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Factors Affecting the Profitability of Pharmacies

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Bachelor of Commerce Masters in Accounting

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ABSTRACT

In South Africa, the pharmaceutical industry has been in a state of flux since the end of apartheid. The Department of Health intends to make healthcare available to all and, in so doing, a number of laws have changed. These laws have affected the entire medicine supply chain and have caused the cost of medicine to be reduced in order to make it more affordable. However, this price fixing or ceiling, as implemented by the Department of Health, has resulted in a number of pharmacy closures.

This research paper thus attempts to identify factors which affect the profitability of pharmacies so that pharmacies can devote their time and efforts to areas that will result in the best outcomes. In this research, the factors identified and tested included average inventory holding, floor space, product mix and location. Other ancillary variables were also tested, including customer loyalty, advertising, prescribing and buying patterns, buyer groups and the effect of information technology. In testing the location, an index was developed from four other factors, which added a level of complexity to the variable that is also apparent in the retail literature.

The method used to analyse these factors was least squares regression. Data was obtained from a questionnaire completed by a sample of 65 pharmacies situated in Johannesburg, South Africa. Cluster analysis also provided insight into the location factor.

The results of this research prove that average inventory holding and floor space have an effect on the profitability of pharmacies. However, location and product mix appear to have no relationship with pharmacy profitability. A number of interesting conclusions were drawn, for example customer loyalty and the number of doctors near the pharmacy seem to have some relationship with pharmacy profitability. Other factors not examined by this research could be considered in the future to determine their relationship with profit.

DECLARATION

I, Graham Edward Pampel, declare that this research report is my own work. It is submitted in partial fulfilment of the requirements for the degree of Bachelor of Commerce Masters in Accounting in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

_____

Graham Edward Pampel

30 September 2013

DEDICATION

I would like to thank my family, girlfriend and friends who supported me throughout this process. The support was greatly appreciated, especially on those days that things did not seem to be going right. I would like to thank my company, Deloitte, for being supportive throughout the process, providing me the necessary leave to ensure that I completed this dissertation on time. To Professor Nirupa Padia, thank you for all the hard work and the hours spent with me keeping me going no matter what challenges I faced.

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1

1 INTRODUCTION

In South Africa, the pharmaceutical industry has been in a state of flux since the end of apartheid. Laws have been enacted which have affected the entire medicine supply chain. These laws have driven the price of medicines downward and as a result a number of pharmacies have closed down.

The purpose of this section is to provide insight in to the issue identified above. Accordingly, the historical background relating to the topic will be discussed. This discussion will provide valuable insights into the pharmaceutical industry as a whole, as well as the specific area of the medicine supply chain to be analysed, namely, pharmacies. The research problem will be developed from this analysis together with an explanation of the significance of this research. Further, the width, breadth and underlying assumptions of the research will also be considered. This chapter will also define the industry-specific terminology that will be used in the following sections of the report. Finally, the chapter will end with a discussion on the subsequent sections of the research report.

1.1 Background of the study

Since 2004, the pharmaceutical industry has consistently been in the media spotlight. Much of the focus has been on the extraordinary profits earned by pharmacies and ways in which to curb these profits in order to make medicines available to the general public at the lowest possible cost. Pharmacists have, for obvious reasons, strongly opposed the new pricing regulations ("New pricing model has pharmacists worried," 2006).

Despite the arguments presented by the pharmacists, in 2004 the Department of Health (DOH) implemented new pricing regulations. In response, pharmacists challenged the new regulations in the Supreme Court of Appeal and the matter was finally resolved in

the Constitutional Court, where the court recommended a review of the dispensing fee model and a consideration of the viability of retail pharmacies ("CCT 59/04," 2004).

Despite the legal setback, the DOH is remaining focused on ensuring that primary health care is available to the entire population. This is aligned with the preamble to the Medicines and Related Substances Act No. 101 of 1965, which states that the purpose of the Act is "to provide for measures for the supply of more affordable medicines in certain circumstances" ("Medicines and Related Substances Act," 1965). This intention is also highlighted by the proposed implementation of the National Health Insurance system ("EDITORIAL: Prepare for a new healthcare battle," 2012; "Negotiations are the best medicine," 2011) by the DOH.

At this stage it should be noted that pricing pressure has not only been focused on the local pharmacy. The pharmaceutical manufacturers have also been under pricing pressures. These relate to the annual price increase that they can apply to their medicines. In this regard, there is a formula that is applied to determine the value of what is referred to as the single exit price (SEP). This concept is defined later in the chapter. However, the pricing committee, a body that forms part of the DOH, can override the expected increase if they believe this is necessary, which was the case in 2008. In that year, the pricing committee increased the SEP by only 6,5%, which was in line with retail inflation. This was lower than the 8% suggested by the manufacturers in line with the published formula (Kahn, 2008b). Drug distributors or wholesalers are not permitted to charge logistics fees in certain instances (Kahn, 2011a).

The state of the South African pharmaceutical industry is, however, no different to that in other developed and developing countries in the world. In Iran, to curb out-of-pocket expenses faced by consumers when purchasing medicines from pharmacies, policy makers intend to reduce the dispensing fee that these pharmacies can charge (Keshavarz, Kebriaeezadeh, Meshkini, Nikfar, Mirian, & Khoonsari, 2012). In both the UK and Germany there have been changes in legislation that have altered the special status of pharmacies. This is mainly due to pricing pressures faced by the health sector in these countries (Pioch & Schmidt, 2004). A working group of the United Nations Millennium

project suggests that there is a need to provide affordable essential drugs to developing countries (Waning, Maddix, & Soucy, 2010).

In order to understand the role of the retail pharmacy in the South African healthcare system it is important to understand all the key role players in the supply chain. These players include the pharmaceutical manufacturers, medicine wholesalers, the DOH, doctors, medical aids and pharmacies.

Pharmaceutical manufacturers form the start of the medicine supply chain. They are responsible for manufacturing the medicines that will be sold in the pharmacies. They are responsible for the process of researching and developing new drugs which are then introduced into the market. These manufacturers are usually multinational corporations such as Aspen, Glaxo-Smith Kline and AstraZeneca, to name but a few. These manufacturers produce two types of medicine for the market; these are referred to as brand name drugs and generic medicines respectively. Brand name drugs are drugs that are developed under a patent and are usually more expensive than generic medicine. Generic medicine, on the other hand, is defined in section 1 of the Medicines and Related Substances Act No. 101 of 1965 as interchangeable multi-source medicine, that is, "medicines that contain the same active substances … which comply with the requirements for therapeutic equivalence as prescribed". Both of these types of medicine need to be sold by the manufacturer at the SEP.

The next step in the supply chain is the medicine wholesaler. This stage in the supply chain is responsible for making bulk purchases from the pharmaceutical manufacturer. The wholesaler assists with the logistics associated with the delivery of medicines to the next stage in the supply chain and is responsible for distributing medicine to both the private and the public healthcare sector. These wholesalers purchase medicines from a variety of local and internal pharmaceutical companies. They also have extensive bargaining power with the drug manufacturers owing to the competition that exists in this arena, particularly when it relates to generic medicines (Kahn, 2011a).

The national health ministry is a key element of any healthcare system. Accordingly, the DOH is responsible for dictating the healthcare policy of the country. It does so by passing legislation that provides stability within the healthcare sector. This ensures consistency.

Doctors play an important role in the medicine supply chain. They are responsible for treating patients for a spectrum of different ailments. Further, doctors are the only members of the healthcare profession that are entitled to prescribe medicines within South Africa. The current reality is that doctors are not only entitled to prescribe medicine but also to dispense it (Gilbert, 1998; "SAMA Medigram : Double dose of good news for dispensing doctors ", 2011). This adds an additional competitive element to the retail pharmacy segment.

Another key role player in the medicine supply chain in South Africa is the medical schemes. These are corporate bodies that have been established in terms of the Medical Schemes Act No. 131 of 1998. Section 1 of this Act defines the business of a medical scheme as undertaking liability in return for a premium or contribution

a) to make provision for the obtaining of any relevant health service;
b) to grant assistance in defraying expenditure incurred in connection with the rendering of any relevant health service; and
c) where applicable, to render a relevant health service, either by the medical scheme itself, or by any supplier or group of suppliers of a relevant health service or by any person, in association with or in terms of an agreement with a medical scheme ("Medical Schemes Act," 1998).

As is clear from the above definition, members of these schemes are entitled to benefits, a portion of which relates to medication. Thus, the medical aid plays a key role in the dispensing of medication as patients can claim their prescriptions from pharmacists or dispensing doctors without paying cash. This is because the medical scheme will settle the claim later. The medical scheme thus effectively controls the cash flows of the pharmacists and dispensing doctors as a result of the lead time between the actual claim being submitted and the payment of the claim. Further, medical schemes play another

role in the medicine supply chain. This role is often seen as detrimental to the healthcare industry, particularly from the perspective of the pharmacist. Medical schemes, as part of their benefit schemes, will only permit that the cheapest generics be supplied (Holford-Walker, 2011). If a doctor prescribes a different medicine, the patient will be responsible for the payment gap that is created. Through this mechanism the medical schemes control the dispensing patterns.

The pharmacy is the final step in the medicine supply chain. A pharmacy is defined in section 1 of the Pharmacy Act No. 53 of 1974, as any place wherein or from which any service specially pertaining to the scope of practice of a pharmacist is provided ("Pharmacy Act," 1974). The Pharmacy Act does not specifically define the practice of a pharmacist. This is defined by the South African Pharmacy Council which, under the 1974 Pharmacy Act, is entitled to prescribe the scope of practice of a pharmacist. Thus, in accordance with Regulation GNR 1158, the key element of the scope of practice is defined as follows:

(1) The provision of pharmaceutical care by taking responsibility for the patient's medicine related needs….. (a) evaluation of a patient's medicine related needs by determining the indication, safety and effectiveness of the therapy; (b) dispensing of any medicine or scheduled substance on the prescription of a person authorised to prescribe medicine; (c) furnishing of information and advice to any person with regard to the use of medicine (Council, 2000a, 2000b).

This regulation further divides the practice of pharmacies into different categories. These categories are explained here because they form an important part of this research paper and they define the research population. There are four categories of pharmacy in South Africa. These include manufacturing pharmacies, wholesale pharmacies, community or institutional pharmacies and consultant pharmacies. These entities are defined in the regulation relating to the practice of pharmacy (Council, 2000a). Only key elements of the definitions are included later in this chapter for the purposes of this research paper. A graphic representation of the industry is included in **Figure 1.1.**

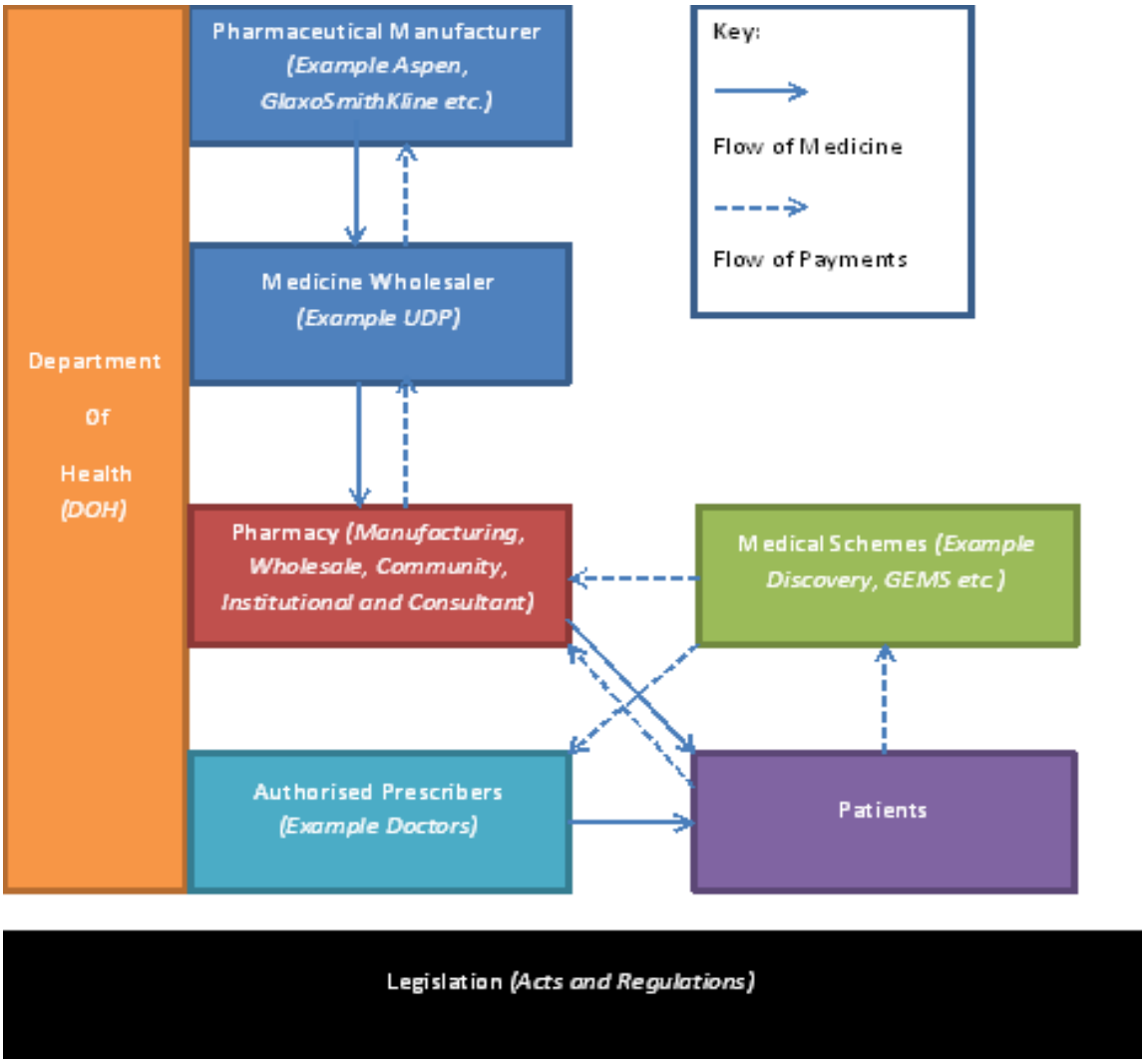


Figure 1.1 Graphical representation of the pharmaceutical industry in South Africa

It is further important to note the change that took place in the pharmacy industry between 2001 and 2010. According to a report published by the South African Pharmacy Council in 2011, the number of pharmacies increased by 17,2% during that period, while community pharmacies increased only by 2% year on year (Council, 2011). This is indicative of the fact that there are numerous barriers to entry into this industry or at least that the industry is not sufficiently attractive for new entrepreneurs.

1.2 Problem statement

A key element of this research paper is to investigate the factors affecting the profitability of pharmacies. Thus, it is necessary to develop an understanding of the term *profit* as it will be used in this work. The *Oxford English dictionary* defines profit as "a financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something" (Dictionaries, 2010). Neither the International Financial Reporting Standards Framework nor the International Financial Reporting Standards defines profit as an individual term. However, it is referenced as an element of disclosure on the bottom line of the Statement of Comprehensive Income. The Statement of Comprehensive Income must include all items of income and expense ((IASB), 2007). Thus, reading the two definitions in conjunction develops an understanding of profit. Accordingly, profit can be conceptualised as: Profit (P) of a firm is the difference between the amount of income (I) earned and the amount spent on expenses (E). Thus, we can write the formula as follows:

$$P = I - E$$

The International Financial Reporting Standards Framework presumes that an entity will continue in operation indefinitely ((IASB), 2010). This is referred to as the going concern principle and is only possible if the following situation exists within an entity's Statement of Financial Position. Accordingly, the assets (A) must exceed the liabilities (L) of the entity. This difference between assets and liabilities is referred to as equity (E) ((IASB), 2010). Thus, it can be represented by the following equation:

$$E = A - L$$

The assets of the entity need to exceed the liabilities ($A > L$) in order for the business to remain liquid. Further, equity comprises the owner's investment into the business, known as capital (C), as well as the amount of profit earned each year. Thus, if $P < 0$ (loss), there would be a decrease in the amount of equity within the business. This could continue to

take place until the capital invested is equal to the equity of the business minus the accumulated profit (∑ P), or rather accumulated loss (∑ Loss). This is represented by the following formula:

$$C = E - \sum Loss$$

Written differently:

$$C = A - \left(L + \sum Loss\right)$$

$$C = A - (L + \sum_{E>I} I - E)$$

At this point in time the entity would need to close or the owner would need to inject further capital into the business in order for it to continue. This would represent the accounting view of profit. This principle was captured in a research study performed in Germany where it was stated that "unprofitability leads to outlet closure" (Pioch & Schmidt, 2001).

As has been previously mentioned, it is the general view that pharmacies earn extraordinary profits. If this were the case, however, there would have been a number of new entrants into the industry and supporting statistics indicate that growth has been flat. As a result, it would appear that there are underlying forces which are limiting growth and that the barriers of entry are greater than the apparently extraordinary profits earned. This research paper does not intend to develop theories as to why there is this apparent disconnect. This research paper intends to determine what factors affect the profit of these pharmacies. Thus the main focus is to consider the factors which have an impact on the first equation presented, that is:

$$P = I - E$$

To understand the factors it is important to break down the elements of income and expense further. From this breakdown it will be possible to identify factors on which the hypotheses will be based for testing in this research paper.

Income is defined in the International Financial Reporting Standards Framework as "increases in economic benefits during the accounting period in the form of inflows or enhancements of assets or decreases of liabilities that result in increases in equity, other than those relating to contributions from equity participants" ((IASB), 2010). This definition is highly theoretical and requires extensive analysis in order to understand the concept of income. It is therefore unnecessary for the purposes of the definition required. As a result, the definition of *revenue*, as defined in *IAS 18 Revenue*, provides a clearer and more understandable view of revenue by defining it as **"**the gross inflow of economic benefits (cash, receivables, other assets) arising from the ordinary operating activities of an entity (such as sales of goods, sales of services, interest, royalties, and dividends)", Thus, for the purposes of this research paper, the terms *revenue* and *income* will be used interchangeably.

To understand revenue in the context of the pharmacy it is important to apply this definition to the pharmacist's trade. Cash and receivables are indicated as economic benefits. The main flow of funds, as indicated in **Figure 1.1**, is the flow of cash to the pharmacy from the patient or the medical scheme. Thus, the pharmacy will either receive cash from the patient or will be waiting for cash to be paid by the medical scheme, hence the recognition of a receivable. This cash or receivable must be received in the ordinary course of the entity's business. The ordinary course of the pharmacy's business as defined above is to provide medicines to patients, thus the sale of goods. Further, the pharmacist is required to provide professional services to the patient, such as indicating the correct method for the use of the medicine. Thus the income of a pharmacy can be redefined as follows: The pharmacy will earn income (I) from sales (S) and the provision of professional services (PS). A number of studies have shown how important the pharmacist's role is in identifying medical errors and inappropriate prescribing and the optimal use of medication, as well as the fact that there is a need to make better use of their knowledge and training (Harrison, Scahill, & Sheridan, 2012; Keshavarz et al.,

2012). In Iran, this has led to the introduction of a dispensing fee for the pharmacists (Keshavarz et al., 2012).

$$I = S + PS$$

These revenue elements can be further broken down into separate elements as they are two distinctive streams. To begin with the analysis, sales (S) can be broken into different streams. There is the sale of ethical medicine (EM), over-the counter (OTC) medicine and non-medical (NM) items. EM is medicine which requires a prescription from an authorised prescriber, usually a doctor. The medicine for which a prescription ("script") is required is those that are Schedule 3 and greater as defined by the Medicines and Related Substances Act No. 101 of 1965. OTC medicine is medicine that is lower than Schedule 2 and can be sold without a script. These medicines are not only stocked in a pharmacy but are also sold in other retail stores such as supermarkets. The last stream of revenue is from the sale of NM items. In South Africa there are different regulations regarding what is entitled to be stocked in a pharmacy as compared to the rest of the world. This will be considered in the next chapter. However, the regulation in South Africa does not prevent pharmacies from stocking a wide range of items. This can include food, cosmetics and toys, to name but a few.

Thus, the revenue generated from each stream will be dependent on two elements: the selling price (SP) and the number of items sold (n). Thus revenue generated from a single item will be determined by multiplying the selling price by the number of items sold. Furthermore, it should be recognised that there is a wide range of products that can be sold under each stream. Thus, the revenue generated from each stream will be the summation of all the sales from that stream. This is represented as follows:

$$\sum (SP_{\mathrm{i}}\, X\, n_{\mathrm{i}} + SP_{\mathrm{j}}\, X\, n_{\mathrm{j}} + \ldots\ldots\ldots + SP_{\mathrm{z}}\, X\, n_{\mathrm{z}})$$

The above formula can be used to represent each stream. Thus the following formula for income can be derived:

$$I = \sum SP_{\text{EM}} \times n_{\text{EM}} + \sum SP_{\text{OTC}} \times n_{\text{OTC}} + \sum SP_{\text{NM}} \times n_{\text{NM}}$$

The equation suggests that to increase income in either or both the sales variable and the number of items sold variable would produce such an outcome. This is not entirely true; microeconomic theory determines the supply and demand curves and their relationship. However, further analysis of these concepts is not within the scope of this paper. The reason for this is twofold. Firstly, it can be generally widely accepted that prices will increase in line with the Consumer Price Index. Further, consumers are more likely to switch products that cost less, particularly when there is a situation of free market competition. Secondly, pricing, particularly in the category of ethical medicine is restricted by government. The second variable, the number of items sold, could be increased indefinitely. The only limiting factor is the physical size of the pharmacy. In the retail literature this is referred to as the gross sales area. This refers to the floor space of the pharmacy. It is possible to extend this notion further by referring to the number of shelves that an entity has as this would be more likely to provide a more accurate description of the available space for the sale of items. It is commonly accepted in the retail literature that floor space is a sufficient proxy for this, as locations are defined by the number of sales per square metre.

