necessary basic information on the product, such as item, model, size, colour, and instructions for use (some of which may be legal requirements).
- iii. Packaging can also be a forceful marketing tool to promote and strengthen brand identity. Although boxes or containers are thought primarily to be protective in nature, they may also contain features with a strong sales orientation. Some retailers build displays using these outer cartons to create the impression that they have made an extra-large purchase of a certain item – presumably at a lower price per unit that is being passed on to the consumer (Johnson & Wood 1996: 148). A good example is the tall towers of MWeb's internet starter kits (Big Black Boxes), often seen in the entrances or in some other visually conspicuous area of the shop (such as at Incredible Connection, Game, Makro and other retailers of computer software). In such instances it would be appropriate to display some advertising (such as added value, reduced price or exceptional quality) on the outside of the outer carton.

However, from the fulfilment house's logistics and distribution point of view, the main purpose of packaging will remain that of protection and identification of the packaged product. Quick, clear identification during goods receiving, picking, assembly and despatch operations are essential to generate the required degree of cost-effectiveness and customer satisfaction in terms of order correctness, and minimisation of errors. The usefulness of this function is also evident when it comes to cycle count- and stocktaking procedures.

b) Unitisation.

The formation of multiple packages into a single standardised uniform load for handling and storage purposes has become one of the cornerstones of effective materials handling and distribution systems. Ruxton and Oxley (in Fawcett 1992: 99) describe unitisation as 'an assembly of individual items or packages, usually

of a like kind, to enable convenient composite movement'. Unitisation usually also helps to create maximum use of storage space. Most fulfilment houses make use of wooden pallets to reap the benefits of unitisation and space utilisation. Universal use of the wooden pallet has been achieved as a result of its versatility. They are fairly cheap in terms of individual unit cost, although a fulfilment house which has for instance forty thousand pallets in circulation at a replacement cost of approximately R33 each, has some R1 320 000 tied up in these handling units alone. This has led to the view held by all market players that pallets are no longer thought of as free. Transport companies doing collections and deliveries are required to return the same number of pallets to the fulfilment house, or will otherwise be billed separately for the unreturned pallets.

A new trend in materials handling might be the introduction of plastic pallets made from recycled plastic containers (Johnson *et al* 1996: 162). The plastic pallet will have no nails that might protrude to injure handlers, damage cargo or scratch floors and pallet racks in the warehouse. The problem at the moment seems to be in the development of a sturdy plastic pallet that will weigh less than twenty-five kilograms (being a weight that can be manually handled), but still strong enough to carry loads of great weight.

c) Mechanised and automated handling systems.

It is necessary to have suitable equipment for the easier handling of unit-loads and faster movement of packages along the supply chain. The term 'mechanised and automated handling systems' therefore include not only the various types of industrial trucks which are designed for the handling and movement of unit-loads, but also conveyor- and crane systems for high-level storage, retrieval and order-picking. In most fulfilment warehouses, the total operation comprises a standard sequence of activities – being the discharge of delivery vehicles and receiving of the goods, the putting away of these raw materials or components in storage locations, and then their eventual retrieval (picking) for assembly purposes. It is for these operations that a wide range of mechanical handling equipment has been developed, ranging from pallet or lift-and-reach trucks, to forklifts and the aforementioned crane systems.

In some technologically advanced warehouses, these handling systems have been completely automated, making use of very advanced communications technology (Fawcett *et al* 1992: 108). Minicomputer terminals are set up on forklifts in order to speed up the process of information transfer during storage, retrieval and order-picking operations. These activities are becoming virtually paperless, thanks to direct communication between materials handling equipment and the warehouse's computerised stock-control system or MIS. The mini-terminals relay instructions and confirm task completion, while digital readings in order-picking cranes tell the operator which location or storage bin to move to for the next pick or put-away.

A new trend in warehousing is automated storage and retrieval systems (ASRS), which consist of computer-controlled handling equipment in what are often unmanned storage areas. These ASRS systems are as of yet not widely in use in South Africa, mostly because of implementing and capital costs running well into the millions of Rands, as well as the need for very high levels of productivity. In the future, well-established fulfilment houses may look to implement this materials handling system in their warehouses, in order to improve their own operations and ultimately offer a better and faster service to their clients.

With the combination of engineering and computer technology, advanced materials handling has become an essential part of both the modern warehousing scene, and the most effective, integrated supply chain fulfilment operations. It is important to note that these high levels of sophistication in the handling system can often carry with them a high degree of risk, therefore careful research and analysis at the planning stages are essential.

3.5.2 Managing a warehouse

A large warehouse can easily swallow a hundred men, so that it appears to be empty. This appearance is also obvious to the workers, who spend much of their time alone or in small groups. Organisation is a tool of management, and represents the way in which people are grouped to do work. Supervision of staff in a large warehouse presents a problem because of the scattering of groups over fairly large areas and their

separation by racks, machinery, and piles of goods. Also, work-force motivation is difficult because of the repetitiveness of the process.

In a fulfilment house, the management of the warehouse is an exacting task, where in fact, management is doing work through people. It is often stated that the essence of management is communication. Communication must exist in an organisation between teams, between members of the teams, as well as with other organisations which touch upon, or interact with their own organisation.

These teams often tend to take on the nature of the manager - they work according to the atmosphere created by the manager. The late Douglas McGregor, Professor of Industrial Management at the Massachusetts Institute of Technology (in Burton 1979: 241), put forward the view that the work force reacts to the assumptions of management in a subtle and frequently unconscious way. The traditional assumption that workers are lazy and prefer to do nothing, has a lot to do with this then frequently being the apparent situation. On the other hand, as stated by Kroon (1993: 351 - 360), when management hold a very different assumption, that all people wish to use and develop their potential and seek satisfaction for their abilities in achievement at work, it can be demonstrated that this then becomes the case.

With the maturing of the labour management function, supervisors in a warehouse must become pro-active, moving from their current work mode of responding to exceptions, to the alignment of their activities to support the fulfilment house's strategic goals and business philosophy. The maturing role of supervisors is supported by the advent of software that easily incorporates labour rules and interfaces with operational systems such as enterprise resource planning (ERP) solutions (Matthysen 2000: 1). The management of large labour forces, with the attendant paperwork, often results in the wasteful application of skilled supervisory resources. Critical to time- and knowledge management in a fulfilment warehouse, is giving supervisors access to real-time information and Management Information Systems (MIS), allowing time to focus on the setting of priorities, the making of critical choices and assessing the material impact of their decisions.