To update the income formula the following adjustments are required to be made. Assuming the total floor space (FS) is equal to one; for every percentage of floor space that is used to sell one product there is less space to sell other items. Thus, the equation for a set of items is

$$n_{\text{i}} = FS_{\text{Total}} \times (1 - FS_{\text{j}} - FS_{\text{k}}) \times n_{\text{i Total Available}}$$

where n_i represents the number of items sold of each category, that is, EM, OTC and NM items. FS_{total} represents the total available floor space within the pharmacy, while FS_j and FS_k represent the percentage floor space utilised for the sale of the other categories and n_i

$_{\text{Total Available}}$ represents all available items for sale of a particular category. To finalise the income side of the profit equation we have the following:

$$I = \sum SP_{\text{EM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{NM}}) \times n_{\text{EM Total Available}}] + \sum SP_{\text{OTC}} \times [FS_{\text{Total}} \times (1 - FS_{\text{EM}} - FS_{\text{NM}}) \times n_{\text{OTC Total Available}}] + \sum SP_{\text{NM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{EM}}) \times n_{\text{NM Total Available}}]$$

The next variable in the profit equation is that of expense. The International Financial Reporting Standards Framework (2010) defines expenses as "decreases in economic benefits during the accounting period in the form of outflows or depletions of assets or incurrences of liabilities that result in decreases in equity, other than those relating to distributions to equity participants". The International Financial Reporting Standards Framework provides further explanation of the above definition by providing examples of expenses that arise during the normal course of business of the entity. These include cost of sales, wages and depreciation. To apply this to a retail pharmacy key expenses would be the purchasing of stock, or rather the cost of goods sold (COS), rent (R), water and electricity (U) and salaries (W) (Keshavarz et al., 2012; Waning et al., 2010). Other minor expenses also exist (EXP). Thus, to represent this as an equation the following formula is developed.

$$E = COS + R + U + W + EXP$$

These expenses are broken into two specific categories, fixed costs and variable costs. Fixed costs are those costs that are incurred irrespective of the whether sales are made. Fixed costs in the above formula include rent and utilities. Variable costs are incurred based on the volume of sales. These would include cost of goods sold and salaries. Although salaries are usually indicative of a fixed expense, besides the pharmacist who needs to be present in the pharmacy to dispense medicine, other staff can be hired on a part-time basis and thus the salaries or wages variable is more variable in nature than fixed.

To further understand the factors affecting the profitability of pharmacies it is important that we define the above variables. Cost of goods sold is a function of the number of items sold (n) and the cost price of the item (CP). Thus, the sale of any one category would lead to the following cost of goods sold formula:

$$COS = n \times CP$$

Thus the total value of the cost of goods sold can be determined from the following formula:

$$COS = \sum n_{EM} \times CP_{EM} + \sum n_{OTC} \times CP_{OTC} + \sum n_{NM} \times CP_{NM}$$

Building on from the formula presented above with regards to floor space, a similar analysis can be provided here as follows:

$$\begin{aligned} COS = \sum CP_{\text{EM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{NM}}) \times n_{\text{EM Total Available}}] \\ + \sum CP_{\text{OTC}} \times [FS_{\text{Total}} \times (1 - FS_{\text{EM}} - FS_{\text{NM}}) \times n_{\text{OTC Total Available}}] \\ + \sum CP_{\text{NM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{EM}}) \times n_{\text{NM Total Available}}] \end{aligned}$$

The next expense to consider is rent. In retailing, rent is determined on the basis of two elements, the physical size of the area rented in square metres and the rate per square metre. Rate per square metre is a function of the location. Thus, rent can be presented as:

$$R = FS_{Total} \times rate(location)$$

Water and electricity are commonly referred to as utilities. The amount that one pays for them is dependent of the size of the property. Thus, utilities are a function of floor space. This is represented by:

$$U(FS)$$

Thus, in order to finalise our equation for profit we can represent it as follows:

$$
\begin{aligned}
P = \Big[& \sum SP_{\text{EM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{NM}}) \times n_{\text{EM Total Available}}] \\
& + \sum SP_{\text{OTC}} \times [FS_{\text{Total}} \times (1 - FS_{\text{EM}} - FS_{\text{NM}}) \times n_{\text{OTC Total Available}}] \\
& + \sum SP_{\text{NM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{EM}}) \times n_{\text{NM Total Available}}] \Big] \\
& - \Big[\sum CP_{\text{EM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{NM}}) \times n_{\text{EM Total Available}}] \\
& + \sum CP_{\text{OTC}} \times [FS_{\text{Total}} \times (1 - FS_{\text{EM}} - FS_{\text{NM}}) \times n_{\text{OTC Total Available}}] \\
& + \sum CP_{\text{NM}} \times [FS_{\text{Total}} \times (1 - FS_{\text{OTC}} - FS_{\text{EM}}) \times n_{\text{NM Total Available}}] \\
& + FS_{Total} \times rate(location) + U(FS) + W + EXP \Big]
\end{aligned}
$$

The above function, which represents the profit of a pharmacy, highlights some key variables which require further investigation. It is clear that the value of inventory held, represented by the three categories above, the product mix representing the split between ethical medicine, over-the-counter medicine and non-medical items, floor space and location have a direct impact on the profitability equation. Thus, the main objective of the research is to determine whether profit is a function of these variables:

$$P = f(Average\ Inventory, Product\ Mix, Floor\ Space, Location)$$

However, the above variables are influenced by other factors, which will be discussed in chapter 2 as part of the literature review. For instance, location is a function of its roadside accessibility, pedestrian accessibility and competition in the region represented by the number of other pharmacies and how close it is to its source provider of scripts, represented by the number of doctors in the area.

$$location(roadside\ acessibility, pedestrian\ accessibility, number\ of\ other\ pharmacies, number\ of\ doctors)$$

The number of items sold is a function of advertising, number of customers, other services and customer loyalty. Cost of goods sold is a function of the size of discounts obtained or being part of buyer groups in order to reduce costs relating to logistics. Inventory holding is a function of the ability of an entity to establish the economic reorder quantity; this is usually possible with inventory management software or an understanding of management accounting techniques like cost-volume-profit and purchasing and prescribing patterns, represented by:

$$n\ (advertising, number\ of\ customers, other\ services\ and\ customer\ loyalty)$$

$$COS\ (Discounts, formation\ of\ buyer\ groups)$$

$$Average\ Inventory\ Holding\ \begin{pmatrix} Information\ Technology, purchasing\ patterns, \\ presribing\ patterns \end{pmatrix}$$

Thus, profit is indirectly a function of roadside accessibility, pedestrian accessibility and the number of other pharmacies represented by the number of doctors in the area, advertising, number of customers, other services and customer loyalty and relationships with doctors, size of discounts obtained, formation of buyer groups, information technology and purchasing and prescribing patterns. This is represented as follows:

$$P$$

$$= f(roadside\ accessibility, pedestrian\ accessibility, number\ of\ other\ pharmacies,$$

$$number\ of\ doctors,$$

$$advertising, number\ of\ customers, other\ services, customer\ loyalty,$$

$$discounts, formation\ of\ buyer\ groups, information\ technology,$$

$$purchasing\ patterns, prescribing\ patterns)$$

1.3 Significance of the study

The pharmaceutical industry has been in the news since 2001 with a number of court cases ("CCT 59/04," 2004) that have subsequently resulted in the suspension of the implementation of the dispensing fee and newspaper articles ("EDITORIAL: Prepare for a new healthcare battle," 2012; Kahn, 2008a, 2008b, 2010, 2011a, 2011b, 2012; Mngadi, 2005; "Negotiations are the best medicine," 2011; "New pricing model has pharmacists worried," 2006; "SAMA Medigram : Double dose of good news for dispensing doctors ", 2011). Pretorius (2011), performed an investigation in South Africa on the impact that the implementation of the SEP would have on pharmaceuticals (Pretorius, 2011). Similar research to investigate the profitability of pharmacies in South Africa appears not to have been performed. Thus this investigation fills a gap in the literature by investigating whether such factors exist. Pretorius (2011) only considered the selling price variable particularly with regard to ethical medicine and some of the indirect factors. This study intends to fill a gap in the retailing literature by determining whether the principles of retailing exist in the pharmaceutical industry in South Africa.

Similar research has been performed in Iran where the pharmacies were considered to be making extraordinary profits and profitability factors relating to dispensing fees and specific non-medical items were considered (Keshavarz et al., 2012). In rural Kyrgyzstan similar cost accounting research was performed to determine the mark-up level required for pharmacies to recoup costs and make minimal profits to ensure that the pharmacy remained financially viable. They considered factors affecting pharmacy costs and revenue (Waning et al., 2010). In Delhi, India research also attempted to fill a gap in the retail literature by determining which discretionary and non-discretionary variables had an impact on the performance of pharmacy stores (Patel & Pande, 2012). It also built on prior research performed in the retail industry which investigated an appropriate method for assessing store performance models. This research focused on the supermarket-type store as the theoretical model for a store (Pauler, Trivedi, & Gauri, 2009).

1.4 Delimitations and limitations

Delimitations

This research will consider retail pharmacies that are situated in shopping centres as well as the corner stores. It deals with pharmacies that form part of a retail chain group as well as the individual store owner. This research will not consider whether operating as a retail chain has advantages above that of the individual owner. However, it may need to consider whether retail chains have some form of competitive advantage. Specific variables have been selected for testing and are considered to be factors. It is possible that there are other factors outside of the in scope factors which may affect the profitability of pharmacies. Further, there are a number of research techniques and methodologies that could be used to validate the effect of a factor on profitability; however, specific methods were applied as described in chapter 3.

Limitations

This study has only been performed in Johannesburg. This will influence the results in that it cannot take into account the costs faced by the pharmacists in the more rural parts of the country. The instrument used in performing the research was a questionnaire which, based on its nature, has inherent limitations when performing research.

The turnover of the pharmacy is utilised as a proxy for profit. The reason for this is due to the fact that there are potentially other factors and costs which may impact the profit of the pharmacy which have not been accounted for.

1.5 Definition of terms

Single exit price (SEP): This is the price at which the product exits the factory. Thus it is the cost that the doctor or pharmacist pays to purchase the drug from the manufacturer.

Over the counter (OTC): These are drugs that can be purchased without a prescription and do not have to be dispensed by a pharmacist. These are Schedule 0 and include medicines such as Aspirin or Panado.

Consumer Price Index: This is the amount by which the prices, faced by consumers, increase on a yearly basis.

DOH: The Department of Health. The organisation that is responsible for healthcare policy and legislation in South Africa.

Manufacturing pharmacy: This is defined in section 16 of the Regulation GNR. 1158 – Except as provided for in the Medicines Act, only the following services pertaining to the scope of practice of a pharmacist, may be provided in a manufacturing pharmacy—

a) the manufacturing of any medicine or scheduled substance;
b) the purchasing, acquiring, keeping, possessing, using, supplying or selling of any medicine or scheduled substance;
c) the furnishing of information and advice to any person with regard to medicine manufactured by him, her or it;
d) the repackaging of medicine in accordance with the Medicines Act;
e) the initiation and conducting of pharmaceutical research and development;

Wholesale pharmacy: This definition is defined in section 17 of the regulation GNR. 1158 - Except as provided for in the Medicines Act, only the following services pertaining to the scope of practice of a pharmacist, may be provided in a wholesale pharmacy—

a) the wholesale distribution of any medicine or scheduled substance through the purchasing, acquiring, keeping, possessing, using, supplying or selling of any medicine or scheduled substance;
b) the furnishing of information and advice to any person with regard to medicine distributed by him, her or it;

Community or institutional pharmacy:

This definition is included in section 18 of the regulation GNR. 1158 – Except as provided for in the Medicines Act, the following services pertaining to the scope of practice of a pharmacist may be provided in a community or institutional pharmacy—

a) the provision of pharmaceutical care by taking responsibility for the patient's medicine related needs and being accountable for meeting these needs, which shall include but not be limited to the following functions:
    i) evaluation of a patient's medicine related needs by determining the indication, safety and effectiveness of the therapy;
    ii) dispensing of any medicine or scheduled substance on the prescription of an authorised prescriber;
    iii) furnishing of information and advice to any person with regard to medicine;
    iv) provision of pharmacist initiated therapy;
b) the compounding, manipulation or preparation of any medicine or scheduled substance;
c) the promotion of public health in accordance with guidelines and standards as determined by a competent authority which includes but shall not be limited to:
    i) the provision of immunisation, mother and childcare, blood pressure monitoring; health education; blood-glucose monitoring; screening tests for pregnancy; family planning; cholesterol screening tests; HIV screening tests; urine analysis; and visiometric and audiometric screening tests;

Consultant pharmacy: This definition is defined in section 19 of the regulation GNR. 1158 – Only the following services pertaining to the scope of practice of a pharmacist may be provided in a consultant pharmacy—

a) the provision of pharmaceutical care with the goal of improving compliance with medicine therapy and which shall be limited to the following functions:
    i) evaluation of a patient's medicine regimen with respect to the indications, safety and effectiveness of therapy;
    ii) the provision of information and advice to any person with regard to the use of medicine;

2 Literature Review

2.1 Introduction

This chapter will attempt to review the necessary literature in order to further develop an understanding of the factors that appear to affect the profitability of pharmacies. The literature helps to paint a complete picture of the research question (Pretorius, 2011). One of the purposes of this chapter is to validate the theories presented in chapter 1. Thus, this chapter will analyse each variable discussed above and consider whether a plausible relationship exists between the variable and profit. The selection of references will consider local and international studies in order to develop a review which is of a high standard (Pretorius, 2011). The literature review will discuss the initial background relating to the industry in general, the development of a model for performance and finally consider each of the factors identified in the research problem to determine whether past research supports a plausible relationship or, where a plausible relationship is proved not to exist, to understand why and consider this in the current research.

The factors that will be discussed are as follows, average inventory holding, product mix, floor space and location. Indirect factors, such as roadside accessibility, pedestrian accessibility, number of pharmacies in the area, number of doctors in the area, advertising, number of customers, other services, customer loyalty, relationships with doctors, discounts, formation of buyer groups, information technology, purchasing patterns and prescribing patterns will be discussed in conjunction with the four main variables.

2.2 Background discussion

Since 1994 there have been a number of legislature changes. The main focus has been to provide basic services to the population in general. The pharmaceutical industry has been no exception to this requirement. The Medicines and Related Substances Act No. 101 of 1965 was promulgated to provide medicines to the public at affordable prices. It is clear from this that the Department of Health is suggesting that it is trying to provide health care to the nation at large. As discussed in chapter 1, the medical supply chain is broken up into numerous players. This supply chain is no different to other countries around the world, as was demonstrated by the case of an individual pharmaceutical company in Japan (Hamuro, Katoh, Matsuda, & Yada, 1998). A similar situation exists in the United States of America, where a qualitative literature review of the retail pharmaceutical industry was performed in order to identify gaps for future research (Brooks, Doucette, Wan, & Klepser, 2008).

As a developing country it is usually viable to replicate policies of other developed and, in certain instances, developing countries. Often adjustments are needed in terms of the policy to fit the local socioeconomic environment of the country. For instance, in terms of the SEP, a judgement was passed relating to an international benchmarking exercise which is to be performed in order to determine the appropriate price ("CCT 59/04," 2004). Accordingly, a recent study considered the pricing regulations of developed countries, including Germany, United States of America, Canada, Australia, the United Kingdom, New Zealand, Belgium and the Netherlands. It is important to note that Germany, Canada in certain instances of patented medication, Australia, New Zealand, Belgium and the Netherlands make use of pricing regulations for medicines (Pretorius, 2011). Only in the United States is there free market competition, which was suggested as one of the reasons why medication is not available to the public at large. It was also noted that the medicine prices in the United States of America are 72% higher than Canada (Pretorius, 2011). The same research article investigated the pricing regulations in developing countries, including India, Brazil, Russia, Egypt, Israel, Mexico and Greece. Each of these countries make use of different pricing measures to keep medical costs low

(Pretorius, 2011). It should moreover be noted that of these sample countries, Canada, Belgium, Netherlands, New Zealand and Greece, make use of international benchmarking techniques to price their medicines (Pretorius, 2011). By contrast, Iran makes use of dispensing fee regulations to limit the amount that a pharmacist can charge for medicine (Keshavarz et al., 2012).

It is clear that the industry in South Africa and the changes that are being carried out relating to policy are no different from the rest of the world. As a result, one needs to develop a model in which to survive in terms of these regulations which will most likely be implemented in due course. To survive in the market an entity needs to be profitable. According to Pioch and Schmidt (2001), unprofitability over a period of time could lead to outlet closure. Furthermore, downward pressures on prices to levels that do not provide incentives for pharmacy ownership actually threaten the distribution of medicine due to the closure of branches (Waning et al., 2010).

2.3 Development of a model for performance

As a new business owner it would be very useful if, prior to a single cent being spent, it would be possible to determine whether ones business would be successful or not. Often this is not possible owing to both the macroeconomic and the microeconomic environment in which the entity needs to operate. Thus, the owner of the business is required to take a risk with the capital he invests into the business. However, with this risk there is a related benefit that can be obtained.

A great deal of literature exists in the fields of marketing, commerce, retailing and consumer business on the determination of factors that promote competitive advantage and the importance of a particular factor on the profit of a company (Dubelaar, Chow, & Larson, 2001; Gijsbrechts, Campo, & Goossens, 2003; C. Guy, 1995; Patel & Pande, 2012; Pauler et al., 2009; Swoboda, Berg, Schramm-Klein, & Foscht, 2013; Waning et al., 2010). *Competitive advantage*, a term coined by Michael Porter, requires the implementation of a generic strategy and this should result in better than average market

returns (Akan, Allen, Helms, & Spralls, 2006). It is clear from this research that there is some degree of interest in determining the factors, strategies and microeconomic conditions that exist that will allow an entity to be successful.

It has been suggested in the literature that pricing is the only factor that influences the marketing mix. See Lovelock in 1996, Marn and Rosiello in 1992 and Kotler and Keller in 2006 (Avlonitis & Indounas, 2004; Pretorius, 2011) in this regard. This suggests that, in order for an entity to be profitable, merely controlling price will have an impact on its performance. This is in contrast to the research presented in the previous paragraph. Further if this were the case, pharmacies in South Africa and other parts of the world where pricing regulations exist would have no control over their profitability, which would then suggest that there would be an equilibrium number of players in the market, otherwise the number of players in the market would continue increasing indefinitely which would not be possible. Thus, the equilibrium number of players will exist at the point where all players make zero profit under the fixed pricing regime.

As a result, this paper intends to return to the "grass roots" definition of profit and to develop a model in order to identify factors which have previously been considered separately in retailing, commerce and marketing research. This is similar to the work performed in rural Kyrgyzstan where basic cost-accounting measures were used to determine an appropriate mark-up on cost for medicines (Waning et al., 2010). This basic definition of profit is income less expenses.

In the development of this model it is essential to hold the macroeconomic environment as constant. The reason for this is that no player in the retail pharmaceutical industry can affect the macroeconomic environment. The macroeconomic environment refers to the CPI, the interest rate environment, global exchange rates and the global economy relating to trade.

The microeconomic environment is considered for the sample and population which is identified in chapter 3. The microeconomic environment includes the region in which a

store chooses to locate itself, the competition in that environment and the pricing regulations within South Africa.

In the development of this model, the model does not intend to produce a value or range of values that should be used as the dispensing fee or mark-up by the DOH. Accordingly, this model is intended to determine whether individual factors or a combination of factors lead to better store performance than another combination of factors. Therefore the model assumes that the selling price is a constant resulting from the regulations implemented by government ("New pricing model has pharmacists worried," 2006).

2.4 Factors affecting the profitability of pharmacies

The rest of this chapter intends to analyse the factors identified in chapter 1 and to determine whether the theoretical definition of profit is grounded in research theory. To observe instances where it is plausible and where it has been identified not to be plausible, as well as to understand the circumstances of this and whether it applies to the local pharmaceutical industry, consequently determining whether further investigation is required.

Pharmacies have to some extent lost their identification as a professional institution offering advice. Although pharmacists are medicine experts they are often seen as the final step in the supply chain and do not utilise their knowledge and training to form an integral part of the supply chain (Harrison et al., 2012). The role of the pharmacist is highlighted by the Pharmaceutical Society of South Africa, which stated in the Health Care 2000 report that a pharmacist's main income should be derived from providing professional services rather than trading in medicine (Bruin, 1990). Over time, however, the lines between professionalism and a firm that is selling goods and trying to make a profit have become blurred. The question has been asked as to whether or not pharmacists are acting as professionals or as shopkeepers (WIlliams, 2007). In reality, pharmacists often have to carry out a dual role. This role portrays them as health care professionals and business owners (Schmidt & Pioch, 2001). However, there has been a shift in their

role over time from providing pharmaceutical care to service-oriented business. One important task of such a business is to manage its front end or retail store better (Patel & Pande, 2012).

2.4.1 Average inventory holding

Economic Order Quantity (EOQ) is a theoretical concept that has formed part of inventory management literature as early as 1915 (Sarkar, Saren, & Wee, 2013). The EOQ is a model which suggests that with the constant level of demand for a good there is an order point which minimises the holding costs and reorder costs associated with that product and, as a result, maximise the profit (Drury, 2004). For entities that experience low profitability, or in the case of pharmacies whose profitability is controlled by "price ceilings" regulated by the government, operating at the lowest possible cost is important for continued survival. The holding costs include items such as insurance and warehousing. They also include a cost known as opportunity cost. This cost is not a physical cash cost that needs to be settled, but rather an economic cost. The opportunity cost is the cost incurred by the entity by tying up its cash and cash equivalents in inventory that does not generate a return, rather than placing them in other assets that do generate a return. The more inventories held by an entity the higher their total costs as there is a positive relationship between holding inventory and the costs incurred.

The other type of cost associated with inventory is what is known as ordering costs. The costs that are normally related to ordering costs include costs related to placing the order and delivery. These costs also include those that may not actually be quantifiable, such as lost sales resulting from not having the necessary stock on hand. The two costs must be offset until the optimal balance is achieved. At this point total costs will be the lowest. This is known as the economic order quantity. Owing to the uncertainty of demand during the lead time, that is, the time between the actual order and the delivery of the stock, entities usually hold safety stocks to ensure that they do not lose sales. Extensive research to relax the original assumptions have been performed (Alfares, 2007; Min, 1992; Pando, Garcia-Laguna, San-Jose, & Sicilla, 2012; Sarkar et al., 2013). This

research paper does not intend to build on this body of literature but rather to use the theory as the existence of a plausible relationship of average stock holding with profit. The relationship appears plausible because the cost of goods sold forms part of the profit equation and, thus, a reduction in these costs will result in an increase in the profit function.

As the pharmaceutical industry has become more deregulated, the pharmacist has had to focus on remaining competitive. In this regard, it has been suggested that inventory management is key to retail financial success. Controlling the inventory of an entity efficiently requires an understanding of the number of products, the size of the store and the operating hours of the entity (Dubelaar et al., 2001). In a competitive industry, such as the retail pharmaceutical industry, if a pharmacy does not have the appropriate stock available customers will simply go to another pharmacy. The owner of the store thus needs to make decisions relating to how much safety stock he should maintain and how much stock to order, as well as the lead time relating to delivery of this stock (Dubelaar et al., 2001) versus the demand for the stock.

2.4.1.1 Information technology

In 1997, Coopers and Lybrand stated that a key element of running a grocery business was sales forecasting and the statistical management of safety stocks (Dubelaar et al., 2001). As has been suggested in the section on the background to the industry, the pharmacy industry is moving away from the pharmacist offering advice, to rather positioning itself as a retailer and supplier of goods. As a result, the pharmacy is now becoming more similar to a grocery store. Therefore, proper inventory management relies on accurate data of sales and inventory (Dubelaar et al., 2001).

Further, this data can be used to determine trends. Accordingly, medicines that complement each other in terms of sales volumes can be identified; for example, the sale of vitamin c and nasal anti-decongestants at the same time during winter could assist in ensuring that the correct stock is available during the times it is needed. This mining of

pharmacy data was used to great effect by Pharma, a drug chain store in Japan. This organisation discovered a number of relationships specific to its chain and customers, thus ensuring that the correct stock was carried in their pharmacies (Hamuro et al., 1998).

Another example was the sale of small disposable heaters. It was assumed that these would only be purchased in winter and no items were manufactured in summer. However, one store still made sales during summer. On further analysis it was identified that the sale of this item was linked to the sale of drugs for rheumatism, and thus the sale of these heaters was linked to patients who needed this medicine. As a result, the manufacturing patterns were changed to provide these items during summer (Hamuro et al., 1998). Pharmacists may actually be able to use information technology to help cut costs (Akan, Allen, Helms & Spralls III, 2006). This can be done by utilising information management software to develop operational efficiencies. It would appear that information technology, if correctly applied, can provide some degree of benefit in achieving better management of stock or identification of trends. Thus, it would appear plausible that information technology is a factor affecting average inventory holding.

2.4.1.2 Prescribing and purchasing patterns

For any patented or branded medication that is produced there is usually a corresponding generic medicine. A generic medicine is a medicine that has the same active ingredients in the medicine and is used within in the same therapeutic class as the patented medicine. The main difference is that the price of a generic medicine is considerably less than the branded or patented medicine. In order to make medication more affordable to the general public, a pharmacist is required in terms of section 22F of the Medicines and Related Substances Act No. 101 of 1965 to offer the customer a generic substitute when the doctor has prescribed the branded or patented medication. This is similar to other countries in the world such as Germany (Pioch & Schmidt, 2001). Similarly, although generic substitution in South Africa is a legal requirement, the pharmacist may guide the customer to a certain medication for reasons of profit margins or stock levels, as is the case in Great Britain and India (Kennedy & Moody, 2000; Keshavarz et al., 2012).

To hold all medicines, both generic and branded, would have a major impact on the holding costs of pharmacies. This would, in turn, have an impact on the average inventory holding of the pharmacy. Thus, as pharmacies rely on doctors to provide medicine, it would be useful to determine whether these doctors have particular prescribing patterns or customers have particular purchasing patterns, as this may generate some degree of competitive advantage. German pharmacies have strong relationships with the doctors in their regions in order to aid stock control. They also carry stock to service their regular customers (Pioch & Schmidt, 2001). Thus, it would appear reasonable to assume that a relationship exists between the prescribing and purchasing patterns of doctors and patients and the average stock holding.

A significant positive relationship between inventory and sales has been identified (Dubelaar et al., 2001). Since the introduction of SEP in South Africa the number of inventory days for pharmacies has been reduced in order to survive (Pretorius, 2011). As a result it is possible to develop the following hypotheses:

- **H_{1a}: Does the average inventory holding affect the profitability of pharmacies (profit = *f* (ave. inventory holding))?**
- **H_{1b}: Does the use information technology affect the average inventory holding (average inventory holding = *f* (information technology))?**
- **H_{1c}: Do prescribing patterns and purchasing patterns affect the average inventory holding (average inventory holding = *f* (purchasing or prescribing patterns))?**

2.4.2 Product mix

As shown in the formula in chapter 1, total sales is equal to the sales price times the number of items sold. Thus, to increase the number of items two broad strategies can be applied: either increase the number of items sold per customer or increase the number of customers that enter the store (known as footfalls). Both of these strategies have their

place in the marketing and retailing literature and neither factor exists exclusive of the other. The second principle would require other external measures to increase the number of customers into the store such as location or size of the store, which will be discussed later in this chapter.

In terms of the first principle, the idea would be to economise or cut down on the time the customer intends to spend on shopping. Thus, in order to ensure that a customer has a one stop shopping location, a more varied array of items must be sold (Messinger & Narasimhan, 1997). Often having other services within a retail store, such as an Automated Teller Machine, in-store bakery or pharmacy has been seen to improve store performance through product differentiation (Pauler et al., 2009). This can be seen in stores such as Pick ‘n Pay and Woolworths, which sell food and clothing in the same store. However, this principle is not surprising since a differentiation strategy is one of Porter’s generic strategies for obtaining competitive advantage (Akan et al., 2006). It is suggested that the greater the product diversification the more likely a firm is to earn a profit (Dubelaar et al., 2001). However, the products must be related (Palepu, 1985).

The question would thus remain whether pharmacies could obtain some form of benefit if they were to implement a differentiation strategy. A differentiation strategy for a pharmacy would be to offer a mix of different products and services. In South Africa this is legally permissible, although it is not the case in countries like Germany where only items that are medical in nature can be sold (Pioch & Schmidt, 2001). The product mix available to pharmacies in South Africa allows these pharmacies to sell ethical medicine, which is all medicine that is required to be dispensed by a pharmacist, over-the-counter medicine, that is, Schedule 0 drugs which can be sold in any open store (Bruin, 1990; "Medicines and Related Substances Act," 1965; Pioch & Schmidt, 2001, 2004; WIlliams, 2007), as well as medicine not requiring a script, that is, Schedule 1, 2 and 3 medicine and, finally, non-medical products, such as cosmetics, toiletries, food and any other good.

Owing to the protection provided to pharmacies for the dispensing of certain medication it would appear that the pharmacy has become more reliant on the number of prescriptions that it fills in a day (Pioch & Schmidt, 2001). Despite this contradictory

evidence, it appears that there is a positive plausible relationship with non-medical items sold and profit. The reason for this is that a pharmacist is not restricted in the products it can sell. Thus, an increased number of items can be sold due to increased variety leading to increased sales. The reason for the contradictory evidence is as a result of a different industry structure, where the pharmacy cannot stock all items, only those that are medical in nature.

To further build on the theory of product mix, the variables being considered in the equation include the number of items sold (n) and the cost of goods sold (COS). The reason for this is that the number of different items available directly affects the product mix. The cost of goods also affects the product mix due to the availability of products, the potential profit margin that can be earned and the costs associated with the purchase of that product.

To alter the number of products sold the equation in chapter 1 suggests that this could be done through a number of different measures, including advertising, number of customers, other services, customer loyalty, and relationships with doctors. The number of customers is influenced by the store's location which is discussed later in this chapter. The development of the following hypothesis is therefore possible:

- **H_{2a}: Does the sale of non-medical items affect the profitability of pharmacies (profit = *f* (non-medical items))?**

2.4.2.1 Advertising

Advertising helps to control the creation of value and give direction. A store can also create a personality or brand image in the minds of a customer through its physical environment and aura (Meenaghan, 1995; Pauler et al., 2009). Marketing research has found that a positive relationship exists between a promotional item and its corresponding sales during a specific time period (Gijsbrechts et al., 2003). In today's competitive environment it remains crucial for a retail store to advertise in order to increase the

number of customers that come into the store. It thus appears plausible that the number of items sold is dependent on the whether a product is advertised or not.

- **H_{2b}: Does advertising affect the number of items sold (number of items sold = *f* (advertising))?**

2.4.2.2 Other services

Owing to the regulations that control the industry, in a retail pharmaceutical environment there are very few ways in which a pharmacy can compete differently to its competitors. Depending on the model used by the pharmacy, one method of competing effectively is to provide a variety of useful, but different, services to its customers.

In Germany the other products and services that a pharmacist is permitted to offer his customers must have medicinal qualities or be used for health and body care (Pioch & Schmidt, 2001). A home delivery service is also often offered to an entity's clients (Pioch & Schmidt, 2004). It appears plausible that offering different services has a relationship with the number of items sold.

- **H_{2c}: Do other services affect the number of items sold (number of items sold = *f* (other services))?**

2.4.2.3 Customer loyalty

For a customer to remain loyal to a particular brand, store or product, the customer needs to believe that he/she is receiving a superior service or quality product (Wong & Sohal, 2003). According to Reichheld in1993, customer loyalty is essential for continued survival (Wong & Sohal, 2003). Other areas of the pharmaceutical industry appear to develop this level of customer loyalty. For instance, patients often visit the same doctor throughout their lives and as such the pharmacy usually builds up a client base that is

fairly regular (Pioch & Schmidt, 2001, 2004). However, this was proved to the contrary in Germany as it would appear customers who could not get a specific product would switch pharmacies and therefore are not loyal (Pioch & Schmidt, 2001).

If customer loyalty could be achieved by a pharmacy, it would result in a fixed portion of the market share. Fixing a portion of the market share is a strong technique in competitive environments between suppliers as this would suggest that a particular supplier's supply curve would be fairly inelastic and, as a result, changes in demand and the price of medicines would have minimal effect on the pharmacy's profitability. It is interesting to note that the pricing objectives of Greek service firms are to focus on maintaining their existing client base (Avlonitis & Indounas, 2004). Pretorius (2011) proved that a major change in the business strategy of pharmacies was to focus on customer retention and this was similar for independent pharmacies as well as corporate groups (Pretorius, 2011). It thus appears plausible that a relationship exists between customer loyalty and the number of items sold.

- **H_{2d}: Does customer loyalty affect the number of items sold (number of items sold = *f* (customer loyalty))?**

Another element relating to product mix is the cost price of the stock that is sold. If there are stock items for which a discount can be obtained, the difference between price and cost is greater thus resulting in larger profit margins being obtained. Further, one of Porter's generic strategies relating to cost leadership (Akan et al., 2006) can be implemented as the pharmacy can offer the product at a lower cost than its competitors. This will provide some degree of competitive advantage for the pharmacy. In line with the EOQ model, cost minimisation is important to maximise profit. Two elements of these costs include logistics cost and physical cost.

2.4.2.4 Discounts and buyer groups

Discounts are a common practice within in a commercial environment. Customers form relationships with suppliers and over time these suppliers will provide them with a discount. Customers also tend to obtain volume-based discounts when they reach certain order thresholds. In Germany in order to achieve these discounts buyer groups were established. Such groups also allowed pharmacies to obtain discounts from suppliers as they purchase large quantities of drugs (Pioch & Schmidt, 2004). However, legislation in South Africa now prevents such a practice as, according to section 18A read in conjunction with section 22G(3)(a) of the Medical and Related Substances Act No. 101 of 1965, manufacturers are required to sell medicines at the SEP and no discounts or rebates can be achieved. This is the case for ethical medicine and thus it would appear that for non-medical items and certain OTCs such rebates are still permissible. Although discounts are permissible, each individual pharmacy will be given the same discount. As a result, it would appear that no plausible relationship exists in the South African pharmacy industry to reduce the costs of goods sold through the use of volume discounts.

However, in the South African pharmacy industry distinctive groups have formed. These include the likes of Dis-chem, Clicks, Netcare and Link. These could represent buyer groups and as a result reduce their logistical fees with a central head office purchasing the stock thus reducing the costs of distribution and time spent on ordering. This approach is seen globally with the likes of Pharma in Japan (Hamuro et al., 1998), in Kyrgyzstan (Waning et al., 2010) and in ordinary retailing in the United States of America with the likes of Wal-Mart, Target and Kmart where these stores have positioned themselves close to the distribution centre to reduce costs (Zhu & Singh, 2009). Further, loyalty can be achieved through a retail brand (Swoboda et al., 2013). As a result, it would appear that a plausible relationship exists between buyer groups and the cost of goods sold.

- **H_{2e}: Do buyer groups affect the number of items sold (number of items sold = *f* (buyer groups))?**

2.4.3 Floor space

A pharmacy is defined by the physical space that it covers. As part of the Pharmacy Council's responsibility, as defined in section 35A(b)(ii) of the Pharmacy Act No. 53 of 1974, the council is required to publish what is defined as good pharmacy practice. In this manual specific mention is made of the size of the dispensary of the pharmacy (Council, 2010). However, the actual size of the dispensary is not mentioned.

In the retailing literature the size of the store is often seen as a driver of the cost of the rental paid for the space. As such a store is defined by the total sales surface (Verhetsel, 2005). There are also inherent costs required to establish a new store and massive capital investment is required which is linked to the size of the store (C. Guy, 1995; Keshavarz et al., 2012; Patel & Pande, 2012). As an outcome of this a pharmacy cannot increase indefinitely as there would be an optimal size where the pharmacy would maximise its revenue. Size definitely matters in retailing, as is shown in the United States of America, where the likes of Wal-Mart, Kmart and Target develop massive superstores as well as smaller regional stores within the same catchment area. The size differential aims to attract a wider catchment area of customers because, as was shown with the larger stores, customers will tend to travel greater distances to these stores (C. Guy, 1995).

In 1997, Sinigagalia (Verhetsel, 2005) proved that the size of the store affects width, depth and quality of the services provided. In 1999 Orenstein (Dubelaar et al., 2001) took the concept of size or rather *scarce shelf* and examined the ability of stores to maximise this space using inventory management systems. One of the variables used to define the atmosphere of a store is the size of its sales area, besides other factors such as number of aisles (Pauler et al., 2009). However, this literature is focused mostly on supermarkets and hypermarkets. It would then be appropriate to determine whether a pharmacy's sales would also be affected by the same physical attributes. A pharmacy would be restricted by the same physical bounds and any retail development. Thus it can be said that size appears to have an impact on sales in a pharmacy. In the retail pharmacies in New Delhi, India, it was identified that store size is a significant factor in driving store efficiency (Patel & Pande, 2012). In this study only the overall size of the pharmacy was considered

and no differentiation was made between the two distinct areas that exist within a pharmacy in South Africa, namely, the dispensary and the rest of the store area. Further insights into the effect of size or rather floor space on sales should be investigated.

As a result of the above it appears that the following hypotheses can be developed:

- **H_{3a}: Does the size of the dispensary affect the profitability of pharmacies (profit = *f* (size of the dispensary))?**
- **H_{3b}: Does the size of the store affect the profitability of pharmacies (profit = *f* (size of the store))?**

2.4.4 Location

There is a well-known aphorism in retailing: location, location, location. However the location variable is complex in nature. Of all the variables presented it is the most difficult to change in the short term. Further, the location of a store is influenced by a number of external and market conditions, for instance development or re-development of the specific area surrounding the store, the type of road accessibility, competitors in the region and the population density of the area.

As a result, in order to determine whether the location of a pharmacy affects its profitability each of the factors should be considered individually to determine whether plausible relationships exist between each component and the profitability of a store. These factors include roadside accessibility, pedestrian accessibility, number of competitors and number of doctors. Finally, the components should be combined to develop a location index in order to generate a complex variable against which profitability could be compared.

According to Patel (2012), location is not a variable that drives pharmacy store efficiency. However, this is firstly contrary to a large amount of retailing literature on the location of a store and its profitability. Secondly, the variable for location in Patel's study

only considered one of the components presented above, number of competitors in the area. Again the outcomes of that study are contrary to other studies that considered competition on profitability (Gonzalez-Benito, 2005; C. Guy, 1995; Zhu & Singh, 2009). Lastly, the study identified footfalls as a driver of efficiency for pharmacy store performance. Footfalls, or rather the number of customers, are influenced by competition because if there are a number of options for a consumer to choose from the consumer will easily switch to another store in the region. Thus location is indirectly related to the footfalls. A literature review of each component is required to develop the plausibility of the relationship.

2.4.4.1 Roadside accessibility

Roadside accessibility is defined as how easy is it to reach the store (Swoboda et al., 2013). Customers are prepared to economise on their use of time. This means that customers will search for the lowest prices. Thus if a store is easy to access the customer will be able to use less time to find the lowest price. However, the time spent searching for the lowest price is referred to as search costs. It is for this reason that particular stores tend to distribute themselves based on a particular benefit that they can achieve. For instance, petrol stations are often located on the side of a highway or main road to capture the flow of traffic (Sadahiro, 2000). Further if a store is dependent on footfalls (Patel & Pande, 2012), then being positioned in relation to main roads and highways allows for greater amounts of traffic to pass near the store thus increasing the catchment of potential customers. In 1963 Berry suggested that retail and business areas in Chicago positioned themselves around highways (C. M. Guy, 1998). Further, closeness to a national road was found to be statistically significant when related to customer loyalty (Swoboda et al., 2013). Thus, it appears plausible that roadside accessibility is a component of location. Hence the development of the following hypothesis:

- **H_{4a}: Does roadside accessibility affect the profitability of pharmacies (profit = *f* (roadside accessibility))?**

2.4.4.2 Pedestrian accessibility

Pedestrian accessibility refers to the different types of shopping location that exist. These include shopping malls, shopping centres and retail outlets. In geographic planning research there tends to be a number of different definitions to define the different shopping locations. These definitions are based on the size of the shopping area, the type of stores that exist, catchment area and physical form (C. M. Guy, 1998). As there are a number of methodological issues related to the types of shopping centre that exist, the definition relating to the physical form was selected as a convenient measure to determine pedestrian accessibility. The physical form of the shopping centre is defined by its appearance, tenant mix and size (C. M. Guy, 1998). This assessment also matches the criteria which consumers often use in identifying shopping destinations (C. M. Guy, 1998). Owing to the latter statement, it would be most useful to use this measure in order to determine pedestrian accessibility. Guy (1998) defines the following different types of shopping development: the focused centre, the retail park, the shopping mall, the regional shopping centre, the factory outlet centre and the speciality centre. Only the definitions that are applicable to the current research problem have been included. These include the focused centre, the shopping mall and the speciality centre.