Matthysen (2000: 2) has identified how the combination of the automation of clerical supervisory functions, together with the delivery of information, can reduce the time spent on administrative activities, and give supervisors the information needed to plan and organise the warehouse operations. This can be done by applying the following five principles:

- i. Consistent application of business rules throughout the entire fulfilment house. Applying this principle will ensure that every employee, being a manager, a supervisor or a warehouse worker, clearly understands what is expected of them. Ultimately, when all employees are treated equally, they will automatically conform to the same working standards and adhere to the same set of business rules and principles.
- ii. Systematic push mechanisms. These should be in place to alert supervisors to exception identification. When orders are 'pushed' through the warehouse, they acquire immediate attention. If they are not dealt with as soon as possible, and finished on time, the next order will come pushing from behind – leading to a build-up of work to be done.
- iii. Collection of activity information. By performing this activity, the objective assessment of productivity can be achieved. Supervisors, or any person in a management position over-seeing workers, need accurate information to be able to assess the productivity of the workforce. Ideally, a performance and capacity management software solution (like the *Idion* Mercury/RMA system discussed earlier) must be implemented to assist operations personnel with performance and capacity management.
- iv. Scheduling applications. This will allow the optimal use of the workforce while still adhering to company standards and legislation. When emergency orders are received that need to be expedited through the channel, additional workers can be contracted to help the fulfilment house keep its delivery-promises.

v. System interfaces.

Interfaces with other systems facilitating a two-way exchange of information, feeding business processes such as billing and extracting activity and workload information from operational sources, is a necessary tool when combining above-mentioned functions in an organisation.

3.5.3 People issues

i. Responsibility.

Responsibility given generates a responsible attitude (Burton 1979: 237 – 244; Kroon 1993; 283 – 284). Therefore, every individual in the warehouse must be given a definite functional responsibility and, where possible, also a geographic responsibility, such as a series of racks or bins, or a specific area such as receiving, assembly or despatch.

ii. Environment.

Research has shown that orderly, clean and neat warehouses lead to a higher rate of productivity (Johnson *et al* 1996: 380). Workers are more positive, show a sense of pride and are harder working in a ‘friendly’ environment. Sanitation can also be related to employee safety and morale and indirectly to the quality of the products handled.

iii. Education.

Courses for training should be run periodically. These can be linked to background training already received, and successful completion of such courses can then in turn be linked to pay rate increases and promotions.

3.5.4 Designing a functional warehouse

Jenkins (1990: 158) has identified and formulated a six step plan to prepare the *functional layout* of a warehouse. These steps will briefly be discussed in order to provide some background information on the preliminary design and layout of a warehouse.

Step 1: Determine parameters.

Firstly it needs to be decided what will and will not be included in the warehouse set-up, as well as what kind of warehouse needs to be designed (be it a Private-, Contract- or Plant warehouse, or some other kind of distribution center). An evaluation must be done on what the existing space and equipment are.

Step 2: Establish all objectives.

While establishing the project's parameters, the objectives may become evident. This is because *what* is to be studied (within the parameters) is inseparable from *why* (the objectives). Some objectives may be to:

- provide minimum-cost warehousing even though sacrificing service,
- provide minimum-cost warehousing while maintaining the established level of service,
- provide better (quantified) service than competition regardless of cost or
- provide competitive (quantified) service at the lowest possible cost.

Step 3: Gather relevant information.

This needs to be done in order to determine how best to conform to these above-mentioned directives. As with any complex problem, the solution becomes easier in direct relationship to the amount of relevant information that is available.

Step 4: Analyse information.

As in any research, do not ignore any of the gathered information. Either decide that it is irrelevant, or assign it a quantitative value.

Step 5: Implement the layout plan.

No project is complete once the best plan has been devised, even when it is in blueprint or a miniature model form. Implementation is the next crucial step. The effective, efficient and most orderly way in which to implement the warehouse layout is to start with an empty building that has all the storage racks and other fixtures installed and the floors and ceilings properly lined. Then as the inventories arrive, they are put away according to the pre-

established plan. In future, no outbound shipments should be made until inventories and paperwork systems are in place and ready to go. The amount of work involved can still be substantial. Just how much depends on how much hand sorting and stacking is required, and how many units and quantities will be involved in the assembly process.

Step 6: Review the initial plan.

This is the time to look back at the whole plan, and how well it has been implemented. Reconcile any differences. Issue citations to jobs well done.

Information gathered during the above-mentioned Step 3, will include many facets. The physical lay-out of the warehouse needs to be in line with the major functions it will be performing. Johnson et al (1996: 363 - 365) identified some of the trade-offs that will need to be made:

i. Space devoted to aisles versus space devoted to racks.

As aisle space increases, storage capacity decreases. This means that aisles must demand equal engineering attention as storage areas, and both have to be planned together to arrive at a functionally efficient warehouse.

Probably the single most important element affecting aisles is the handling equipment employed. Johnson (1996: 364) calculated that a typical order picker spends 60 percent of his time in a warehouse moving from location to location, and this is why a worthy objective of a layout design should be to lose the least space possible, in order to minimise travelling distances and time. This is why narrow-aisle lift trucks, side loaders, 180-degree turret lifts, deep-reach forks and stacker cranes were developed – mainly to minimise space consumed in aisles.

Another important consideration regarding aisles is that both sides of the aisle must offer access to stored goods. A warehouse should never be designed with an aisle running along the side of a wall. Also, a single row of pallet racks with aisles on both sides of the rack, should never be used. Racks should be back-to-back so that aisles permit access to storage on both sides.

ii. Horizontal versus vertical high-rise layout.

This trade-off arises between building costs which decline on a cubic-foot basis as one builds higher, and warehouse equipment costs which will necessarily increase. Building height translates to storage height. Height is even more important than width and depth in determining total storage capacity. Changing this dimension, if needs be, also has the least effect on building costs for the same increase in capacity.

In the past, high storage was not always possible to implement because equipment manufacturers did not provide for reaching higher. The high rise hoists necessary to perform this function, have only been developed fairly recently, but is already in use in all major fulfilment warehouses.

iii. Productive production flows.

Finished goods that are shipped most often and in the greatest volume, must be stored in the most efficient area for material handling. According to Jenkins (1990: 176) this simple notion can reduce the warehouse worker's material handling and travel time by up to 50 percent.

Conventional warehouses usually have the receiving dock on one end and the shipping or despatch dock on the other, with straight, clear racks and aisles running orderly from the one end to the other. This is a much more efficient and time-saving set-up than the old irregular 'maze-system' still utilized in some of the older warehouse set-ups.

A new trend is to implement a diagonal storage system. Racks are laid out diagonally rather than at right angles to the aisle. This concept is not uncommon, as can be seen by the way diagonal parking bays are laid out in some city streets and parking lots. This is done to reduce the needed width of the street or the total amount of space for a given number of parking spaces. The same reasoning applies to diagonal storage in a warehouse. There might be some space lost with this pattern against walls and the ends of aisles, but this loss can be reduced by storing in these triangular voids things of less depth and width than the standard unitized loads.

Taking all of the above-mentioned elements into account, it can be concluded that the single storey warehouse construction is more productive and economically viable to be used as a fulfilment house warehouse. Jessop *et al* (1994: 194 - 199) have listed the following six reasons why it is better, in most cases, to erect single storey warehouses:

- i. The cost per cubic foot of storage space is usually much cheaper in a single storey construction, because the shell can be of lighter construction than is possible with a building having upper floors.
- ii. The weight-carrying capacity of an upper floor is always limited by structural considerations. Forklifts and other machinery or equipment needed to reach high warehouse shelves, are very heavy and their weight will not be supported by a floor that has not specifically been reinforced to support this weight.
- iii. Material-handling costs are likely to be less in a single-storey warehouse than in a multi-storey building where goods have to be transported up and down between floors. Special lifts or conveyor belts are necessary to transport these heavy bulk items.
- iv. More use can be made of natural daylight in a single storey layout, effectively lowering electricity costs.
- v. Adequate ventilation is cheaper and easier to arrange when there is only one ground-level floor involved.
- vi. Modern high-rise equipment enables the efficient use of vertical space from a single ground floor, effectively making it unnecessary to have more than one storey.

3.5.5 Warehousing by the fulfilment house on behalf of the client

Most clients of fulfilment houses will, at some point in time, need to make use of the warehousing service offered by the fulfilment house. Often, a great amount of capital equipment, human resources and management expertise are tied up in these costly

stock-holding or storage units. Fawcett (1992: 113) has tried to justify the existence of warehousing activities on the following grounds:

i. Assembly area (make- and break-bulk).

Fulfilment warehouses are used to assemble end-items from the supplied components. They are also used to facilitate break-bulk operations, where large bulk quantities are broken down into smaller individual orders before onward transit to the client, or the client's client (e.g. retailers or end-users).

ii. Safety stock.

These warehouses can provide a buffer between the rate of supply and manufacture, and that of demand. The supply of raw materials or components and production operations (assembly), can be planned in advance, whereas actual demand from clients and their customers is usually unpredictable. In the event of a sudden unexpected increase in sales demand, component supply failure, or a breakdown in assembly, inventory held in the warehouse (also referred to as safety stock), can then be used until the problem is resolved or an alternative source is found.

iii. Cutting of costs.

By warehousing stock, production cost savings can be optimised by permitting long production runs, and minimising set-up and changeover costs. This will help keep manufacturing and processing costs down by means of economies of scale.

iv. Seasonal demands.

Anticipation inventory can be created, especially for goods with a seasonal demand pattern. In order to make provision for such demands, and yet maintain consistency in levels of production, goods to service this seasonal demand need to be built-up over an extended period of time. A typical example is the increase in sales of multi-media educational products in the first few months of the year, when new students enroll at universities and colleges. On the other side of the time-scale, according to Ronny Russel (previously Product Marketing Manager at *Workgroups*, one of the *Siltek*

divisions) the sales of computer and other multi-media games reach a peak during the last few months of the year, especially around Christmas time.

v. Customer service.

Fulfilment warehouses aid in the maintenance and improvement of customer service levels. The closer their clients' stock is located to the market, the greater the availability of goods to fulfill individual orders, and the shorter lead times can be. When the points of supply and demand are far removed from each other, providing high levels of customer service becomes more demanding on the distribution system, as well as more costly. Fulfilment houses can use their logistics and distribution management function to set up these warehouses to help maintain customer service levels in a more cost-effective and efficient manner.

In addition to these reasons, there is a need for companies at all times to protect their investment in inventory, being components or finished goods. The most convenient way to achieve this, is for them to stock their goods in a secure and suitable environment such as the warehouse of their fulfilment house, where the risk to inventory from damage, deterioration and unauthorised removal will be minimised. Franz *et al* (1994: 22) determined that an average of around sixty-three percent of warehouse space in South Africa is owned, while the balance is either leased (twenty-six percent) or owned by third parties (eleven percent). Fulfilment houses must at all times insure the protection of the intellectual property of their IT clients' goods.

Recently, there seems to be a trend towards gradually moving to increased warehouse outsourcing, although many South African companies are known to be hesitant in relinquishing control over their warehouse facilities. It is the aim of fulfilment houses to offer a complete solution to their clients. Therefore they strive to keep all their clients' stock in their warehouse, where they can assemble and deliver on order. Raw material as well as finished goods are housed, at a pre-determined warehousing fee.

At any given time, any client of the fulfilment house must know their exact stock quantity on the fulfilment house's premises. The relevant account manager must generate reports from the MIS and forward it to the client, usually on a weekly or

monthly basis (depending on the predetermined SLA). Information included in these reports may comprise of quantities of components kept in own raw materials or in customer stock, products or end-items housed as finished goods or kept in customer stock, information of work in progress, or information on stock that is currently in transit. These, and other reports, will be discussed at length later in this chapter.

3.5.6 Geographic location

Many factors influence facility location. Inappropriate locations could result in many serious problems such as poor service to customers, high operating costs, excessive loss due to theft, and unnecessary high freight costs. The difference between carefully selected locations and random selections could well mean the difference between a successful warehouse system and one that is doomed to failure. The four factors discussed below should all, amongst many others, influence the fulfilment house warehouse location decision to a greater or lesser extent:

a) Infrastructure and transport.

Infrastructure and the available transportation services are in many cases the most important location considerations (Jenkins 1990: 59 – 63). The warehouse should be located in such an area as to permit the lowest total inbound and outbound freight costs within the constraints of the facility's objectives as stated above. Transportation costs are relatively easy to measure and highly visible. It also directly affects inventories, as related to transit times, the likelihood of damage, and service reliability.

The warehouse location decision as influenced by the availability of adequate transportation facilities, can also take on a more personal nature. A different type of transportation that should be considered is that which involves moving people, particularly employees (Burton 1979: 237 – 243; Jenkins 1990: 63 – 64). The overriding consideration in conducting business is, and will always be, people. Therefore, the accessibility of the warehouse to employees and others who come to conduct business there, is also an important consideration in determining warehouse location.

b) Community resources.

Being close to a labour force and other community resources are some more location necessities of a more personal nature, but is just as important as other operating requirements. While labour availability is not as great a concern in warehousing as it might be in many other aspects of the industry (such as those requiring a greater number of workers, or more specialised training), it is still an important factor to take into consideration.

Some community resources that could favourably influence the facility operations and employees' well being, are:

i. Safety and security.