The *focused centre* is usually built to serve the surrounding residential area. It contains a supermarket and other small shops. This can also be referred to as a shopping complex, local centre or neighbourhood centre. The *shopping mall* is a single building that is usually very large and contains anchor tenants. They also have other features such as entertainment or a food court. The *speciality store* is usually situated on the side of the road and tend to specialise in one type of good (C. M. Guy, 1998).

Although the speciality store is not usually the nature of a pharmaceutical business, it appropriately completes the contrasting establishments selected in solving this location hypothesis. Owing to the different store locations that exist and the different types of store that would cluster together in the different retailing establishments, it would seem that stores are influenced by the type of establishment in which they operate. As a result,

it appears that a plausible relationship exists between pedestrian accessibility and profitability resulting in the following hypothesis.

- **H_{4b}: Does pedestrian accessibility affect the profitability of pharmacies (profit = *f* (pedestrian accessibility))?**

2.4.4.3 Competition

In unregulated environments, competition results in the lowest possible price being paid by the consumer. This is because suppliers will drive down the price in an attempt to take market share away from their competitor. This is known as free-market competition. The United States of America makes use of such forces within its pharmaceutical industry (Pretorius, 2011). However, in most countries there is extensive regulation around selling price maintenance. Thus competition in these environments can be detrimental to the survival of the store location.

The question arises is to what is defined as competition for a pharmacy. The simple answer is a pharmacy that is in close proximity to the pharmacy. The issue then becomes how to define how close another store needs to be in order to influence the focal store. This can be determined by defining discrete distance bands (Zhu & Singh, 2009) or assuming that the areas of competition overlap (Pauler et al., 2009). This is not the aim of this research paper, however, it is necessary to determine whether competition has a negative effect on store performance. In all cases it was identified that competition within the region has a negative impact on sales and, as a result, profitability ((Gonzalez-Benito, 2005; Pauler et al., 2009; Verhetsel, 2005; Zhu & Singh, 2009). Thus the next hypothesis appears to have a plausible relationship within the literature on which its existence is based. It appears that competition has a negative impact on store profitability.

- **H_{4c}: Does the number of other pharmacies in the area affect the profitability of pharmacies (profit = *f* (number of other pharmacies in the area))?**

2.4.4.4 Number of doctors

Footfalls, or the number of customers, has been identified as a key driver of efficiency in pharmacies in New Delhi, India (Patel & Pande, 2012). From this the next hypothesis is developed. As most of the medicine in South Africa can only be supplied to a patient by an authorised prescriber or doctor ("Medicines and Related Substances Act," 1965), it would suggest that in areas with a high density of doctors there would be increased profitability. This seems logical when you consider the number of doctors at a hospital and the pharmacy at the same hospital. After their doctor's visit most patients collect their script at that pharmacy. Further, if footfalls are a key driver of efficiency, being in an area surrounded by doctors is a way in which a pharmacy could increase its footfalls. The reason for this is that patients will go to the store closest to their doctor. Thus there would be a difference in the level of travel experienced if a pharmacy were close to a number of pharmacies than those that are not close. As a result, we develop the following relationship:

- **H_{4d}: Does the number of doctors in the area affect the profitability of pharmacies (profit = *f* (number of doctors in the area))?**

From the analysis of the literature that exists on the location of a store it appears that there is sufficient evidence to suggest that a number of locational factors affect the profitability of the retail store. However, each of these components is not mutually exclusive and a particular location is a function of each of these. As a result the final hypothesis needs to be developed as follows:

- **H_{4e}: Does the location index affect the profitability of pharmacies (profit = *f* (location index))?**

2.5 Conclusion of literature review

Based on the review of the current literature it appears that a number of valid hypotheses exist that supports the profit function that was developed in chapter 1. It is evident that there is increased global focus on assessing the performance of pharmacies in order to trim their profits to ensure that patients receive medicines at the lowest cost possible. It is important to note that it is possible that there are other variables or factors not considered in the current research. However, the key factors of research interest relate to the average inventory holding, product mix, floor space and location.

3 Research Methodology

3.1 Introduction

This chapter will describe the purpose of developing an appropriate research methodology and will consider the research design to determine how the data links to the research questions proposed. Subsequently, a description of the population will be provided together with the associated sample and the sampling technique used. The process of data collection will then be considered as well as the development of the research instrument. The methods applied to analyse the variables and test the research hypotheses will be provided. Finally, the validity and reliability of the testing instrument will be considered.

3.2 Research methodology

Research methodology normally forms part of three broad categories: quantitative research, qualitative research and mixed methods approach. Quantitative research is a method that is used when the researcher intends to quantify a specific phenomenon and measure specific values or variables. Qualitative research is used in research where the problem cannot be easily reduced to numerical values and the item being tested is complex in nature (Leedy & Ormrod, 2010). In contrast, a mixed methods approach makes use of elements of both of these broad categories to develop a complete picture of a situation where it is possible to decompose the research question into numerical elements and qualitative elements.

This research paper intends to make use of a quantitative research approach to analyse the research hypotheses that have been developed. It is also post-positivist in nature. The reason for this is that the research method makes use of a scientific approach to explain

phenomena, but does not suggest that the variables are the only variables that exist to explain the research outcomes (Wagner, Kawulich, & Garner, 2012). Further, as will be shown as part of the research design, the data collected is objective in nature.

Although true objectivity cannot be obtained owing to the design of the research instrument, it does approach a level of objectivity. The reason for this is that the data is based on "hard" facts at the time at which the data is collected and the answering of the questions is not dependent on the opinion of the person completing the research instrument. The research hypotheses were developed from theory and have been explicitly defined so that the research can be re-performed and verified (Wagner et al., 2012).

Post-positivist quantitative research has certain inherent limitations. One of the main issues related to this study is that, where plausible relationships are not found to exist, there is no mechanism to determine with some degree of insight into the industry why this would be the case. This would leave unanswered questions which could be areas for future research.

3.3 Research design

In order to perform the research a method needs to be constructed in order to collect the appropriate data. This data must then be linked appropriately to the research question. This will allow for conclusions to be drawn (Rowley, 2002).

An adequate understanding of one's research design is important for answering the research questions posed. Firstly, it allows the researcher to understand whether the design is adequate for addressing the research questions. Secondly, as with all research methods, there are inherent limitations to a specific approach which need to be considered when drawing conclusions on any findings identified. Lastly, each research design has certain advantages and disadvantages associated with it. This may relate to the ease of execution, the target group and the availability of literature. The rest of this

section attempts to describe the research design method that has been applied. It will look at the advantages and disadvantages of this design from a theoretical perspective, as well as in the context of this research paper.

There are a number of different methods that exist under quantitative research. These include experimental research, grounded theory, action research, case study research and survey research to name a few (Leedy & Ormrod, 2010). This paper is not a paper on research design, however, and, as a result, only the research method selected under quantitative methodology has been explained. The research method used is survey research. Although survey research is often misunderstood in the literature, this specific research method is intended to obtain information from a group of people by making use of a list of questions. Surveys can be conducted using pen-and-paper questionnaires or face-to-face interviews or can be administered online.

Accordingly, a questionnaire can then be administered to the sample that is willing to participate in the research. The nature of survey research is such that it takes a snapshot of the state of a phenomenon at a certain point in time. This snapshot is then used to draw conclusions and these conclusions are then assumed to represent a longer period of time (Leedy & Ormrod, 2010). However, it should be noted that such assumptions or inferences can be dangerous as, owing to the nature of the sample and the time period, there may have been external factors which were not considered as part of the research and that might have affected the ability to infer the conclusions to the population or time period.

A mix of a pen-and-paper approach and face-to-face interviews was used in this research. The reason for this is that, for pen-and-paper research, a complete listing of the entire population is usually obtained and the questionnaire is then mailed to the recipient. The recipient is then able to complete the questionnaire in their own time and there is no place for the interviewer bias that exists if the questionnaire is administered during a face-to-face interview. However, the response rates with this type of design are usually low. In a face-to-face interview, the researcher has better control of the response rate as he or she is required to visit the participants and then ask all the questions in the questionnaire in the

same order for each respondent. There is obviously some degree of bias relating to the face-to-face interview as the respondent may feel compelled to respond in a particular way (Wagner et al., 2012).

To try and encapsulate the advantages of each method as well as the limitations relating to the availability of a complete listing of pharmacists, a pen-and-paper questionnaire was developed and each questionnaire was handed personally to the responsible pharmacist or store owner to complete. The questionnaire could be completed while the interviewer waited or was left at the pharmacy to be completed at a convenient time and follow-up was performed. The use of this approach was to ensure a better response rate than a mailed survey while still encouraging unbiased responses, as the interviewer did not participate in the completion of the questionnaire.

It is important to note that the use of questionnaires in performing this type of research is not new and quantitative research is often performed using such instruments (Dubelaar et al., 2001; Eboli & Mazzulla, 2009; Helgesen, Nesset, & Voldsund, 2009; Keshavarz et al., 2012). In each of these studies data was obtained from a survey that was completed, in these cases mail surveys. The survey data was then used to determine certain positivist theory by establishing the existence of cause-and-effect relationships within the data. Consequently, the research hypotheses developed in chapter 2 represent similar cause-and-effect relationships and, as a result, the use of survey research would appear to be appropriate for answering the questions.

3.4 Population

The study is focused on the urban retail pharmacy sector of the South African pharmaceutical supply chain. Thus, the population would include all of these pharmacies. As disclosed on the Pharmacy Council website the number of pharmacies across all the different defined types of pharmacy is 4 582. However, the research questions limit the research to community pharmacies which account for 3 118 pharmacies across the nine provinces (Council, 2012). To further define the population, there are different locational

characteristics that exist within the different provinces of South Africa; this resulted in a population of 1 099 community pharmacies in Gauteng, which was defined as the population for this study.

3.5 Sample and sampling method

A sample represents a subset of the population as it is usually not possible to test the entire population. The sample should be sufficiently representative of the population so that inferences can be made to the population (Leedy & Ormrod, 2010). The population sample focused on community pharmacies in Johannesburg and its surrounding areas, with Johannesburg forming part of Gauteng province.

Two types of sampling technique exist in practice: probability and non-probability sampling. This research makes use of non-probability sampling because, owing to the method of distribution of the questionnaire, it would not have been possible to guarantee that each element of the population would be included (Huysamen, 1993; Leedy & Ormrod, 2010). However, a key element of this form of sampling is the removal of any evidence of bias (Howell, 2004). To address this issue, the questionnaire was handed out in all the areas surrounding the Johannesburg Central Business District. Using theoretical compass points, the sample covered the south, east, west and north of Johannesburg. In addition, the sample selected included both corporate retail pharmacy chain groups like Dis-chem and Clicks and small independent pharmacists.

Non-probability sampling is further divided into the different methods by means of which it can be performed. For example, purposive sampling is a method of sampling that is used when the sample is picked for a particular reason (Leedy & Ormrod, 2010) and there is often a specific selection criterion (Wagner et al., 2012). The selection criterion for this sample was that the responsible pharmacist, that is, the person who is responsible for ensuring compliance with pharmaceutical legislation, or the owner of the pharmacy, was requested to complete the questionnaire. The reason for this was that they have

specialised knowledge and experience of the characteristics highlighted in the research hypotheses.

3.6 Instrument design and data collection

This section will describe the method used to create the research instrument. A key element of the research instrument is to ensure its reliability and validity and this will be discussed later in the chapter. According to Wagner et al. (2012), there are a number of simple key principles that should be applied in order to build credibility with your audience. These include giving your research questionnaire a title and supplying a covering letter that explains the purpose of the research. Refer to Appendix B for a copy of the questionnaire that was used in this research. Further, according to Goodman in 2003, it is also useful to provide instructions above the specific question block to ensure correct completion of the questions involved (Wagner et al., 2012). The questionnaire was therefore designed with these principles in mind. The next element of the research instrument that needs to be considered is the content.

The content included in the questionnaire should be effective in obtaining meaningful data from the respondent (Walonick, 2004). In developing content for the questionnaire, the research hypotheses were considered and the type of data that was required for each hypothesis was determined. This enabled the questions to be framed correctly. To ensure that the questionnaire was relatively easy and simple to complete a number of questions were asked by defining ranges. These questions related to physical store size, dispensary size, turnover from scripts, total turnover, average inventory holding, number of other pharmacies in the region, number of doctors who practice in the region, as well as the locational items of roadside accessibility and pedestrian accessibility. This type of questioning also considered the ethical issues relating to the right to privacy associated with research (Leedy & Ormrod, 2010). The reason for this is that data relating to financial performance is often considered to be private and participants were unlikely to share this information with the researcher.

In developing the other questions to be included in the content of the questionnaire, simple closed questions were used. A closed question is a type of questioning technique in terms of which a user is required to answer in a specific way and there is no other answer that can be provided. Closed questioning is often easy to use in statistical analysis (Wagner et al., 2012). Other benefits associated with closed questioning include the fact that little writing is required, provides the ability to make group comparisons and is useful for testing specific hypotheses. The latter characteristic is probably the most important. Consequently, this type of questioning was considered appropriate for achieving the desired outcomes of this research (Vinten, 1995).

A major drawback of closed questioning is that the respondent is restrained by the items, which can result in the wrong outcomes. For instance, if selected items are presented as a closed question such as the following: "What would you most prefer in a job?"(Kalton & Schuman, 1982). The respondent is then constrained by the answers or categories presented. However, as was shown when the same question was left open-ended, the statistically significant responses did not include any of the themes or categories presented as part of the closed question (Kalton & Schuman, 1982). However, the closed questions used in this questionnaire elicited yes/no type responses. The reason for this was to ascertain the existence of a variable or not. However, some of these yes/no responses did illicit contingent questions being asked within the questionnaire (Wagner et al., 2012). As a result of this type of closed questioning the drawback presented was not considered to be an issue. The next part of this chapter will discuss the different variables.

3.6.1 Average inventory holding

The variable of average inventory holding is defined in rand, as this is the currency in which purchasing transactions take place in the pharmaceutical industry at the retail pharmacy level. Accordingly, this basis of measure would appear to be appropriate. Moreover, an average balance was selected owing to the fact that the inventory balance could be higher or lower than the mean at different times of the year as a result of the trading cycles that exist. These trading cycles are present in the pharmacy industry

because the incidence of illness varies according to the time of the year (Hamuro et al., 1998).

In order to illicit a response from respondents certain ranges were developed, the value of which was based on discussions with three different pharmacists who were personal friends of the researcher.

3.6.2 Total turnover and turnover from scripts

The term *turnover* is often used in commerce to refer to revenue or income. Accordingly, turnover represents the number of sales made during a period of time. For the purposes of the research this period was taken to be a monthly period. Turnover is further defined in rand, as this is the currency used to perform sale transactions in pharmacies in South Africa. Specifically, the concept of thousands of rand (’000s) was used.

Although the research problem intends to address profitability, turnover has been used as a proxy for profit. There are two main reasons for this. Firstly, turnover is a figure that is less guarded by members of the public than profit. Secondly, turnover is a “clean” number, as it represents the number of sales made. Profit includes other factors that have not been expressly considered or defined in this research question, such as gearing. Gearing relates to the basis on which businesses are financed. In other words, companies that have made use of loan financing from a financial institution could have a lower profit than those that use their own start-up capital, owing to the interest expense charged, which is recorded in the Statement of Comprehensive Income. Another example of this is the fact that certain pharmacies may own the building within which they are located and others may be renting. Again, there will be an unaccounted variable within the model that may have an impact on the outcome of the analysis.

The turnover measures were represented using ordinal data because the data represents intervals which have a comparable element (Leedy & Ormrod, 2010). To determine the intervals the insights of the three pharmacists were used. This approach is supported by a

study conducted in Tehran, Iran, where a pharmacy's income was defined as $106 301 annually (Keshavarz et al., 2012). Thus, converting to a rand equivalent would, on the 22 January 2013 at a rate of 8.857630/USD (x-rates.com, 2013), result in R941 574,93. This would represent the mean revenue expected. However, this is considered to be revenue earned on an annual basis, which was consequently deemed to be too low. Hence, on discussion this was used as the mean monthly turnover earned. Further, it should be noted that in Tehran the turnover that can be earned on non-medical items is restricted, which may suggest the reason for the difference.

3.6.3 Number of pharmacies

The number of pharmacies in an area is used as a proxy for the level of competition that is experienced. Hence, more pharmacies in an area would represent more competition. However, it does not suggest that when there are four pharmacies in a region there is twice the competition than if there were only two pharmacies. As a result, the pharmacy measure represents ordinal data. As defined, ordinal data ranks data but does not take into account how similar or dissimilar the groups are (Leedy & Ormrod, 2010). Therefore, a ranking letter was allocated to each item and a value of 5 was allocated when there was less than one pharmacy in the area as this corresponds to low competition. Each block after that was allocated a corresponding number, ending at 1, with 1 suggesting that the environment is the most competitive.

Zhu and Singh (2009), study analysed the effect of competition as a decreasing function of distance from the store. However, our competition measure is not concerned with this complex measure of competition, merely with the existence of competition. Thus, the discrete bands that were defined by Zhu and Singh (2009) were a measure of less than two miles, which when converted to the metric system is just more than three kilometres. This measure of competition is consistent with other studies performed (Patel & Pande, 2012) and this band therefore seemed appropriate for the competition measure.

3.6.4 Number of doctors in the region

Population density is often seen to have an impact on the number of customers who actually make use of a store (Pauler et al., 2009). However, in the retail literature, population density is not the only way in which to measure the number of people who will actually make use of a store. For instance, in Japan (Sadahiro, 2000) found that, in areas where a large number of people work, this too may affect the number of footfalls in a store. For instance, stores were often found around key public transportation centres in the business district rather than in the suburbs. Based on this, the questionnaire in the current study attempted to develop a similar density measure.

As a pharmacy is reliant on the number of scripts it fills it is reliant on the providers of these scripts (i.e. the doctors) being in the area. To measure this ordinal data was used. Again, the dataset represents intervals and, as the data does not indicate degrees or amounts, it is ordinal data. Once again, a ranking measure was allocated to each box. As the number of doctors in the area increases so too do the providers of scripts increase. As a result, the field with the most doctors is represented using a rating of 5, while less than one doctor in the region is represented by the lowest score of 1.

3.6.5 Floor space

The floor space of the pharmacy is defined using the metric system; thus, floor space is measured in metres squared. The data set represents ordinal data because the data generated represents discrete intervals. These intervals are then ranked, which is a key element of ordinal data. To define these bands reliance was placed on the retail literature, which states that type of store trip depends on either the size of the store or the purpose of the trip. Accordingly, it was indicated that a pharmacy is generally 250 m^2 or less (C. M. Guy, 1998). As a result the measure of floor space was developed from this by working backwards to define each ratio.

A similar process was used to determine the physical size of the dispensary. As a dispensary forms part of a larger pharmacy, the dispensary must be a proportion of the total size. The use of this approach enabled the smaller dispensary-only pharmacies to select the same answer in each grouping to indicate that their entire pharmacy represents the dispensary.

3.6.6 Roadside accessibility and pedestrian accessibility

"Roadside accessibility" and "pedestrian accessibility" are defined using ordinal data. This is because a random value from 1 to 5 is allocated to each item. However, the value allocated suggests that a particular item is preferred for the location index over another item, although it does not suggest the degree to which one is preferred over another. For "roadside accessibility", "main roads" were considered to be rated a 5 as these are indicative of more traffic (Sadahiro, 2000) and busy side streets were rated as 1. In terms of "pedestrian accessibility", "shopping centres" were considered to be a 5 and "roadside" a 1.

3.6.7 Location index

The location is developed as a variable of the four components that form part of location. The location represents ordinal data as the value generated from the other components is comparable. A 5 represents a location point with a high degree of favourability, while a 1 represents a location that is unfavourable. However, there is no reference to how much more favourable a 5 is to a 4. The variable is constructed by using a 25% weighting to the location index. The reason for this is that the aim is not to suggest a single variable has a larger influence on a location in comparison to another variable. Thus, this is deemed appropriate.

3.6.8 Other relevant data points

The other data points included in the questionnaire represent binary nominal data. The data points are nominal because the coding of the data merely reflects a difference in the items; there is no comparison of the items or significance of the value allocated. The data is binary as there are only two potential answers, which are provided by responding either "yes" or "no".

3.7 Data analysis

To analyse the research questions, a mix of parametric and non-parametric statistics will be used. Parametric statistics can only be used when the data meets certain key assumptions about the parameters of the population. For example, some parametric procedures, such as regression, requires that, (a) that the data be interval or ratio in measurement level and (b) that the dependent variable has a normal distribution (Leedy & Ormrod, 2010). As the ordinal data is being treated as scale measurement the use of parametric analysis is possible.

The first step in data analysis is to summarise the data. This is often done by using descriptive statistical techniques. The methods applied in summarising the data include calculating means, standard deviations and distribution graphs. After this basic analysis of the data, it can then be applied in other parametric and non-parametric statistical procedures such as chi-square, correlational analysis and regression.