Effectiveness and responsiveness of the police force, especially in areas known to have a high crime rate. This consideration increases in importance as the value of the goods in the warehouse increases. Especially warehouses where goods with a high intellectual value are kept, are prone to thefts and raids. Fulfilment houses in the IT industry know that one end-item may cost only a couple of Rand to produce, but because of the intellectual property contained in the material (such as on CD's, disks or in manuals or textbooks), the actual value of this product can amount to many hundreds or even thousands of rands. While it may cost only about R20 to produce one physical Microsoft operating pack (such as the new Windows Millenium operating system package), the reseller value of this end-item into the consumer market can be many thousand of rands.

While fulfilment houses do rely on the local police force, they always also have their own security systems in place. The safety of the people and the goods in the warehouse should never be compromised. Especially foreign companies with locations in South Africa, are known to spend a lot of money ensuring the safety and security of their workers and inventory.

ii. Community attitude.

The attitude of the community towards the particular warehouse can be an important community decision influencing the warehouse location decision. It is not advised to employ white workers only in a predominantly black area, or *visa versa*. It is also important to note that sex, race, colour or creed have yet to be found significant in assessing the competence of warehouse personnel.

iii. Education opportunities.

The adequacy of the surrounding schools available to the employee's children, will influence the type of worker that can be attracted to the location. Also, the existence of other institutes of learning where employee's can further educate themselves, might be an important consideration to some employees considering joining the workforce.

iv. Suitable housing.

Availability of housing at reasonable prices is another important human consideration, especially when employing a large warehouse workforce, who might have a limited budget to spend on housing and other personal necessities.

v. Necessary warehousing services.

The availability of repair services for the facility's equipment is crucially important, especially when locating in undeveloped countries. Operations in a warehouse should never come to a stand-still because of defective equipment. Waiting on repair services or spare parts can drastically reduce the productivity of a warehouse, which will in turn negatively effect the client SLA, because of delays in expected delivery times.

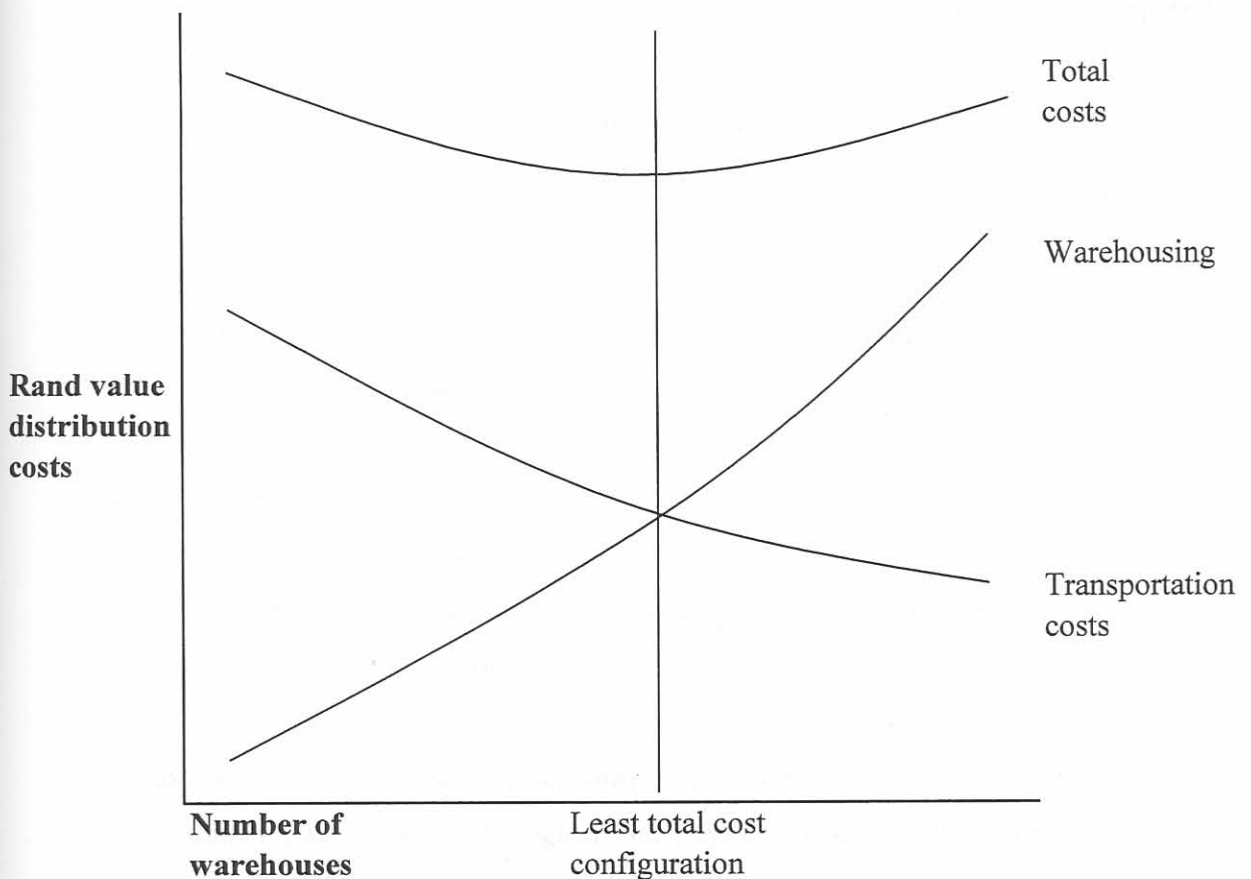
vi. Environmental considerations.

Avoidance of areas with pollution problems is always a good idea when searching for an ideal warehouse location. Especially in European countries, environmental considerations impact greatly on location considerations (Jessop *et al* 1994: 238 – 239). Consumer awareness and environmental regulations will shape logistics policies in the new millennium.

c) The client.

Being close to the client and its market is of crucial importance to any fulfilment house and its warehouses. As discussed above, delivery times, especially in the rapidly changing IT industry, should directly affect the location of the warehouse. Many fulfilment houses set up strategically placed warehouses (or just some kind of presence in the form of a distribution depot) in different parts of the world to better service all their clients' physical distribution needs. A trade-off needs to be made between transport costs, and the cost of setting up a number of strategic warehouses or distribution depots.

Figure 3.3 Relationship between warehouse and transport costs.



Source: Fawcett P, McLeish R & Ogden I. 1992. Logistics Management: 67.

According to Jenkins (1990: 69), the following four factors directly affect delivery time:

i. Client Service Level Agreements.

The required time to meet the client's stated service objectives. These are off course determined by the earlier agreed-upon SLA between the fulfilment house and its client. Sometimes seen as detrimental to normal business practice, preference is often given to big, important clients who are responsible for a large percentage of the fulfilment house's profits. Sometimes special arrangements need to be made to handle emergency orders that need to be delivered urgently.

ii. Available capacity.