In determining which statistical methods are appropriate for use in this study, various methods were considered from previous studies. To determine whether a pharmacy was a lucrative business in Tehran, Iran, the researcher made use of non-parametric statistics such as chi-square to determine the significance of proportion differences (Keshavarz et al., 2012). In a similar study performed in New Delhi, India, a Tobit regression model was used to determine drivers of efficiency after a data envelopment analysis (DEA)

method was utilised. DEA is useful for developing the “best” solution for relating input to output (Patel & Pande, 2012).

Furthermore, the impact of market structure was considered on a service firm’s pricing objectives. This study considered a number of industries and as part of the study a cluster analysis was conducted to analyse the market structure (Avlonitis & Indounas, 2004). To specifically test the relationship between inventory and sales in a retail chain store, which is represented by a relationship of inventory increasing by the square root of sales, t-statistics and p-values were used to identify significant predictors of the relationship (Dubelaar et al., 2001).

To address the research questions presented by the current study, the following methods are to be used. Descriptive statistics will be used to summarise the data, which will subsequently be used to determine whether the parametric variables can be tested using inferential statistics. The summarised data will also be used to determine whether any relationship can be identified. The main aim of the research hypotheses is to determine whether a relationship exists between the independent variable and the dependent variable. The mathematical determination of relationships from the scatter plots is known as regression analysis (Vesselo, 1965). Ordinary least squares regression is a parametric technique that can be used to determine whether such a relationship is linear.

Ordinary least squares regression is a parametric technique that can be utilised to model a causal linear relationship between variables. Other methods of regression that exist are Tobit and logistic regression. In order to determine significant mean differences between different buyer groups and regions, independent samples t-test and Analysis of Variance (“ANOVA”), test will be utilised.

Cluster analysis is a technique that can be used to determine groupings within the data. It is a multivariate, exploratory technique designed to reveal natural groupings that may exist in the data ("Chapter 23 Cluster Analysis,"). A number of different methods of cluster analysis exist. These methods include hierarchical cluster analysis, Ward’s method, Square Euclidean Distance and K-means clustering. Cluster analysis can often be

used in conjunction with regression analysis and is generally applied by grouping or classifying variables which can then form part of the independent variables in the logistic regression (Wood, 2006) or ordinal regression (Helgesen et al., 2009).

The cluster analysis method to be used is K-means clustering, because a preconceived idea relating to the number of clusters that may exist and no grouping of the variables into smaller groups is required. The preconceived grouping is defined by the four variables which relate to competition and accessibility. The limitation of this cluster analysis method is that the researcher needs to decide on the number of clusters (Everitt, 1979).

3.8 Validity and reliability

When performing research using a questionnaire, the validity and reliability of the data obtained can be threatened. One reason for this is the fact that if the questionnaire is not appropriately designed, it is possible that the data obtained will not be reliable. This can happen when the constructs being used to collect the data are not applied consistently (Wagner et al., 2012). However, if the research instrument is valid, the questions included in the questionnaire will address the proposed hypotheses (Leedy & Ormrod, 2010). Although there are various types of validity and reliability measures, only those that are appropriate for the research instrument used in this study will be considered here.

3.8.1 Validity

There are four main types of validity: face validity, content validity, criterion validity and construct validity. The questionnaire in this study appears to have some degree of face validity as the questions were developed from the research questions proposed. The questionnaire also has a level of content validity. In order to attain this validity, certain elements were verified with three pharmacists prior to the questionnaire being administered to a larger sample. Further, a number of the relationships identified are

relationships that have been developed in the literature (Dubelaar et al., 2001; Keshavarz et al., 2012; Patel & Pande, 2012; Pauler et al., 2009). The content validity of a tool is obtained when the questions included address the specific area of research (Wagner et al., 2012).

3.8.2 Reliability

Reliability refers to the consistency of the results produced by the research instrument. For instance, a test is reliable if the same results are produced for the test when performed by the same people on a different day (Leedy & Ormrod, 2010). This type of reliability is referred to as test-retest reliability. The research tool in this study, however, makes use of an internal measure of reliability. Accordingly, the questions at the end of the questionnaire request percentage data relating to where the pharmacist believes the revenue in the pharmacy is earned and the number of scripts and the value of these scripts. The use of this data, that is, average turnover of a pharmacy for a year and a month, can be compared to the answers provided in the tick-box questions. Hence, if there is a high correlation this would indicate reliability.

In addition, in order to enhance the reliability of the tool, it was administered to each participant in the same standard way. Accordingly, it was presented to the pharmacist responsible for its completion who then completed the questionnaire without any help or guidance from the researcher. In addition, the questions were designed so as to ensure consistency in selection, as the pharmacists could only select their answers from a predetermined set.

3.9 Conclusion

This chapter has presented an extensive review of the process involved in developing the research instrument, the definitions of the variables to be used and the methods by which

the data collected will be analysed in order to draw the conclusions required to support the research hypotheses that have been formulated.

4 The Results

4.1 Introduction

The purpose of this section is to provide the results obtained from the research. The interpretation of these results in the context of the research hypotheses is not explicitly explained in this chapter. Rather, deep knowledge is provided while analysis is performed in the following chapter, chapter 5. By contrast, this chapter will expand on any findings to give context to the statistical measures used. The chapter is laid out in the following way: It begins with a description of the sample selected and the distribution of this sample. This is then followed by an analysis of the key descriptive statistics obtained from a summarisation of the data collected. Regression analysis will then be conducted to determine the existence of any relationships in the data. In addition, a K-Means Cluster analysis will be presented and finally an analysis will be conducted to determine whether there are mean differences in significance between different groupings of the data.

4.2 Sample tested and response rate

The questionnaire was handed out to 105 pharmacies in the greater Johannesburg area. Respondents were requested to complete the questionnaire at the time it was presented to them. If the pharmacy was too busy, the questionnaire was left with the responsible pharmacist or owner to complete at a time that was most convenient for them. If the questionnaire was left at the pharmacy, a follow-up trip was made a few days later to collect it. Using this process, 65 questionnaires were completed and returned, and the data they contained could be used for the statistical analysis. A response rate of 61.9% was consequently achieved, which is in line with similar research studies (Kennedy & Moody, 2000; Keshavarz et al., 2012). Participants were informed that it was not compulsory to participate in the research and that they could refuse to complete the

questionnaire. It was assumed that the corporate pharmacies that completed the questionnaire were permitted to participate in the research. All participants were informed that their identity would remain confidential and each pharmacy was allocated a code consisting of a P and then a number. Table 4.1 and Figure 4.1 show the split per type of group that completed the research.

Table 4.1 - Split between the different groups

		Frequency	Percent	Cumulative percent
Valid	Corporate group	12	18.5	18.5
	Independent group	53	81.5	100.0
	Total	65	100.0	

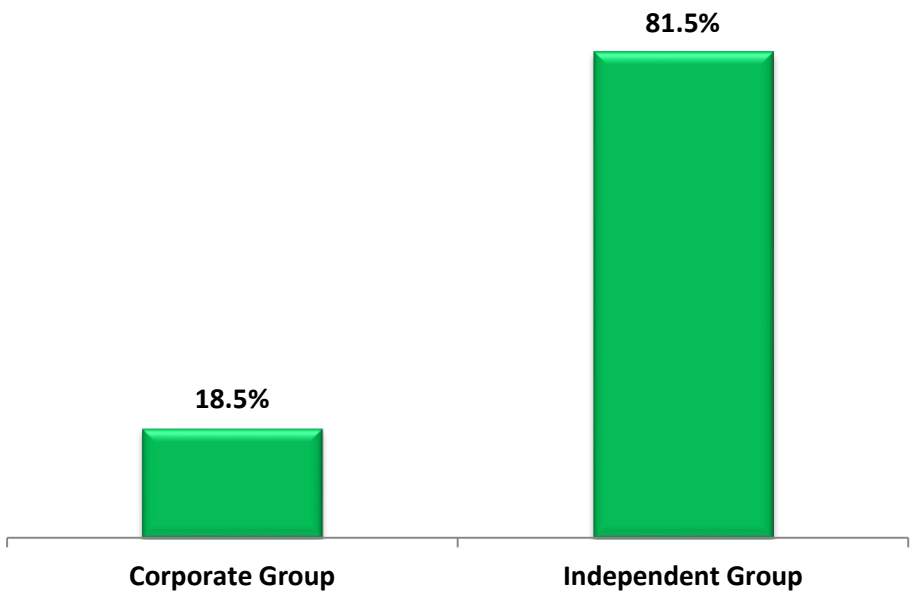


Figure 4.1 - Graphical representation of the respondents

Further, the distribution of the respondents was divided into different groups based on their geographical region. This is presented in Figure 4.2 below. The distribution across the geographical regions is relatively evenly split except for the east. This is most likely due to insufficient questionnaires being handed out in that region. However, the split

among the other regions suggest that the sample is fairly representative of the greater Johannesburg area.

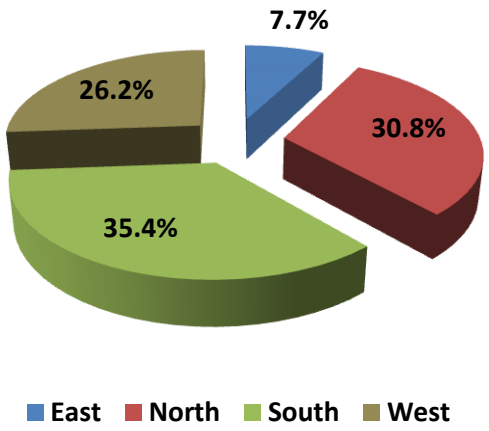


Figure 4.2 - Split of respondents by geographical location

4.3 Descriptive statistics

A key element in analysing the descriptive statistics is to understand and describe the basic features of the sample and the measures that were collected. Simple summaries supported by graphical representations of such summaries are used to assess the distribution of the variables that will be used in inferential statistical procedures.

Table 4.2 - Distribution of average inventory

	Frequency	Percent	Cumulative percent
< R 250 000	4	6.2	6.2
R 250 000 - R 750 000	13	20.0	26.2
R 750 000 - R 1 250 000	26	40.0	66.2
R 1 250 000 - R 1 750 000	13	20.0	86.2
> R 1 750 000	9	13.8	100.0
Total	65	100.0	

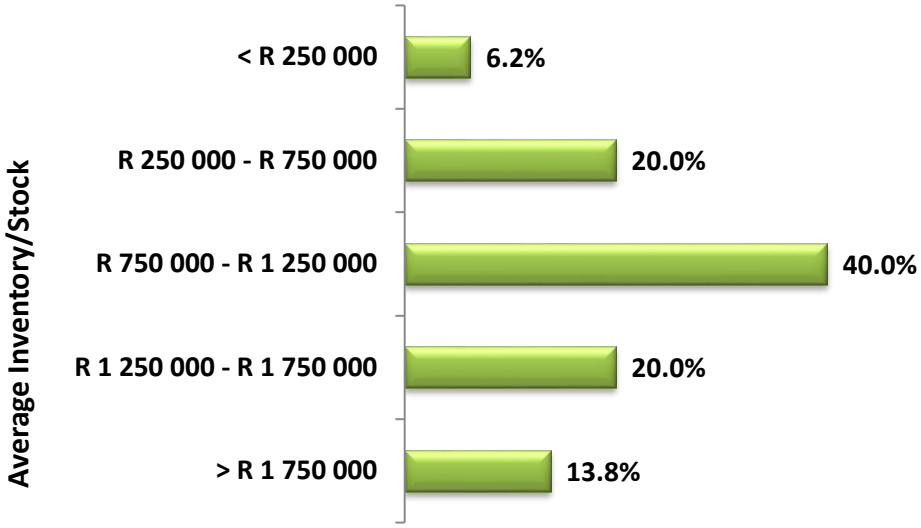


Figure 4.3 - Graphical representation of average inventory

Table 4.2, Figure 4.3 shows the distribution of the different pharmacies among the different average inventory or stock levels. 80% (n=52) of the pharmacies keep inventory or stock worth R 250 000 to R 1 750 000.

Table 4.3 - Distribution of total turnover and turnover from prescriptions

		Count	Column N %	Mean
Turnover from scripts	< R 400 000	7	10.8%	
	R 400 000 - R 800 000	24	36.9%	
	R 800 000 - R 1 200 000	12	18.5%	
	R 1 200 000 - R 1 600 000	11	16.9%	
	> R 1 600 000	11	16.9%	
	TOTAL	65		2.92
Total turnover	< R 500 000	3	4.6%	
	R 500 000 - R 1 000 000	19	29.2%	
	R 1 000 000 - R 1 500 000	14	21.5%	
	R 1 500 000 - R 2 000 000	10	15.4%	
	> R 2 000 000	19	29.2%	
	TOTAL	65		3.35

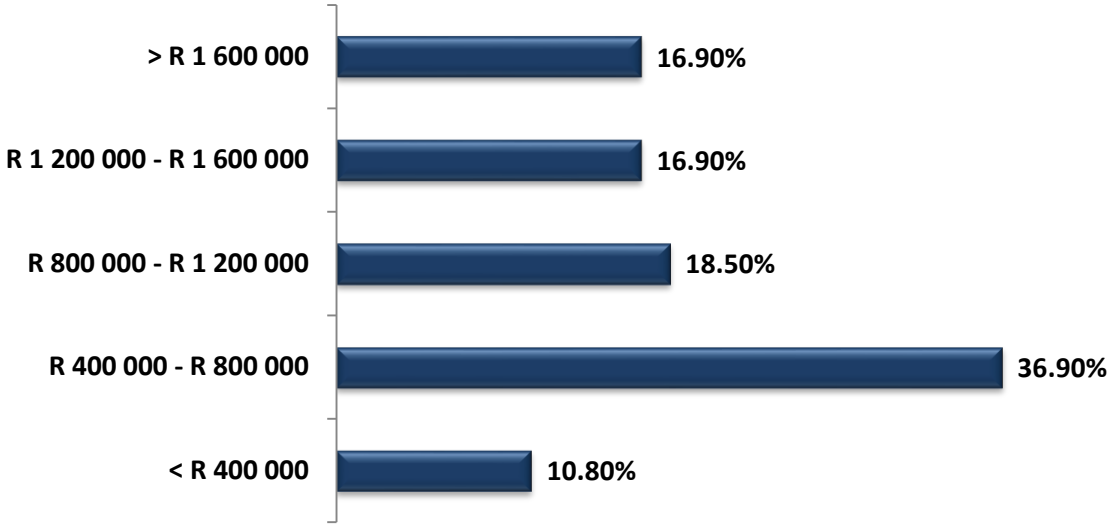


Figure 4.4 - Distribution of turnover from prescriptions

Table 4.3, Figure 4.4 and Figure 4.5 shows the distribution of the different pharmacies among the different turnover intervals for scripts and in total. Close to 50% (47.7%, n=31) of the pharmacies have a turnover from scripts that is less than R 800 000 and more than 55% (55.3%, n=36) of the pharmacies have a total turnover of less than R 1 500 000.

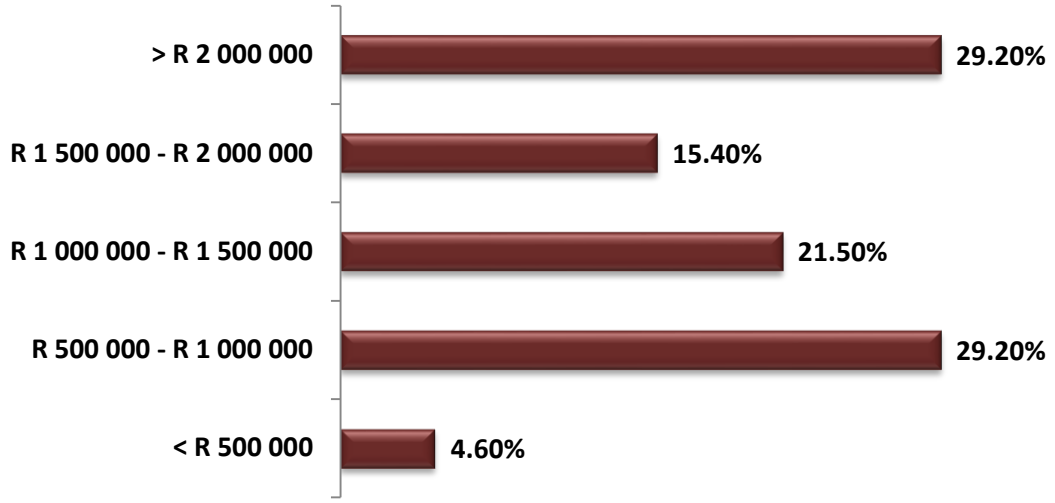


Figure 4.5 - Distribution of total turnover

Table 4.4 - Distribution of physical size and size of dispensary

		Frequency	Percentage
Physical size of pharmacy	Less than 100 sq m	4	6.2%
	100 - 150 sq m	18	27.7%
	150 - 200 sq m	16	24.6%
	200 - 250 sq m	17	26.2%
	> 250 sq m	10	15.4%
	TOTAL	65	100.0%
Physical size of dispensary	Less than 25 sq m	9	13.8%
	25 - 50 sq m	29	44.6%
	50 - 75 sq m	20	30.8%
	75 - 100 sq m	6	9.2%
	> 100 sq m	1	1.5%
	TOTAL	65	100.0%

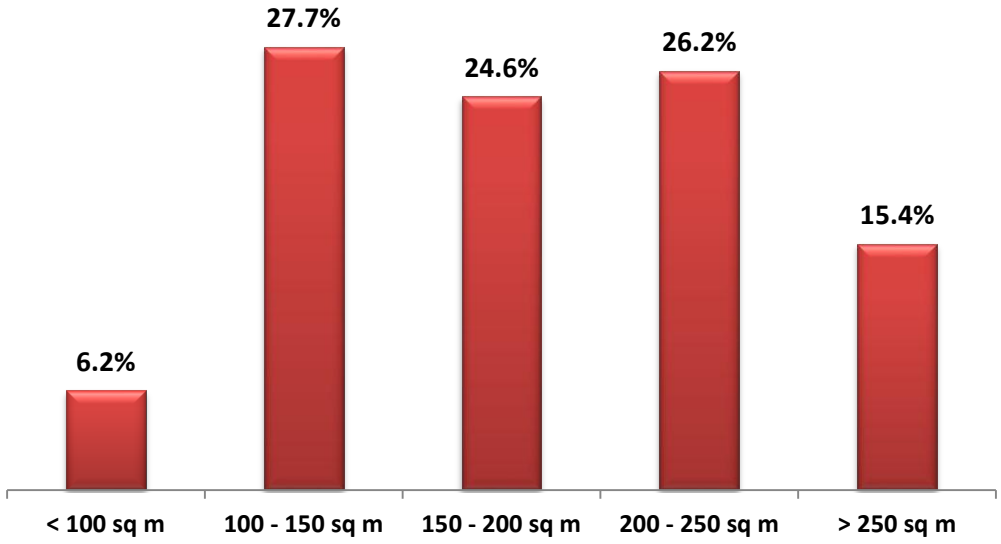


Figure 4.6 - Distribution of physical size of pharmacy

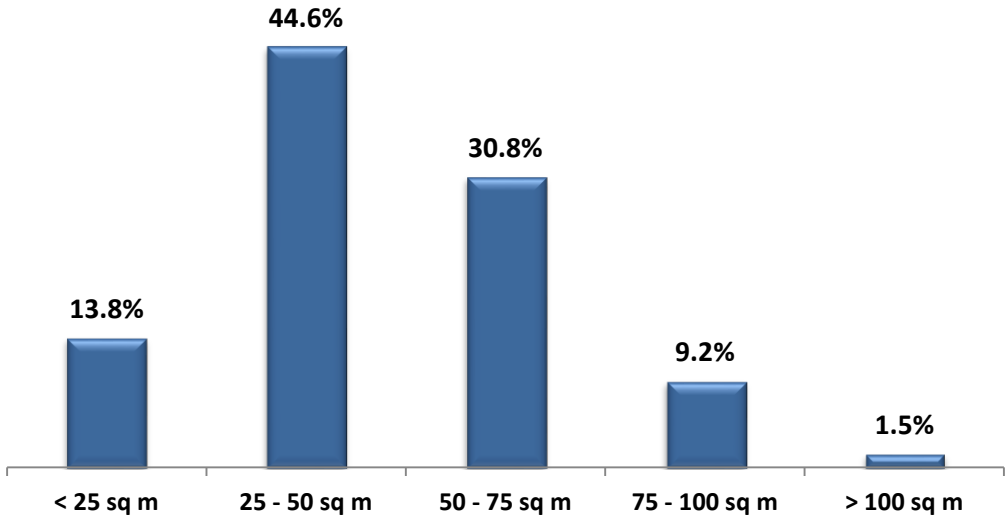


Figure 4.7 - Distribution of physical size of dispensary

From the above graphics the following additional conclusions can be drawn. More than 75% (78.5%, n = 51) of the pharmacies have a size in the range of 100 to 250 m^2, and more than 75% (75.4%, n = 49) of them have dispensaries with a physical size of 25 to 75 m^2. The correlation between the size of the pharmacy and the size of their corresponding dispensaries is small (Spearman's rho = .401, n = 65, $p < .01$), indicating

that the dispensary size is not necessarily larger for all larger pharmacies. The size of the dispensary is skewed to the left which suggests that for many of the pharmacies the dispensary size is similar. If we combine the size of the dispensary with the revenue generated from scripts, this would also be skewed to the left if plotted from smallest to largest. Consequently, there is evidence that there may be a correlation between dispensary size and turnover from scripts.