The availability and costs of transportation to make possible these required and agreed-upon delivery times. On some occasions, even fulfilment houses need to outsource their physical distribution or delivery workload if they are unable to accommodate it all in-house.

iii. The distance factor.

The travel distance to the fulfilment house's customers, which can be very long and costly when delivering to overseas clients.

iv. The time factor.

The actual travel time to customers, which radically multiplies when goods have to be delivered to outlying rural areas with a poor infrastructure or road network, also affects delivery time.

In fact, the two main all-encompassing considerations to locate close to customers, are of a psychological and physical nature (Jenkins 1990: 76 - 81). Psychologically, customers generally 'feel' that if their fulfilment house, or at least some kind of presence (like a warehouse of some kind or a distribution outlet) is close by, they are better off to deal with them than with suppliers that are more distant. The physical part of this is, as mentioned above, that it is normally

the shortest distance between the fulfilment house and its customer that results in the least travel time.

d) Rates payable or receivable.

Taxes and subsidies can have a huge impact on choosing a location to set up a warehouse. Some real estate taxes are based on market value, others on initial cost. Complicating this even more, is the fact that, more often than not, percentages and ratios of the market value and initial cost are used to determine taxes to be paid.

In Free Enterprise Zones, special tax inducements are offered to companies. Some nations subsidise, promote or protect certain types of commerce, especially companies in the infant stage. It is never illegal to avoid taxes legitimately; it is intelligent business to cut all and any costs as much as possible.

3.5.7 The future of warehouses

Notwithstanding the continuing use and development of warehouses, there are now some logistics management leaders, developers and writers who are questioning the purpose and value of warehouses (Fawcett 1992: 134). In order to achieve fast, smooth movement of IT goods along the supply chain, high-speed, if not instantaneous transfer of information concerning that movement is vital. As explained before, if products do not reach the hi-tech, volatile IT market as soon as possible after their development, a new and improved substitute may have already taken its place, causing the initial developer to lose benefits that could have been gained by being the first entrant to introduce the new technology (Thompson & Strickland 1996: 146). Being first to introduce a new product concept into the market, can have a high pay-off when:

- i. First-time customers remain strongly loyal to the pioneering company when making repeat-purchases.

- ii. Moving first constitutes a pre-emptive strike, making imitation very hard and sometimes even unlikely.
- iii. Early commitments to suppliers of raw materials, new technologies and distribution channels, as well as setting up strategic partnerships with these suppliers, can lead to a cost advantage over rivals. It will create even more barriers to entry for potential competitors.
- iv. Pioneering helps to build a company's image and reputation with resellers as well as with consumers.

Techniques such as optimised production technology and 'Just-In-Time' (JIT) distribution have brought into question the advantages of warehouses and other kinds of storage- and distribution centers. The installation of electronic point-of-sale (EPOS) equipment in so many retail outlets provides on-line transfer of sales information from shops and stores to distribution centers and suppliers, enabling logistics and distribution managers to track actual demand on a daily basis. This can make the keeping of large sums of capital tied up in safety stock a thing of the past. Storage or warehouse facilities and their associated running costs also acquire huge amounts of initial investment- and running capital.

Studying all of the above, one can indeed debate the benefits of warehousing, especially from a financial point of view. This is where the initiators and developers of the fulfilment house industry saw a gap in the market, and have consequently differentiated themselves from the traditional view on warehouses as being a storage-only set-up. The warehouse space they offer to their clients, are not just storage space for keeping stock, but is in fact a value-adding service. The fulfilment house will procure all components needed to produce the end-item at its own cost, and store them at their secure warehouse facility for a specified period of time before starting production. After the end-item has been assembled, the fulfilment house can once again keep the product in stock until the client decides where and when it needs to be delivered. Most fulfilment houses then only invoice their clients for all components procured or manufactured, and all assembly done, once the final goods have been delivered to the client or to the client's client.

3.6 Physical distribution

3.6.1 Mode of transport

Transportation is a major component of the overall logistics cost and effort. Evaluating, selecting and managing the best mode of transport (road/rail/air/sea) for each specific client with his specific needs, is one of the value-adding services offered by fulfilment houses. The process of DRP (Distribution Resource Planning) discussed earlier, was developed as an attempt to apply material requirements planning principles to outbound distribution. Although there is currently some continuing debate as to whether this can be done successfully (Van de Mark 1988: 34; Masters 1992: 64), it is expected that the use of DRP in the fulfilment industry will increase as supply chain relationships are improved (Johnson *et al* 1996: 346).

i. Road transport.

Regardless of the specific resource planning systems that are in use, the selection of the best mode of transport for each individual client's unique requirements, is still one of the basic concerns to be evaluated and then operated and managed by the fulfilment house. Owing to its ability to operate door-to-door, road transport has the facility to move almost anything almost anywhere, making it the most useful method of land transport. In comparison with other modes, road transport is competitively priced – particularly as a bought-in service from third-party operators. Owing to the fragmented and traditionally independent nature of the haulage and distribution industry, there has always been a high degree of competition, which has ensured that, on the basis of price alone, road operators have frequently had the sharper competitive edge. In South Africa, as in the rest of the world, road freight is most commonly in use, accounting for seventy-four percent of all transport (Franz *et al* 1994: 21, 52).

Despite its perceived advantages, however, road-based distribution has to a certain extent become a victim of its own success (Fawcett *et al* 1992: 47). Collection and delivery operations by road, continue to be hampered by mounting congestion in town and city centers, thereby increasing operating costs and perpetuating the unfriendly image of big delivery trucks. These heavy-load vehicles are often considered to be

one of the major threats to general safe road travel. In spite of improvements in vehicle and component technology, security is an ongoing source of management concern. Road distribution is at great risk from both the casual pilferer and organised groups. Especially in the hi-tech IT industry, goods of high value are usually involved. South Africa in particular, does not have a very good record concerning theft from vehicles, or even the theft of a whole load and vehicle and other types of hi-jackings.