A number of variables were considered to be functions of other variables; these included:

$$n\ (advertising, number\ of\ customers, other\ services\ and\ customer\ loyalty)$$

$$COS\ (Discounts, formation\ of\ buyer\ groups)$$

$$Average\ Inventory\ Holding\ \begin{pmatrix} Information\ Technology, purchasing\ patterns, \\ presribing\ patterns \end{pmatrix}$$

Where n represents the number of items sold and COS is the cost of goods sold. Thus, additional questions in the questionnaire attempted to determine the effect of each of these variables. In terms of advertising, approximately half (53.8%) of the sample was found to do some sort of advertising. This is included as part of table 4.5. It was identified that 80% (n = 52) of the pharmacies delivered medicines to their patients, while 87.7% (n=57) reported that they offered additional services that were medical in nature. These services were usually the monitoring of blood pressure, blood glucose and cholesterol. Only a small percentage (35.4%) of pharmacies was identified as providing other services. These other services include ear piercing, while three pharmacies within this sample offered printing of photographs (see fig. 4.8).

Table 4.5 - Miscellaneous questions

	Yes	No	N/A	TOTAL
Doctors have particular prescription patterns?	45 69.2%	20 30.8%	0 0.0%	65 100.0%
Do you hold stock according to these patterns?	43 66.2%	22 33.8%	0 0.0%	65 100.0%
Do you advertise?	35 53.8%	30 46.2%	0 0.0%	65 100.0%

Do you form part of the pharmacy group?	47 72.3%	17 26.2%	1 1.5%	65 100.0%
Do you obtain discounts for bulk purchases on medication?	33 50.8%	32 49.2%	0 0.0%	65 100.0%
Do you obtain discounts for bulk purchases on other items?	44 67.7%	21 32.3%	0 0.0%	65 100.0%
Are your customers repeat customers?	59 90.8%	6 9.2%	0 0.0%	65 100.0%

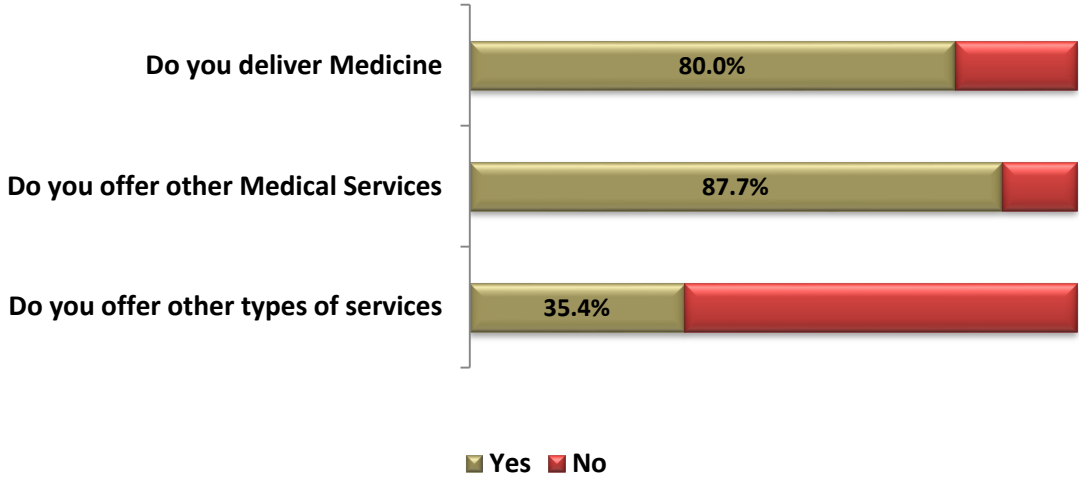


Figure 4.8 - Provision of other services

In terms of the variable relating to customer loyalty there appears to be a clear indication that, in the South African context, customers remain loyal to a pharmacy. This was represented by 90.8% (n = 59) of pharmacists responding that the majority of their customers are repeat customers.

The next variable that was considered was the cost of goods sold. According to the literature, this is a function of discounts and the formation of buyer groups. According to the results presented in table 4.5, only half (50.8%) of the sample receive medication at a discount. A slightly better percentage was obtained by the sample for discounts on other items (67.7%). However, it should be noted that these discounts received are not necessarily as a result of being part of a group. This is because 72.2% (n = 47) responded

that they formed part of a group but the corresponding percentage for discounts was not the same value.

With reference to average inventory holding, there were other variables which were considered to influence the average inventory holding. These included information technology, and purchasing and prescribing patterns. Information technology is utilised by all pharmacies, as is indicated by table 4.6. Of these pharmacies, 60 (92.3%) also manage their stock with inventory management software. This software produces reorder points and can provide reports showing the number of inventory days.

Table 4.6 - Information technology and inventory management

	Yes		No		TOTAL	
Do you have computer facilities?	65	100.0%	0	0.0%	65	100.0%
Do you use inventory management software?	60	92.3%	5	7.7%	65	100.0%

In relation to the prescribing patterns of doctors, 69.2% (n = 45) stated that doctors have particular prescribing patterns. Of the 45 pharmacies that responded, 43 (95.6%) hold stock relating to the prescribing patterns of these doctors. This is shown in table 4.6 above. Pharmacies reported that they carry stock according to their patient patterns and do not carry all available medicines as the range of generics would be too vast. This is indicated in table 4.7.

Table 4.7 - Stock carrying patterns

Do you carry all stock or according to patient patterns	All	5	7.7%
	Patient Patterns	60	92.3%
	TOTAL	65	100.0%

Based on the above data, relationships would seem to exist within the data set. Further, the miscellaneous questions support a number of the underlying hypotheses that form part of the key variables of the study.

4.4 Regression analysis

Regression analysis was used to test the individual variables driving profit separately and then in combination, as is defined in the ultimate model presented in chapter 1. In performing regression analysis, ordinary least squares method was used, the reason treating the ordinal variables as scale variables.

4.4.1 Individual variable analysis

In performing the regression analyses, total turnover was used as the dependent variable. This is consistent with the model presented above, as this model suggests that each factor influences profitability; moreover, turnover was used as a proxy for profit. The independent variables used consisted of average inventory, roadside accessibility, pedestrian accessibility, number of pharmacies, number of doctors, physical size and product mix, as well as a combination of the location factors.

From the regression analyses performed, average inventory was identified as having a medium positive correlation with total inventory($r=.454$, $n=65$, $p<.001$). The variables, number of doctors in the area and physical size of the pharmacy, were also identified as having a medium positive correlation with turnover. The results of these regressions are presented in tables 4.8 to 4.24.

Table 4.8 - Average inventory versus total turnover correlations

Correlations

		Total Turnover	Average Inventory/Stock
Pearson Correlation	Total Turnover	1.000	.454
	Average Inventory/Stock	.454	1.000
Sig. (1-tailed)	Total Turnover	.	.000
	Average Inventory/Stock	.000	.
N	Total Turnover	65	65
	Average Inventory/Stock	65	65

Table 4.9 - Average inventory versus turnover - model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.454[a]	.207	.194	1.171

a. Predictors: (Constant), Average Inventory/Stock

b. Dependent Variable: Total Turnover

Table 4.10 - Average inventory versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.483	1	22.483	16.398	.000[b]
	Residual	86.379	63	1.371		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Average Inventory/Stock

Table 4.11 - Average inventory versus turnover - coefficients

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.644	.447		3.680	.000
	Average Inventory/Stock	.542	.134	.454	4.049	.000

a. Dependent Variable: Total Turnover

From the above table, it is clear that the ANOVA test on the model suggests that the variable is significant, as p-value is < .001. The B Coefficients for both the Constant and the Average Inventory are significant, as illustrated by the significant t-tests. The coefficient of determination or R squared variable in the model summary suggests that approximately 20% of turnover is explained by average inventory. Thus 80% of the model is explained by other variables that are not included in this model.

However, it is possible to develop the following model from the above analysis:

Total turnover = .542 * Average inventory + 1.644

To explain this by means of an example: Owing to the fact that we used a scale to represent the ordinal values, if a store had an average inventory of R750 000 to R1 250 000, this would represent a corresponding scale value of 3. Thus, if we substituted this into the model presented, total turnover would be equal to .542 * 3 + 1.644, which would be a value of 3.27. As a result, due to rounding, the scale value would also equal 3 and thus this would suggest that the turnover earned would be in the R1 000 000 to R1 500 000 range.

Table 4.12 - Roadside accessibility versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.219	1	.219	.127	.723[b]
	Residual	108.643	63	1.724		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Location - Roadside Accessibility

The F value for the ANOVA test is small for this predictor and the p-value is not < .001 and, as a result, roadside accessibility is not considered to be significant in determining total turnover. Thus, it appears that no relationship exists between this predictor and total turnover.

Table 4.13 - Pedestrian accessibility versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.567	1	.567	.330	.568[b]
	Residual	108.294	63	1.719		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Location - Pedestrian Accessibility

The ANOVA test shows no evidence that a relationship exists between pedestrian accessibility and total turnover as the p-value is not < .001.

Table 4.14 - Number of pharmacies versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.583	1	4.583	2.769	.101[b]
	Residual	104.278	63	1.655		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Number of Pharmacies

The ANOVA test produces no evidence that a relationship exists between number of pharmacies and total turnover as the p-value is not < .001.

Table 4.15 - Number of doctors versus total turnover - correlations

Correlations

		Total Turnover	Number of Doctors
Pearson Correlation	Total Turnover	1.000	.302
	Number of Doctors	.302	1.000
Sig. (1-tailed)	Total Turnover	.	.007
	Number of Doctors	.007	.
N	Total Turnover	65	65
	Number of Doctors	65	65

Table 4.16 - Number of doctors versus total turnover - model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.302[a]	.091	.077	1.253

a. Predictors: (Constant), Number of Doctors

b. Dependent Variable: Total Turnover

Table 4.17 - Number of doctors versus total turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.945	1	9.945	6.334	.014[b]
	Residual	98.917	63	1.570		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Number of Doctors

Table 4.18 - Number of doctors versus total turnover - coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.307	.444		5.196	.000
	Number of Doctors	.315	.125	.302	2.517	.014

a. Dependent Variable: Total Turnover

As is represented by the results, the ANOVA test indicates that there is some degree of significance for the number of doctors versus total turnover, as the F value is greater than the test statistic and the p-value is significant at a level of .05 ($p < .05$). Thus, it is considered to be significant. However, on analysis of the model summary in table 4.16, the R-squared coefficient of determination is .091 and this would suggest that the number of doctors in the area explains around 9% of the variation in turnover. This is relatively small; as a result, it is more likely that this variable should be considered for a multiple regression analysis.

The test for the location index below was found to not have a significant relationship with turnover as the p-value is not less than .05 for the ANOVA test.

Table 4.19 - Total location index score versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.817	1	1.817	1.069	.305[b]
	Residual	107.044	63	1.699		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Total Index Score

Product mix was also found to have an insignificant relationship with total turnover. This is due to the p-value for F not being less than .05. However, to determine this relationship a product mix index was developed. This index made use of the responses relating to delivery of medicine, offering of medical services and the offering of other services in the questionnaire. Each of these items was allocated a score of 1. It is assumed that every pharmacy offered the service of "dispense medication". As a result, the index generated represented a score between 1 and 4; with 1 representing a pharmacy which only dispensed medication and 4 being the best score where a range of services was offered. This index is a useful method for analysing the effect of product mix on turnover.

Table 4.20 - Product mix versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.126	1	2.126	1.255	.267[b]
	Residual	106.736	63	1.694		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Index to indicate number of services offered (Product Mix Index)

Finally, the physical size of the pharmacy was used to determine whether a relationship existed with turnover. Based on the ANOVA tests, the p-value for F is less than .01, as shown in table 4.23, thus indicating a significant relationship. The Pearson correlation coefficient suggests that the relationship is medium with a score of .427, as shown in table 4.21. The R-squared coefficient of determination indicates that the turnover of the

pharmacy is explained by 18.3%, as shown by the model summary in table 4.22. Further, the B coefficients for both the Constant and physical size of pharmacy are significant as explained by the t-test related to the test for significance. Thus, a model for total turnover can be developed as follows:

Total turnover = .472 * Physical size + 1.857.

Therefore, if the physical pharmacy size is 100 to 150 sq m it would obtain a score of 2 on the scale. Therefore the total turnover would be equal to .472* 2 + 1.857, which results in a score of 2.801. When rounded off this would suggest that the turnover would form part of category 3, which is in the range of R1 000 000 to R1 500 000.

Table 4.21 - Physical size versus turnover - correlations

Correlations

		Total Turnover	Physical Size of Pharmacy
Pearson Correlation	Total Turnover	1.000	.427
	Physical Size of Pharmacy	.427	1.000
Sig. (1-tailed)	Total Turnover	.	.000
	Physical Size of Pharmacy	.000	.
N	Total Turnover	65	65
	Physical Size of Pharmacy	65	65

Table 4.22 - Physical size versus turnover - model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.427[a]	.183	.170	1.188

a. Predictors: (Constant), Physical Size of Pharmacy

b. Dependent Variable: Total Turnover

Table 4.23 - Physical size versus turnover - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.891	1	19.891	14.085	.000[b]
	Residual	88.970	63	1.412		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Physical Size of Pharmacy

Table 4.24 - Physical size versus turnover - coeeficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.857	.425		4.366	.000
	Physical Size of Pharmacy	.472	.126	.427	3.753	.000

a. Dependent Variable: Total Turnover

Further analysis of these results will be presented in the next chapter (chapter 5). The regression analysis then considered a multiple regression model for all the variables presented.

4.4.2 Multiple Regression Analysis

In order to perform the multiple regression analysis, a number of variable transformations were required in order to convert the data obtained by the questionnaire from raw data into a meaningful construct which could be used as a variable in the analysis. The average inventory variable and physical size of the pharmacy were treated as scale variables. Variables that required transformation were the location index and the product mix. In order to transform the locational responses into a meaningful location index, each element was summed from the responses. The worst score obtained for any location item was then represented by 1 and the best score was represented by 5. Thus, the maximum

value for the location index was 20 and the lowest score was 4. The results of the location index are presented in table 4.25. The product mix transformation was discussed in the previous section.

Table 4.25 - Location Index

Location Index - sum of no. of pharmacies, no. of doctors, pedestrian accessibility, roadside accessibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	1	1.5	1.5	1.5
	7	1	1.5	1.5	3.1
	8	4	6.2	6.2	9.2
	9	12	18.5	18.5	27.7
	10	2	3.1	3.1	30.8
	11	8	12.3	12.3	43.1
	12	7	10.8	10.8	53.8
	13	2	3.1	3.1	56.9
	14	6	9.2	9.2	66.2
	15	10	15.4	15.4	81.5
	16	6	9.2	9.2	90.8
	18	4	6.2	6.2	96.9
	20	2	3.1	3.1	100.0
	Total	65	100.0	100.0	

Ordinary least squares linear regression was performed using the stepwise method. In the model, the following variables were considered to be the independent variables: average inventory, physical size (which is the proxy for floor space), the transformed location index and the product mix. The correlations are represented in table 4.26. It is clear that, when using a two-tailed t-test at the level of .05 to determine the significance of the Pearson correlation coefficient, that only physical size of the pharmacy and average inventory are significant. This agrees with the individual regressions where the two variables each explained approximately 20% of the turnover value.

Table 4.26 - Multiple regression analysis - correlations

Correlations

	Total Turnover		
	Pearson Correlation	Sig. (2-tailed)	N
Average Inventory/Stock	.454**	.000	65
Index to indicate number of services offered	-.140	.267	65
Physical Size of Pharmacy	.427**	.000	65
Location Index - sum of No of Pharmacies, No of doctors, Pedestrian accessibility, Roadside accessibility	.220	.079	65

**. Correlation is significant at the 0.01 level (2-tailed).

For the tables representing the ANOVA test, model summary and coefficients, model 2 should be analysed. The reason for this is that this model includes the two significant variables of average inventory and physical size. In table 4.28, the p-value for the F value for model 2 is less than .001 and, as a result, the null hypothesis that none of the independent variables have a significant relationship with the dependent variable, can be rejected and it can be assumed that at least one of the independent variables influences the dependent variable. From table 4.27 the R-squared value shows that the relationship only explains 27.3% of the variation in total turnover. Thus, more than 70% of the model is explained by factors other than those selected. The total turnover equation can be modelled according to the following equation:

Total turnover = 1.644 + .397 * Average Inventory + .315 * Physical size of pharmacy

This is included as part of table 4.29, where the beta coefficients and constant terms are significant at a p-value of less than .05. The beta coefficients (standardised version of the B-coefficients) indicate that, of the two independent variables, average inventory has the largest effect on total turnover.

Table 4.27 - Multiple regression - model summary

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.454[a]	.207	.194	1.171
2	.523[b]	.273	.250	1.130

a. Predictors: (Constant), Average Inventory/Stock

b. Predictors: (Constant), Average Inventory/Stock, Physical Size of Pharmacy

c. Dependent Variable: Total Turnover

Table 4.28 - Multiple regression - ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.483	1	22.483	16.398	.000[b]
	Residual	86.379	63	1.371		
	Total	108.862	64			
2	Regression	29.722	2	14.861	11.642	.000[c]
	Residual	79.140	62	1.276		
	Total	108.862	64			

a. Dependent Variable: Total Turnover

b. Predictors: (Constant), Average Inventory/Stock

c. Predictors: (Constant), Average Inventory/Stock, Physical Size of Pharmacy

Table 4.29 - Multiple regression - coefficeints

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.644	.447		3.680	.000
	Average Inventory/Stock	.542	.134	.454	4.049	.000
2	(Constant)	1.104	.487		2.267	.027
	Average Inventory/Stock	.397	.143	.332	2.775	.007
	Physical Size of Pharmacy	.315	.132	.285	2.381	.020

a. Dependent Variable: Total Turnover

It should be mentioned that regression analysis was performed without generating the location index. When this was performed, the significant variables were average inventory and number of doctors, while physical size of pharmacy was no longer significant. However, when analysing the R-squared value, the relationship was explained by 27.8%, which is similar to the previous multiple regression model presented. This may indicate an interaction relationship between the size of the pharmacy and the number of doctors in the area.

CHi-squared **A**utomatic **I**nteraction **D**etection (CHAID) tree analysis was also used to determine which variables are the most important in predicting total turnover. The predictor values used in the analysis were physical size of pharmacy, physical size of dispensary, number of doctors, number of pharmacies, location – pedestrian accessibility, location – roadside accessibility, and average inventory/stock. From the decision tree presented in figure 4.9 it is clear that only physical size of the pharmacy and number of doctors discriminate with respect to the total turnover. If pharmacy size is either less than 100 m^2 or larger than 200 m^2 and the number of doctors is more than five, then the chances are, based on this sample, that this pharmacy has a total turnover of more than R2 000 000.

However, there is a limitation inherent in this test owing to the sample size being fairly small and the analysis not being able to extend further than three levels. Nevertheless, it can be used to determine a model for turnover. This shows that the model is accurate 53.8% of the time overall when it is used to predict turnover. This is particularly so when predicting the turnover category of R500 000 to R1 000 000 with an accuracy of 89.5%. This is represented in table 4.30.