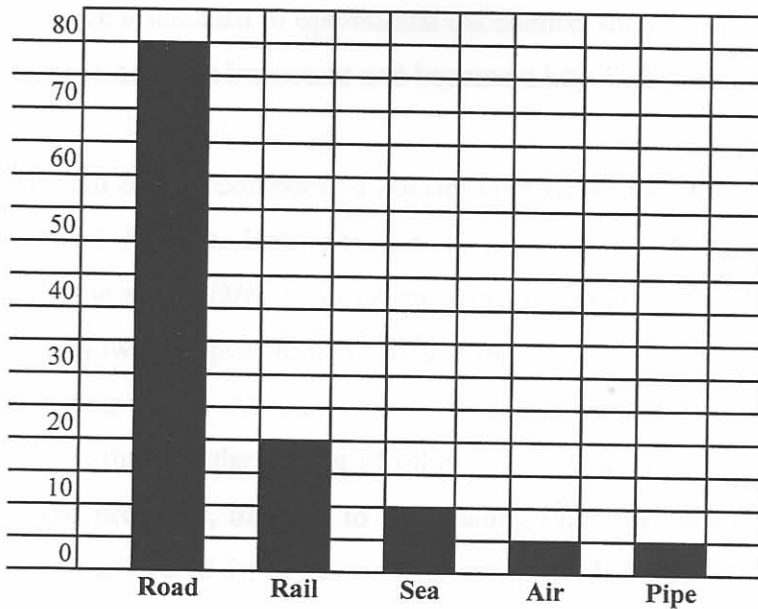
ii. Rail transport.

The South African railway company *Spoornet*, did not have a very good start to the new millenium. *Spoornet* is currently planning to lease about half of its freight rail networks to private operators, making use of only around 5 800 km of their current freight network where there is a dedicated service and good profit. This comes as *Spoornet*, which is in line for a big eminent overhaul, expected to lose R200 million for the year ended March 2000 after its R135 million loss for the previous year (Chalmers 2000: 17). The planned turnaround strategy will focus on growing *Spoornet's* market share through efficiency improvements and better customer service. It will also include conforming to the regulations of the road-based freight industry to try and create a better playing field for rail.

However, regardless of all the advantages, disadvantages and discussions above, *road* transport continues to be the fulfilment house's most favoured means of moving goods, being in-bound raw materials and components, or finished goods and end-items (Franz *et al* 1994: 52). Refer to the figure on page 90 for a comparison of the methods of freight transport most often used.

In Europe, movers of goods have some other viable modes of transport available to them. Road freight is still the number one means of transport (accounting for sixty-three percent of all goods moved), but thanks to the many navigable rivers and water channels criss-crossing the European continent, movement of goods on water is also popular, accounting for approximately twenty-four percent of transport (Fawcett *et al* 1992: 47). Rail and pipe movements make up most of the balance.

Figure 3.4 Usage of transport modes by South African companies.



Source: Franz P, Cilliers W & Andrews D. 1994. Logistics excellence in South Africa: 89.

In South Africa, changes in transportation to rationalise this effort are inevitable. Because of deregulation, options available to fulfilment houses and their distribution-partners have increased dramatically. Distributors and transport companies are no longer constrained with respect to the variety of services they are allowed to offer. Lately, however, intermodalism seems to be at the order of the day, where various transport services are combined in order to offer the most suitable service solution to each client.

Franz *et al* (1994: 55) calculated that service criteria in South Africa (in order of priority), are as follows:

- On-time delivery.
- Reliability.
- Damage-free delivery.
- Ability to expedite.
- Flexibility.

Price is mentioned to be the least important of ten requirements included in the list drawn-up by Franz. Once carriers begin to perform equally in respect of the above five criteria and achieve a standard of operational excellence, the provision of a *value-added service* will become more important and become a key differentiator of service.

A good example is that of two competitive courier companies in South Africa, *DHL* and the newly formed *Postnet*. Both companies' pick-up and delivery prices for parcels are basically the same. *DHL* is an international company with a big customer base and a good worldwide reputation, where *Postnet* is now desperately trying to improve and grow their South African market share by differentiating themselves from their competitors through the adding of other valuable services. *Postnet* goes to their clients' business premises, offering to bring along their own workers who will pack the goods to be delivered in boxes or shippers provided free of charge. This service can be especially helpful to fulfilment houses who often have to deal with emergency shipments.

iii. Emergency shipments.

Expediting emergency shipments through the supply chain is often required by the fulfilment house client. Clients need to notify their fulfilment house as far as possible in advance, of the need to expedite or rapidly move a shipment through the system. The fulfilment house (or his distribution-partner) must then make every effort possible to ensure that the goods are delivered to its destination with maximum speed (Johnson *et al* 1996: 251 – 252). When road transport is being used, the operations manager must ensure that the product is quickly placed on the next outbound vehicle. When railroads are involved, the yardmaster needs to be notified, in order for him to single out the expedited railcar when it arrives, and immediately switch it to the proper outbound train.

3.6.2. Distribution by the fulfilment house in-house or outsourcing

Establishing, maintaining and enhancing your distribution network to provide a reliable, cost-effective service is of utmost importance. The way in which the final

product reaches the market (important aspects are short lead times, good condition and competitive pricing), can influence hugely on the success of its introduction into the retail channel. Road transport is the only means of transport which is, for most businesses, relatively easy to own and operate as part of their in-house own-account sector. Because of the relative shortness of many journeys (fulfilment houses are often situated very close to their clients), road transport has become the dominant means of transport in many areas of logistics and distribution.

If the fulfilment house cannot handle all aspects of distribution successfully on its own, this function is then outsourced to companies who specialise in physical distribution. This so-called *third party logistics*, where certain elements of logistics are outsourced to third party service providers, is a fast growing trend internationally (Forker 1997: 7). It is also an area of logistics in South Africa that has seen significant changes in recent times, particularly so in transport and distribution. How information is then traded with these carriers, will directly effect the level of service the fulfilment house can expect.

The prime reasons for outsourcing physical distribution, is demonstrated by the following benefits accruing from the use of these specialised, third-party service providers (Fawcett *et al* 1992: 152; Franz *et al* 1994: 53; Johnson *et al* 1996: 230):

i. Customer service.

The fulfilment house can offer an improved service to its client by utilising the extensive, well-established distribution and service networks of the third-party contractor. Improved levels of service can be achieved especially when servicing clients or their markets in out-lying or rural areas, and most particularly when the client does not demand a particularly dedicated service.

ii. Concentrate on core competency.

Specialist distribution contractors allow the fulfilment house increased flexibility regarding its range of services offered to their clients. Specialised management of logistics operations by professional transport and distribution operators release the fulfilment house management to concentrate on the mainstream business activities. Distribution-related problems are left to be

dealt with by the contracting company, relieving the fulfilment house of unwanted pressures.

iii. Reduce costs.

The outsourcing of the physical distribution service can greatly reduce costs in the long run. Economies of scale exist when a fulfilment house uses a third-party contractor with an extensive network of services. General distribution of more than one client's goods at the same time, makes contractors' operations financially viable and profitable, thereby achieving a more realistic cost for the fulfilment house's client and ultimately for the end-user. Service Level Agreements (SLA's) are negotiated in order to meet all requirements and achieve reasonable and competitive bottom-line prices.

iv. Better management.