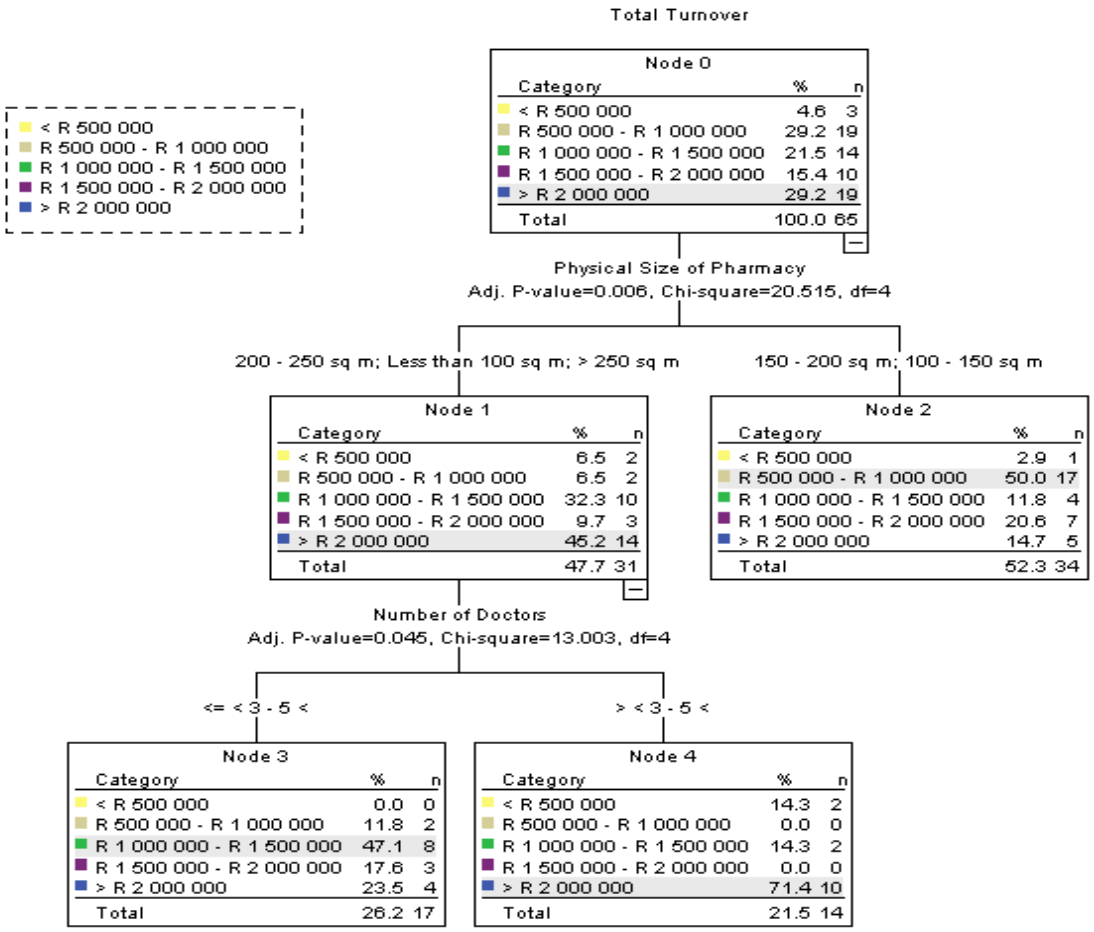


Figure 4.9 - CHAID test

Table 4.30- CHAID Classifications

Observed	Predicted					
	< R 500 000	R 500 000 - R 1 000 000	R 1 000 000 - R 1 500 000	R 1 500 000 - R 2 000 000	> R 2 000 000	Percent Correct
< R 500 000	0	1	0	0	2	0.0%
R 500 000 - R 1 000 000	0	17	2	0	0	89.5%
R 1 000 000 - R 1 500 000	0	4	8	0	2	57.1%
R 1 500 000 - R 2 000 000	0	7	3	0	0	0.0%
> R 2 000 000	0	5	4	0	10	52.6%
Overall Percentage	0.0%	52.3%	26.2%	0.0%	21.5%	53.8%

This analysis further supports the existence of a relationship between the physical size of the pharmacy and the number of doctors in the area, as both of these factors seem to create distinct results relating to the prediction of the turnover of a pharmacy.

4.5 K-means cluster analysis

In an effort to classify the respondents into different competitiveness groups, a K-means cluster analysis was performed using the four variables that measure how well placed a pharmacy is in terms of the number of doctors and other pharmacies in the vicinity, as well as its accessibility in terms of pedestrians and roadside access. The variables were measured using a five-point scale with the higher values corresponding with low levels of competition and high levels of accessibility. In the cluster analysis a four-cluster solution was used as this closely represents the location index value that has been generated. The central values of the final cluster for each of the four clustering variables are listed in table 4.31. These four clusters were characterised by making inter-cluster centroid value comparisons for each of the different situational variables and also comparing all centroid values to the overall mean situational values.

4.5.1 Low competition/good accessibility

A pharmacy that falls into this cluster is a pharmacy surrounded by very few pharmacies (low competition) and many doctors (density). The accessibility of these stores was relatively good, as they are positioned in a mall or shopping complex and these are usually located on main roads, resulting in good traffic passing by.

4.5.2 High competition/poor accessibility

In a region where high competition/poor accessibility exists, the pharmacy is subject to a high degree of competition with a number of pharmacies and the number of doctors is low. The accessibility of these stores is also the lowest.

4.5.3 High competition/good accessibility

Survival within this group, high competition/good accessibility, requires a high degree of accessibility. This is because there are a number of other pharmacies in the area (competition). However, there are few source providers of scripts in this sub-group. Therefore, success is due to the fact that there is a high level of traffic via roadside accessibility as well as pedestrian accessibility.

4.5.4 Low competition/good pedestrian accessibility/poor roadside accessibility

In this cluster, low competition/good pedestrian accessibility/poor roadside accessibility, a pharmacy has very few competitors as the number of pharmacies in the region is low. There was also a score relating to the number of doctors in the region and only a single accessibility variable is seen to positively affect this group, that is, good pedestrian accessibility.

Table 4.31 - Final cluster centres

Less than overall mean Larger than overall mean	Cluster				Overall Mean
	Low Competition/ Good accessibility	High Competition/ Poor accessibility	High Competition/ Good accessibility	Low Competition/ Good pedestrian accessibility/ Poor roadside accessibility	
Number of Doctors	4.83	2.44	2.72	4.80	3.32
Number of Pharmacies	4.00	2.24	2.11	3.70	2.75
Location - Pedestrian Accessibility	3.42	2.36	3.72	3.10	3.05
Location - Roadside Accessibility	4.83	2.24	4.44	2.60	3.38

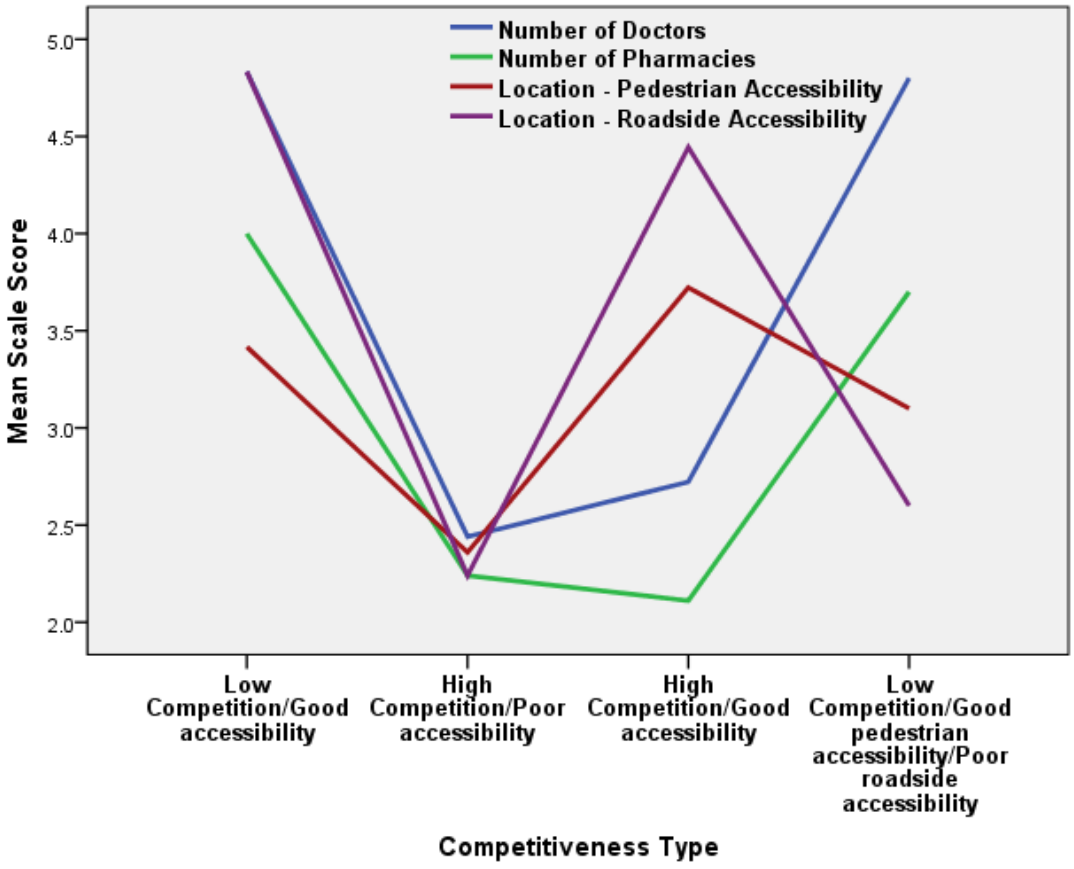


Figure 4.10 - Graphical representation of each cluster

4.5.5 Situational index

An index value was developed for each situation by summing the score obtained from each situational variable, with a high situational score being indicative of a more preferable business location. Table 4.32 shows the distribution of the respondents among the different index scores.

In treating the situational index as a scale variable, table 4.33 lists the mean situational index for the group as a whole, as well as for each of the situational groups that were created by the cluster procedure.

Table 4.32 - Distribution of situational index

		Frequency	Valid Percent	Cumulative Percent
Valid	6	1	1.5	1.5
	7	1	1.5	3.1
	8	4	6.2	9.2
	9	12	18.5	27.7
	10	2	3.1	30.8
	11	8	12.3	43.1
	12	7	10.8	53.8
	13	2	3.1	56.9
	14	6	9.2	66.2
	15	10	15.4	81.5
	16	6	9.2	90.8
	18	4	6.2	96.9
	20	2	3.1	100.0
	Total	65	100.0	

Table 4.33 - Situational Index

Competitiveness Type	Mean	N	Std. Deviation
Low Competition/Good accessibility	17.08	12	1.832
High Competition/Poor accessibility	9.28	25	1.458
High Competition/Good accessibility	13.00	18	1.940
Low Competition/Good pedestrian accessibility/Poor roadside accessibility	14.20	10	1.476
Overall	12.51	65	3.345

4.5.6 Validation of cluster solution

The four-group cluster solution was cross-tabulated with the situational index to establish the validity of the solution.

Table 4.34 - Situational index * competitiveness type cross tabulation

Situational Index	Competitiveness Type				Total
	Low Competition/Good accessibility	High Competition/Poor accessibility	High Competition/Good accessibility	Low Competition/Good pedestrian accessibility/Poor roadside accessibility	
6.00	0	1	0	0	1
	0.0%	4.0%	0.0%	0.0%	1.5%
7.00	0	1	0	0	1
	0.0%	4.0%	0.0%	0.0%	1.5%
8.00	0	4	0	0	4
	0.0%	16.0%	0.0%	0.0%	6.2%
9.00	0	11	1	0	12
	0.0%	44.0%	5.6%	0.0%	18.5%
10.00	0	2	0	0	2
	0.0%	8.0%	0.0%	0.0%	3.1%
11.00	0	4	3	1	8
	0.0%	16.0%	16.7%	10.0%	12.3%
12.00	0	2	5	0	7
	0.0%	8.0%	27.8%	0.0%	10.8%
13.00	0	0	1	1	2
	0.0%	0.0%	5.6%	10.0%	3.1%
14.00	0	0	2	4	6
	0.0%	0.0%	11.1%	40.0%	9.2%
15.00	3	0	5	2	10
	25.0%	0.0%	27.8%	20.0%	15.4%
16.00	3	0	1	2	6
	25.0%	0.0%	5.6%	20.0%	9.2%
18.00	4	0	0	0	4
	33.3%	0.0%	0.0%	0.0%	6.2%
20.00	2	0	0	0	2
	16.7%	0.0%	0.0%	0.0%	3.1%
TOTAL	12	25	18	10	65
	100.0%	100.0%	100.0%	100.0%	100.0%

On reviewing the table presented above, it is clear these pharmacies were clustered in the grouping of low competition/good accessibility have a high situational index score. Pharmacies that exist in an area where there is high competition/low accessibility have a low situational index score. Of the other two groupings it is important to note that the

pharmacies that have low competition have a better situational index than pharmacies that have higher competition but good accessibility. Further analysis will be presented in the next chapter.

4.6 Group type tests

An analysis of groups and regions was performed to identify whether there were any variables within these subdivisions that may indicate the existence of a relationship based on geographical location or whether a pharmacy forms part of a corporate group or is an independent pharmacy. Accordingly, chi square tests and t-tests were performed on the groups in order to identify any significant relationships. For the regional tests, chi square tests and ANOVA were used together with the associated tests for homogeneity.

4.6.1 Group tests

From the chi square tests that were performed, only three adhered to the inherent assumption of the chi square test that at least 80% of the cells must have an expected value of more than 5, as presented in table 4.35. It is clear that only one of these questions resulted in a significant value where the p-value was less than .01. This relates to advertising. As a result, it was found that pharmacies that form part of a corporate group are more likely to advertise than independent pharmacies.

Table 4.35 - Pearson correlation for chi square relating to groups

		Type of Group
Business relationships with doctors?	Chi-square	.003
	df	1
	Sig.	.953[a]
Do you advertise?	Chi-square	8.471
	df	1
	Sig.	.004[a,*]
Do you obtain discounts for bulk purchases on medication?	Chi-square	.488
	df	1
	Sig.	.485[a]

From the independent t-tests performed (see table 4.36), a significant difference was identified with a t-value of less than .01 for the percentage of turnover earned from scripts and the percentage of turnover earned from other items. A two-tailed t-test was used for the test for independence. This relationship suggests that between the corporate and the independent pharmacies there is a difference in the source of turnover earned. Accordingly, corporate pharmacies earn more turnover from other items than the independent pharmacies.

Table 4.36 - T-Tests

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
What percentage of sales is cash or accs?	Equal variances assumed	.039	.845	-.583	63	.562	-3.39623	5.82790
	Equal variances not assumed			-.657	19.033	.519	-3.39623	5.16827
What percentage of your sales is medical aid?	Equal variances assumed	.039	.845	.583	63	.562	3.39623	5.82790
	Equal variances not assumed			.657	19.033	.519	3.39623	5.16827

Average no. of scripts per day	Equal variances assumed	3.599	.062	1.730	63	.089	55.662	32.183
	Equal variances not assumed			1.424	13.809	.177	55.662	39.094
Average value of scripts per day	Equal variances assumed	.457	.501	-.722	63	.473	-20.75525	28.75445
	Equal variances not assumed			-.668	15.158	.514	-20.75525	31.06621
Percentage of turnover from scripts	Equal variances assumed	.140	.710	**-5.693**	**63**	**.000**	-33.29088	5.84748
	Equal variances not assumed			-5.498	15.783	.000	-33.29088	6.05515
Percentage of turnover from other items	Equal variances assumed	.012	.915	**5.707**	**63**	**.000**	34.42296	6.03146
	Equal variances not assumed			5.647	16.184	.000	34.42296	6.09538

4.6.2 Regional Tests

In the regional testing no meaningful relationships were identified in the results and have been excluded. This suggests that the relationships that do exist can be inferred across the regions.

5 Interpretation of Results

5.1 Introduction

The results presented in the previous chapter provide information; however, without an interpretation of these results, usefulness would be limited. This chapter will thus provide a deeper explanation of these results by comparing them with the hypotheses proposed in chapter 2. This comparison will determine whether the results found support the hypotheses proposed, with each hypothesis being considered individually. Where the evidence in support of a hypothesis is weak or contradictory, possible reasons will be provided.

5.2 Testing of hypotheses

The hypotheses developed in chapter 2 were split into different groupings and this chapter will analyse the results according to those groupings. Each grouping will present a number of hypotheses and the subsequent analysis of their validity.

5.2.1 Average inventory holding

In terms of average inventory holding the following research hypotheses were developed:

- **H_{1a}: Does the average inventory holding affect the profitability of pharmacies (profit = *f* (ave. inventory holding))?**
- **H_{1b}: Does the use information technology affect the average inventory holding (average inventory holding = *f* (information technology))?**

- **H_{1c}: Do prescribing patterns and purchasing patterns affect the average inventory holding (average inventory holding = *f* (purchasing or prescribing patterns))?**

To analyse the first hypothesis, ordinary least squares regression was used. Thus, in relation to H_{1a} it was found that a relationship appears to exist where average inventory holding has a relationship with turnover and, as a result, is a factor of profitability. This relationship explains around 20% of relationship with profit and was explained through the R-squared coefficient of determination. The Pearson correlation suggests that a medium relationship exists with a value of .454. There is further support for this relationship in the fact that during the multiple regression analysis, average inventory was again identified as a key factor that explained the relationship between the factors and profit, with the relationship being a positive linear relationship.

However, increasing inventory does not suggest that there will be an increase of profit indefinitely. This is due to the EOQ model, which suggests that there are costs associated with holding inventory. These costs may eventually lead to a decrease in profit over time. As a result, there is an optimal inventory holding point. Both of these concepts are supported in the literature where inventory is a predictor of sales (Dubelaar et al., 2001) and there is an optimal point for inventory (Alfares, 2007; Min, 1992; Pando et al., 2012; Sarkar et al., 2013). The results of this study do not differ from the literature related to this topic. Thus, the finding presented builds on the current literature in this area and specifically relates to the profitability of pharmacies. It can therefore be concluded that a pharmacy should consider its average inventory holding when considering ways in which to improve its profitability.

With regard to H_{1b}, it appears from the data presented that all pharmacies utilise information technology, with 92.3% of pharmacies making use of this technology to manage stock levels. As a result, it could be said that information technology is a factor of average inventory holding. The extent of the relationship and whether it is a main driver in the relationship has not been specifically considered in this research paper. However, as it is being utilised by such a high percentage of pharmacies to manage stock,

pharmacies that do not manage their stock in this way could consider whether there is any benefit to be obtained from managing stock in this way. Although this study did not explicitly determine whether information technology affects average inventory holding, there is evidence that exists to support this notion. This also supports prior research which concluded that pharmacies could look to cut costs using this technology (Akan et al., 2006; Dubelaar et al., 2001). Further, the use of sales data also provides a competitive advantage as was shown in Japan (Hamuro et al., 1998). There appears to be evidence from this study that supports this theory.

From the results presented, 92.3% of pharmacies carry stock in line with their patient patterns. This relationship appears logical owing to the fact that a patient often remains with a pharmacy their entire life (Pioch & Schmidt, 2001). Furthermore, if a patient obtains chronic medication, their prescription is linked to a specific pharmacy and thus the pharmacy can predict the stock required to service their regular customers. The extent to which this relationship affects average inventory was not tested in the hypothesis.

In addition, it was found that 95.6% of pharmacists carried stock in relation to the prescribing patterns of the doctors in the area, although just less than 70% stated that such a relationship with their doctors existed. It appears that the pharmacies that do not carry stock in this way should attempt to determine whether such a relationship exists. This can be done by using information technology. The notion that there is a set of prescribing patterns is supported by the literature, which states that, in Germany, patients remain with their doctors for their entire life (Pioch & Schmidt, 2001). Thus, it could be said that if a patient remains with their doctor for their entire life and the pharmacies in South Africa have identified that they carry stock in relation to patient patterns, by inference there exists a relationship with the prescribing patterns of doctors. Therefore, the pharmacies that do not carry stock in relation to the prescribing pattern of doctors may be able to manage their stock holding more efficiently if they attempted to determine whether such a relationship exists for their pharmacy by mining their pharmacy data (Hamuro et al., 1998). Accordingly, in relation to H_{1c} there appears to be evidence to support the idea that the prescribing patterns of doctors and the purchasing patterns of patients influence

average stock holding. Again, the research paper did not attempt to determine the level of relationship that exists.

As a result the following can be concluded:

- **H_{1a}: Average inventory holding appears to affect the profitability of pharmacies (profit = *f* (ave inventory holding))**
- **H_{1b}: The use of information technology appears to affect the average inventory holding (average inventory holding = *f* (information technology))**
- **H_{1c}: Prescribing patterns and purchasing patterns appears to affect the average inventory holding (average inventory holding = *f* (purchasing or prescribing patterns))**

5.2.2 Product mix

- **H_{2a}: Does the sale of non-medical items affect the profitability of pharmacies (profit = *f* (non-medical items))?**
- **H_{2b}: Does advertising affect the number of items sold (number of items sold = *f* (advertising))?**
- **H_{2c}: Does other services affect the number of items sold (number of items sold = *f* (other services))?**
- **H_{2d}: Does customer loyalty affect the number of items sold (number of items sold = *f* (customer loyalty))?**
- **H_{2e}: Does buyer groups affect the cost of goods sold (cost of goods sold = *f* (buyer groups))?**

To test H_{2a} a product index was used. It was assumed that all pharmacies fill scripts and this enabled all pharmacies to be provided with a score of 1. Each of the following three other products were also allocated a score of 1: delivery service, other medical services such as blood pressure and other services such as ear piercings. In performing the regression analysis, the relationship identified was insignificant. The F-value was 1.255 and the p-value was equal to .276, which suggests that there is no relationship. The

sample for this does not appear to support the hypothesis suggested in the retail literature, however, which suggests that there is a competitive advantage to be obtained by selling other services provided they are related (Palepu, 1985).

Furthermore, benefit has been seen in major retailing organisations providing one-stop shopping destinations (Messinger & Narasimhan, 1997). In South Africa a pharmacy is not a one-stop destination, as even the major corporate bodies such as Clicks and Dis-chem focus mainly on medical and health products, with neither operating as a major retailer as referred to by Messinger (1997). However, on analysis of the group tests it appears that corporate pharmacies do generate higher turnover from non-medical items than the independent pharmacies. This does not, however, necessarily create a sufficient plausible relationship in terms of which non-medical items have an effect on profit. Accordingly, an area for future research could be to determine whether non-medical items are a factor for corporate groups. It would appear that no plausible relationship exists between the sale of non-medical products and pharmacy profitability.