Improved management control can be achieved when fulfilment houses enter into strategic partnerships with third-party providers of distribution services. Contractors usually provide their customers with a weekly, monthly or quarterly report and account (depending on the SLA) for services during that period. Distribution costs would therefore be known in advance, enabling the fulfilment house to budget accurately for the particular service.

v. Utilising capacity.

When an own, dedicated fleet is used by the fulfilment house, these vehicles are more often than not under-utilised. Even the big delivery trucks, owned and operated by specialist delivery companies, have an underutilised capacity of approximately nine to eleven percent. On the other hand, research has shown that companies who have acquired their own specialised fleet of delivery vehicles, can have an under-utilisation capacity of around twenty-five percent, even up to fifty percent (Forker 1997: 27).

The policy on emergency shipments and the expediting of orders differs between industries. Franz *et al* (1994: 53) calculated that, in the case of emergency shipments, forty-six percent of companies outsource the additional capacity required. Some industries (like the beverage industry in South Africa) do not outsource emergency

shipments at all. Since it is the primary goal of fulfilment houses to offer a value-adding solution through superior service levels to their clients, they often need to employ outside contractors to help them cope with the needed capacity when they suddenly have to expedite emergency shipments.

3.6.3 Specialist distributors

As discussed above, companies that have as their core business the physical distribution of goods, are often employed by fulfilment houses to handle the collection or delivery of their clients' goods. *Tarsus Technologies*, the distribution arm of the JSE-listed *MB Technologies*, stamped its authority on the recently held South African Compaq Channel Awards (Scott 2000:1). For the fifth consecutive year, *Tarsus* won the top award for the region, being voted the Distributor of the Year at the function held at the Theatre on the Track at Kyalami in February 2000.

A good example of outsourced distribution can be found in the partnership formed between *LG Electronics* (the world's largest optical storage manufacturer and third largest monitor manufacturer) and *Compucomp*, a leading South African distributor of computer hardware and software. *LG Electronics* appointed *Compucomp* to distribute their range of IT products, including their new PC range which was launched in South Africa during February 2000. Carlos Vizcarra (in Evans 2000:1), CEO of the *Compucomp* group of companies, said that the agreement with *LG Electronics* can be viewed as 'highly strategic', and that it would 'significantly effect the company's bottom-line' during the next 12 to 24 month period. Vizcarra adds that *Compucomp* has the infrastructure, including seven branches around South Africa and more than one thousand dealers, to 'ensure that the *LG* range of products achieves maximum market penetration'. Commenting on the appointment of *Compucomp* as its nationwide distributor, Jaehong Kim, product manager of IT products at *LG Electronics Incorporated* in Johannesburg, said that *LG* aims to become one of the biggest IT players in South Africa (Evans 2000:2). He adds that their PC range is 'going to make a strong impact on the local market' and he believes that *Compucomp* has 'the expertise and the access to the dealer market to make a huge success of this venture'.

In another recent distribution outsourcing deal, *Siltek Distribution Dynamics (SDD)*, the focused IT supply chain company in the JSE-listed *Siltek* group, boosted its capacity to distribute IBM personal systems following an outsourcing agreement with *First Technology (Pty) Ltd* (Flatau 1999:1). In terms of the agreement, *SDD* will incorporate *First Technology's* Gauteng IBM distribution operation, including its sales and marketing teams, into its own IBM business unit which distributes IBM personal computers, servers and thinkpads. The move is in line with *Siltek's* IT supply chain strategy to achieve incremental revenue gains without increasing operating costs, thereby boosting the group's bottom line. The current outsourcing deal is projected to increase *SDD's* recovery on fixed overheads as well as to increase gross operating profit with the increased sales channel.

3.7 Reporting

3.7.1 The Management Information System

It is not a new concept to have a formal system in place in order to organise and manage inventory. As long as two decades ago, Murdick (1980: 11) formulated this comprehensive definition of a Management Information System (MIS):

“The system which monitors and retrieves data from the environment, which captures data from transactions and operations within the firm, and which filters, organises and selects data and presents them as information to managers is called the Management Information System (MIS).”

In the past, managers were only able to process information on a personal basis, which meant that different managers would operate according to their own different and unique perceptions of their environment. Also, systems which were being developed, had a functional bias, concentrating exclusively on inventory control, production, accounting or distribution planning.

Fortunately, some fundamental changes are now occurring in progressive companies. In the new millennium, management is becoming increasingly system-oriented and more sophisticated in their management techniques. Information is now planned and

is made available to managers or other decision-makers as and when needed. This leads to a system that is able to tie planning and control to operational systems of implementation. In today's leading logistics organisations, order fulfilment should be the central focus. Every activity should be targeted at supporting this process together with the correct organisational structure and information systems.

Having available correct, relevant and timeous information, is crucially important to the fulfilment house and its clients. Through the fulfilment house's MIS, reports can be compiled to relay information to the client, regarding amongst others stock levels of components and finished goods, the value of this stock, work in progress, expected delivery times etcetera.

The basic steps in the development of a MIS (Murdick 1980: 27), consists of the following:

- i. The determination of information needs is the primary concern. The type of information that will be needed by the fulfilment house to effectively manage its client's account, must initially be decided upon. Just as important, is what information will be needed by the client, in order for him to best manage his outsourced business and have some control over his stock. The fulfilment house's client is almost never the end-user – they in turn also need to sell their stock to resellers, retailers or consumers.
- ii. Secondly, MIS objectives need to be set. Here the fulfilment house has to decide exactly what his chosen MIS has to be able to do. The relevant important aspects are, amongst others: ease of use, being able to cover a wide range of functions, as well as drafting and printing comprehensive reports, charts and graphs.
- iii. The next step is to develop a specific MIS plan, together with a proposal for management approval. Usually an operational team will develop this plan, which will stipulate all above-mentioned requirements. This plan will then be proposed to the relevant decision-making authorities.

The MIS performs many functions with respect to decision making. Firstly, it helps managers make decisions by supplying crucial information which offers guidance in solving problems. Secondly, the MIS aids in the making of repetitive decisions where the decision process remains constant but the input varies. Also, as listed by Fawcett *et al* (1992: 84 - 88), information systems can have the following four additional purposes:

- i. Serve as a trigger mechanism by producing instructions or documents necessary to activate other components of the system. For example, a proportion of the lead time between a client placing and receiving an order, is accounted for by the length of time that it takes to process the order and initiate action from the fulfilment house's supplier.
- ii. Information systems monitor and control the whole system performance, ensuring that established cost and customer service objectives are met.
- iii. They coordinate functions both within the system and between distribution and other key decision areas of the fulfilment house.
- iv. They link the fulfilment house's internal MIS to interrelated external systems such as those of their suppliers, clients and third party distribution operators.

Murdick (1980: 325) further researched some distinct advantages of implementing an MIS on the fulfilment house network:

- i. Cross-functional integration.
It uses electronic data-capturing mechanisms to calculate the quantities on all goods (components, work in progress and finished goods) in the warehouse. This will assist in the reduction of errors because of greater standardisation and better procedures and policies. Whenever stock is moved, *i.e.* received, issued the MIS. In most cases it is easier to achieve technical integration of system areas than it is to integrate across functional boundaries. As a result, information systems provide the prime mechanism to enable cross-functional integration.

ii. Shorter lead times.

When components are correctly received when they arrive, and production orders are timeously inputted by the relevant people, production can successfully be planned ahead. This preparation-time improvement will have a positive effect on lead times and ultimately on the capital budget.

iii. Generating of reports.

Charts, graphs and lists can be drawn off the MIS that will reflect quantities on hand, quantities on order and quantity to be assembled. This will directly aid the keeping of a better historical record system. Also, it will improve management's understanding of the business and free their time for higher-level contributions.

iv. Minimum stock holding.

The keeping of stock will be down to a minimum when an MIS is used correctly. This will mean that as little as possible capital will have to be tied-up in inventory.

v. Minimum out-of-stock situations.

If avoiding an oversupply were the only problem associated with inventories, the solution would be simple: store fewer items. Unfortunately, not having enough is as bad as having too many. In other words, in conjunction with keeping stock levels to a minimum, an MIS will also help to avoid a stockout situation and the inevitable resulting loss of orders.

A stockout occurs when the supply of an item is exhausted and the client wants this item delivered either to himself or to his client. Stockout costs are difficult to determine and often inexact, but nevertheless very real (Johnson 1996: 316, 319 – 320). Estimating the cost or penalty for a stockout involves an understanding of client reactions to the fulfilment house being out of stock at the time the clients want the product. In order to better control this situation, its monetary value must be calculated. Without making the effort to quantify the profit consequences of shortages, the fulfilment manager is flying in the

dark when it comes to choosing the most profitable aggregate service level (Herron 1987: 113).

A company's MIS is its heartbeat. All information is entered here, and all reports are drafted from the information entered. Some processes to be generated from a MIS are listed and discussed below.

3.7.2 Order processing

The order processing system triggers all other operations in the fulfilment house's logistics and distribution management function. Whilst in theory it is possible to manufacture, procure or warehouse a product in anticipation of its sale to a client, in practice it is obviously much more profitable and efficient to do so in the certain knowledge of future sales. It is imperative that the moment an order is placed by a client, this event must trigger a string of actions to satisfy that order.

Various ordering methods were discussed which all assist in the determination of both frequency and quantity of orders from clients. Fulfilment houses must effectively apply these ordering techniques in an attempt to optimise order requirements and reduce unnecessary stock holding. In today's hi-tech IT environment, companies often rely on electronic data interchange (EDI) systems for this purpose. With co-operation between the supplier, the fulfilment house and the client it is possible for replenishment orders and associated data to be transmitted between computers, thus ensuring that all logistic requirement-planning decisions are based on the very latest information.

When a fulfilment house receives an order from a client, the first step will be to ensure that there are sufficient components in stock to fulfill this order. If not, more needs to be procured. In a real-time system, entering a specific purchase order into the system will immediately reflect these relevant quantities involved. The fulfilment house needs to receive a formal purchase order from his client, before any goods can be issued, assembled into an end-item or despatched for physical distribution. The fulfilment house then issues a sales order to his client in return.

All the above-mentioned transactions are captured on the fulfilment house's MIS. There is evidently much room for the implementation and improvement in the management of order levels and order frequency, which in the long run, should assist in reducing the high reliance on emergency ordering which is both costly and detrimental to the maintenance of consistent service levels.

3.7.3 Shipment reporting

This report tracks the exact size, value and whereabouts of the client's goods. This function is especially important if the goods from one client's order are travelling in different consignments or to different locations. If the client receives a daily shipment report he will always be fully aware of where his stock is.

This reporting service is also especially important in the specifically specialised fulfilment industry. Goods are often not delivered back to the fulfilment house client, but directly to a reseller or into the retail channel (the client's client). The fulfilment house will invoice his client for goods delivered, but this client then needs accurate information to in-turn invoice his client.

3.7.4 Serial tracking

On occasion, goods are bar-coded or provided with promo-codes or some other kind of identifier, in the fulfilment house's warehouse. This process is usually implemented when products are of a highly specialised technical nature (examples are computer operating systems, internet starter kits or multi-media games). The final product or its components can then be tracked through the retail channel right into the final consumers home or office. The fulfilment house and the client can get specific information on each end-item, such as date of manufacture or date of delivery, etcetera. If a fault or defect is discovered in an end-item, it is then easier to trace a batch according to its serial number.

The serial tracking of end-items will lead to much more detailed, comprehensive and useful shipment reports. This is yet another way in which fulfilment houses offer

added value via a total management solution to its client's whole supply chain operation.

3.7.5 Invoicing

It is important that the quantity and value displayed on the sales order, corresponds directly with the relevant invoice. Many fulfilment houses generate their invoices from the delivery note, to ensure that the quantities are correct.

Some fulfilment houses are allowed to invoice on behalf of their clients. This happens when the fulfilment house delivers directly into the retail channel, and not first back to their own client. Since many retailers (like the South African franchise of the *Incredible Connection* computer stores) do not accept any goods without an invoice attached to it, fulfilment houses can then even print invoices with their client's name and logo, and deliver it together with the goods into the channel.

3.7.6 Management of receivables

This value-adding service offered by fulfilment houses is also utilised when the consignment is not delivered back to the client, but rather physically distributed to the appointed resellers, usually located all over the world.

The fulfilment house's client will provide them with a list of their customers (usually resellers), who will then not place their orders with the client, but directly with the fulfilment house. Especially in international business transactions, fulfilment houses can then collect royalties or other payments from these resellers, and forward it to their client.

This complex system of financial management provides a central point to monitor, manage and control the financial viability of all assets, including depreciation, lease variations and ownership of complete assets. The financial value of the goods are managed by the fulfilment house, from procurement right through to the final distribution process.

3.8. Summary

This chapter is the result of a thorough investigation of the six main processes and functions generally performed by a modern-day fulfilment house, which are:

- Creating a new product and establishing its components.
- Procuring these components.
- Physical assembly.
- Warehousing of components or finished goods.
- Physical distribution.
- Reporting.

The advantages gained by the client company when using a fulfilment house, are proved to be numerous and substantial. The main benefit is in the value that a fulfilment house adds to the operations of the client company. Especially in an IT or other related technological company, it can be concluded that management and employees alike should concentrate on the core competency of the company and outsource as many of the operational functions as possible.