The marketing literature suggests that advertising can be used to influence customers' perceptions in order to encourage them to purchase a particular product. Advertising has influenced the level and type of product selected for advertising in a store flyer (Gijsbrechts et al., 2003). Thus, marketing would appear to have an impact on the number of goods sold and, in turn, the number of items sold has a direct impact on the profit of the entity. Thus, H_{2b} attempted to determine whether advertising was an important factor in generating sales in the pharmacy industry. However, a chi square test could not be performed on the data owing to the underlying assumption of the chi square not being fulfilled. This assumption is that 80% of the cells need to have an expected count of more than 5. However, in table 5.1 the services offered were cross-tabulated with the responses to the question, "Do you advertise?".

Table 5.1 - Cross tabulation - services offered versus advertising

Index to indicate number of services offered * Do you advertise cross tabulation

			Do you Advertise		Total
			Yes	No	
Index to indicate number of services offered	1	Count	6	1	7
		% within Do you Advertise	17.1%	3.3%	10.8%
	2	Count	2	3	5
		% within Do you Advertise	5.7%	10.0%	7.7%
	3	Count	17	15	32
		% within Do you Advertise	48.6%	50.0%	49.2%
	4	Count	10	11	21
		% within Do you Advertise	28.6%	36.7%	32.3%
Total		Count	35	30	65
		% within Do you Advertise	100.0%	100.0%	100.0%

From this table it appears that advertising does not affect the services offered, as there is more or less an equal proportion between advertising and not advertising with the largest proportion of each of the advertising groups having a product index of 3. In the group tests performed, it was found that corporate groups are more likely to advertise than independent pharmacies. However, it is not possible to conclude from the data obtained whether the difference between group types results in differing quantities of items sold and this research paper did not attempt to prove that hypothesis. This is another area for potential future research. In conclusion, as regards H_{2b}, advertising does not appear to have an impact on the number of goods sold by a pharmacy.

H_{2c} appears not to represent a plausible relationship, as the chi square assumptions were not satisfied. However, a cross-tabulation of the number of services with the different service type questions was analysed. The only cross-tabulation that produced a meaningful result is presented in table 5.2. From this table, it can be seen that larger proportions of pharmacies that deliver medicine tend to have a higher product index while larger proportions of the pharmacies that do not deliver medicines tend to offer a smaller number of services. This table suggests that offering a delivery service to one's clients is usually one of the first methods pharmacies use in order to differentiate themselves. To conclude that a plausible relationship exists between other services

offered and number of goods sold would be rather presumptuous. Nevertheless, there is evidence to suggest that a delivery service influences the number of items sold. However, the research hypothesis is rejected as there is insufficient statistical evidence to support the relationship.

Table 5.2 - Cross tabulation - index of services versus do you deliver medicine?

Index to indicate number of services offered * Do you deliver medicine cross tabulation

			Do you Deliver Medicine		Total
			Yes	No	
Index to indicate number of services offered	1	Count	0	7	7
		% within Do you Deliver Medicine	0.0%	53.8%	10.8%
	2	Count	1	4	5
		% within Do you Deliver Medicine	1.9%	30.8%	7.7%
	3	Count	30	2	32
		% within Do you Deliver Medicine	57.7%	15.4%	49.2%
	4	Count	21	0	21
		% within Do you Deliver Medicine	40.4%	0.0%	32.3%
Total		Count	52	13	65
		% within Do you Deliver Medicine	100.0%	100.0%	100.0%

In Germany, customer loyalty was identified as being a key element of the pharmacy business (Pioch & Schmidt, 2001). Furthermore, when the SEP legislation was released in South Africa, evidence suggested that a pharmacy would attempt to remain competitive by encouraging customer loyalty (Pretorius, 2011). The data obtained reflected the fact that 59 (90.5%) pharmacies recognise that their customers are in actual fact repeat customers. This further supports the notion presented that pharmacies can obtain benefits from stocking inventory that is in accordance with their patient patterns. It therefore appears plausible that a relationship exists between customer loyalty and the amount of goods sold. It would therefore appear that hypothesis H_{2d} can be accepted as valid.

The final hypothesis H_{2e} attempted to determine whether being part of a buyer group would influence the cost of goods sold. Accordingly, it considered that an element of cost of goods sold is the price at which these goods were purchased. There is evidence in the cross tabulation of total turnover and being part of a pharmacy group, as shown in table 5.3, to suggest that being part of a pharmacy group does have an effect on the turnover earned. To state that this is a result of a reduction of costs and not of retail branding is not possible; however, if the cost side of the equation were considered, the literature supports the reduction of costs through a single distribution centre (Hamuro et al., 1998; Waning et al., 2010; Zhu & Singh, 2009).

By means of the cross tabulation of the discounts metric with group type, as shown in table 5.4, it would seem that being part of a corporate group or an independent does not have an impact on the ability of the pharmacy to obtain discounts in medicine. In considering the demand side of the equation, it is possible that branding is providing a competitive advantage. As the pharmacy is part of a group, the brand is associated with a particular pharmacy, which may attract customers (Swoboda et al., 2013) to the store. In conclusion, this hypothesis is rejected owing to the fact the research paper specifically made mention of the cost side of the equation. There is consequently insufficient evidence to support the assumption that membership of a buyer group has an effect on the supply side or the demand side of the curve.

Table 5.3 - Cross tabulation - total turnover versus pharmacy group

Total * Do you form part of the pharmacy group cross tabulation

			Do you Form Part of the Pharmacy Group			Total
			Yes	No	N/A	
Total Turnover	< R 500 000	Count	2	1	0	3
		% within Do you Form Part of the Pharmacy Group	4.3%	5.9%	0.0%	4.6%
	R 500 000 - R 1 000 000	Count	14	4	1	19
		% within Do you Form Part of the Pharmacy Group	29.8%	23.5%	100.0%	29.2%
	R 1 000 000 - R 1 500 000	Count	9	5	0	14
		% within Do you Form Part of the Pharmacy Group	19.1%	29.4%	0.0%	21.5%
	R 1 500 000 - R 2 000 000	Count	6	4	0	10
		% within Do you Form Part of the Pharmacy Group	12.8%	23.5%	0.0%	15.4%
	> R 2 000 000	Count	16	3	0	19
		% within Do you Form Part of the Pharmacy Group	34.0%	17.6%	0.0%	29.2%
Total		Count	47	17	1	65
		% within Do you Form Part of the Pharmacy Group	100.0%	100.0%	100.0%	100.0%

Table 5.4 - Cross tabulation - discounts versus group type

Crosstab

			Type of Group		Total
			Corporate Group	Independent Group	
Do You Obtain Discounts for Bulk Purchases on Medication	Yes	Count	5	28	33
		% within Type of Group	41.7%	52.8%	50.8%
	No	Count	7	25	32
		% within Type of Group	58.3%	47.2%	49.2%
Total		Count	12	53	65
		% within Type of Group	100.0%	100.0%	100.0%

In conclusion, the following can be stated with regard to the hypotheses for product mix:

- **H_{2a}: It appears that the sale of non-medical items does not affect the profitability of pharmacies (profit ≠ *f* (non-medical items))**
- **H_{2b}: It appears that advertising does not affect the number of items sold (number of items sold ≠ *f* (advertising))**
- **H_{2c}: It appears that other services does not affect the number of items sold (number of items sold ≠ *f* (other services))**
- **H_{2d}: It appears plausible that customer loyalty affects the number of items sold (number of items sold = *f* (customer loyalty))**
- **H_{2e}: It appears that buyer groups does not affect the cost of goods sold (cost of goods sold ≠ *f* (buyer groups))**

5.2.3 Floor space

- **H_{3a}: Does the size of the dispensary affect the profitability of pharmacies (profit = *f* (size of the dispensary))?**
- **H_{3b}: Does the size of the store affect the profitability of pharmacies (profit = f (size of the store))?**

To test H_{3a}, ordinary least squares regression was performed. From the evidence presented, the two-tailed test of the Spearman's rho shows that the correlation is significant at 0.01 as the p-value for the relationship is .008. This is shown as part of table 5.5 below. Furthermore, the scatter plot of the data has been included in Figure 5.1, In this figure the coefficient of determination R-squared value is 0.123. The test was performed to determine whether the size of the dispensary had an impact on the turnover from scripts. The reason these metrics were compared is to remove any profit, or rather turnover effects, from the sale of non-medical products. It can thus be concluded that the size of the dispensary affects the profitability of pharmacies.

Table 5.5 - Spearman's rho - size of dispensary versus turnover from dispensary

Correlations

			Physical Size of Dispensary	Turnover From Scripts
Spearman's rho	Physical Size of Dispensary	Correlation Coefficient	1.000	.328**
		Sig. (2-tailed)	.	.008
		N	65	65
	Turnover From Scripts	Correlation Coefficient	.328**	1.000
		Sig. (2-tailed)	.008	.
		N	65	65

**. Correlation is significant at the 0.01 level (2-tailed).

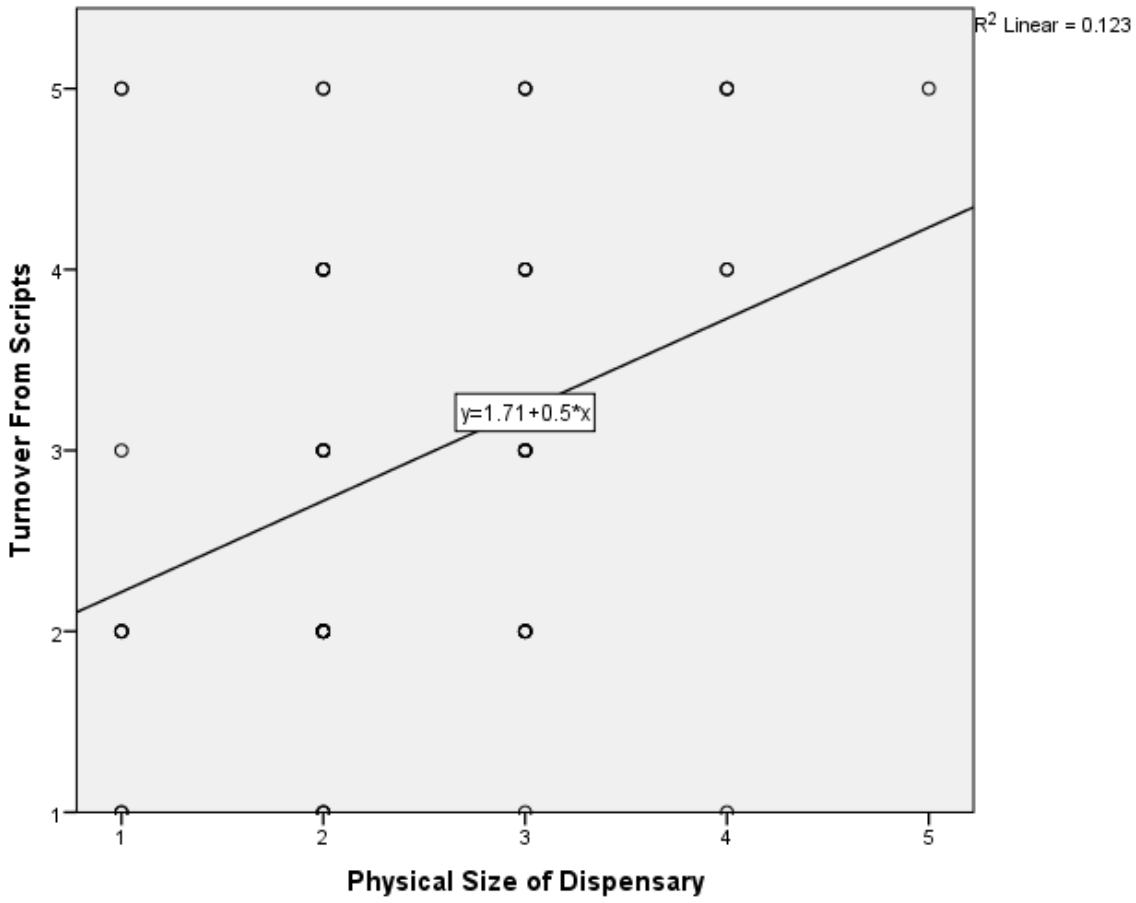


Figure 5.1 - Scatter plot - size of dispensary versus turnover from scripts

In the retail literature there is evidence to suggest that the size of a store matters (Pauler et al., 2009), as it affects the types of product and service that are offered (Verhetsel, 2005). In the pharmaceutical literature, on the other hand, there is also evidence to support the fact that the size of the store is a driver of efficiency and has an impact on the profitability of pharmacies. The current study confirms these findings. When the variable, physical size of pharmacy, was regressed against the total turnover, a medium correlation was identified. The multiple regression analysis produced a similar result by identifying the physical size of the pharmacy as a variable which explains the total turnover. Finally, using CHAID, physical size of the pharmacy was again identified as a determinate. Thus, it would appear that hypothesis H_{3b} can be accepted. In conclusion, the following can be stated with regard to the hypotheses presented.

- **H_{3a}: It appears that the size of the dispensary affects the profitability of pharmacies (profit = *f* (size of the dispensary))**
- **H_{3b}: It appears that the size of the store affects the profitability of pharmacies (profit = f (size of the store))**

5.2.4 Location

- **H_{4a}: Does roadside accessibility affect the profitability of pharmacies (profit = *f* (roadside accessibility))?**
- **H_{4b}: Does pedestrian accessibility affect the profitability of pharmacies (profit = *f* (pedestrian accessibility))?**
- **H_{4c}: Does the number of other pharmacies in the area affect the profitability of pharmacies (profit = *f* (number of other pharmacies in the area))?**
- **H_{4d}: Does the number of doctors in the area affect the profitability of pharmacies (profit = *f* (number of doctors in the area))?**
- **H_{4e}: Does the location index affect the profitability of pharmacies (profit = *f* (location index))?**

Prior to making any conclusions regarding the above hypotheses, the important elements will be recapitulated. Roadside accessibility refers to whether a store is easy to access by road. The literature suggests that stores are often found on the side of highways or main roads so as to capture passing customers (Sadahiro, 2000; Swoboda et al., 2013). Pedestrian accessibility makes reference to the type of shopping location with extensive retail literature demonstrating that the definition of such locations are unclear (C. M. Guy, 1998). However, specific types of location were examined in this study as the number of other pharmacies in the area was analysed and this was used as a proxy for the level of competition in the area. Number of doctors in the area was also analysed and this was used to represent population density.

In relation to roadside accessibility, no relationship was identified using ordinary least squares regression. The other tests like CHIAD also did not identify a relationship. The

reason for this lack of relationship appears to be due to the specialised nature of the shopping trip. The pharmacy is not dependent on passing traffic to attract customers into the store. Customers, as previously purported (C. M. Guy, 1998), usually visit a pharmacy for a particular reason; for example purchasing medicine, therefore a pharmacy will not have to rely on passing traffic for customers. Thus, hypothesis H_{4a} is rejected.

In relation to pedestrian accessibility, hypothesis H_{4b} is rejected as no plausible relationship exists between pedestrian accessibility and total turnover. It appears that this is again related to the nature of trip theory that is presented to define retailing space. The definitions of pedestrian accessibility were not the issue as those used were standard, distinct and understandable. The issue lies in the fact that visiting a pharmacy is not part of every shopping trip and is generally a special trip that is made. Hence, pharmacies are located in stores like Clicks. This is supported by the literature (Pauler et al., 2009). However, owing to the nature of trip theory, a standalone pharmacy could also attract the same customer.

The number of other pharmacies in the area is a proxy for the level of competition faced by a pharmacy. In New Delhi, India, location is not a factor that drives the efficiency of a pharmacy and, hence, its profitability (Patel & Pande, 2012). The definition used is that of competition. Therefore, the hypothesis presented as H_{4c} is rejected. The rejection of this hypothesis supports the findings presented. In addition, in support of this conclusion, pharmacy locations are controlled by the Pharmacy Council of South Africa which is responsible for issuing a certificate for trading in a particular location. The Pharmacy Council thus has the ability to control the level of competition in an area.

It is interesting to note that the number of doctors in an area appears to be related to the total turnover of the pharmacy. This was identified using least squares regression and this relationship explains around 9% of the total variance in turnover. Although it is a small factor in the overall model, the relationship nevertheless still exists. Thus, hypothesis H_{4d} is accepted. This is further supported by CHAID, which found the number of doctors to be a factor. This appears to be reasonable owing to the fact that once a patient visits a doctor they will most likely take their script to the nearest pharmacy. As a result, if a

pharmacy is close to a number of doctors, it is likely that the pharmacy will experience a number of patients visiting the store.

In terms of the multiple regression analysis, when each factor was accounted for separately, the number of doctors was the only factor that was identified from the locational factors.

Location is a complex variable in that it is made up of a number of factors. Accordingly, a location index was derived in order to examine the factors. This location index was included in a simple ordinary least squares regression as well as part of the multiple regression analysis. In both these instances the relationship identified was not plausible and resulted in the rejection of hypothesis H_{4e}.

Further analysis of the location was performed not necessarily to determine its effect on profit, but rather to determine which factors suggested a potential business location. This was done using cluster analysis, which indicated that better situations were associated with pharmacies that had low competition and high number of pharmacies and were easily accessible in terms of roads and pedestrians. Using the rest of the data from the cluster analysis, pedestrian accessibility was shown to be more important than roadside accessibility. Although this paper rejects the notion of the location index influencing profit, using the cluster analysis a better location index could nevertheless be developed. The location index assumed that there is an equal weighting of 25% for each factor on the location. Based on the cluster analysis, these weightings could be altered to reflect the location factors more appropriately.

The following hypotheses are summarised below:

- **H_{4a}: It appears that roadside accessibility does not affect the profitability of pharmacies (profit $\neq f$ (roadside accessibility))**
- **H_{4b}: It appears that pedestrian accessibility does not affect the profitability of pharmacies (profit $\neq f$ (pedestrian accessibility))**

- **H_{4c}: It appears that the number of other pharmacies in the area does not affect the profitability of pharmacies (profit ≠ *f* (number of other pharmacies in the area))**
- **H_{4d}: It appears that the number of doctors in the area affect the profitability of pharmacies (profit = *f* (number of doctors in the area))**
- **H_{4e}: It appears that the location index does not affect the profitability of pharmacies (profit ≠ *f* (location index))**

5.3 Conclusion

In conclusion, it would appear that a number of hypotheses support the literature presented, particularly with respect to the average inventory holding and physical size of the store. Location appears not to affect the profitability of pharmacies nor does product mix. This is most likely due to the specialised nature of the products sold. As customer demand for these products is fairly inelastic, location would therefore not influence the customer buying decision, except in cases where the pharmacy is close to a doctor because patients visit the doctor and then obtain medication. Other more implicit variables were considered and conclusions drawn, but these are not conclusive and could be areas for future research. It should also be noted that although certain hypotheses were proved to be true, the multiple regression analysis model only explains 27.3% of the variability in turnover. Thus, there are other factors apart from those tested that affect the profitability of pharmacies.

6 Conclusions and Areas for Future Research

6.1 Introduction

Since the beginning of the new democratic era the pharmaceutical industry has been in a state of flux. Subsequently, the Department of Health has focused on providing healthcare in general and medicines in particular to a wider population as well as to reduce the costs faced by the patient. As a result, there has been pressure on the medicine supply chain which has resulted in the passing of a number of new pieces of legislation. One such piece of legislation is the implementation of the single exit price (SEP).

For any organisation, profit is defined as income minus expenses. This is no different for a pharmacy. With one of the variables on the income side being fixed, that is, the selling price of the goods, pharmacies need to look for other ways in which to influence the other variables in order to remain profitable. There is extensive literature relating to the different variables that affect profit. The variables tested by this research study included average inventory holding, product mix, floor space and location.

6.2 Overall conclusions

Using ordinary least squares regression analysis, it was found that only average inventory holding, physical size and the number of doctors in the area are positively correlated with turnover, while average inventory and physical size individually explain around 20 and 18.3% respectively of the variation in total turnover. Although a relationship with the number of doctors in the area exists, the relationship explains only a small percentage of turnover variance. On further analysis the same variables were identified as drivers of a multiple regression model. However, in the multiple regression model the factors only

explained 27% of the relationship with turnover. It thus appears that there are other factors not considered by this research paper that affect pharmacy profitability.

With reference to the other drivers of profit tested in this research paper, it was found that there was evidence to support plausible relationships with certain factors, such as customer loyalty and stock holding patterns, in relation to doctors and patients.

There are a number of limitations inherent in this research that should be considered. Relationship testing was performed using ordinary least squares regression, which was done by treating the ordinal data as scale data. However, had the data been continuous, the regression tests could have had more statistical power to determine whether a relationship existed.

The findings of this research are similar to those of a study performed in New Delhi, India. This study made use of a different methodology, but the key drivers of store size and reduction of costs were similar. Furthermore, the construct of the location index within this study was identified as not being a factor of profitability. However, it should be noted that an element of this index did have a relationship with total turnover.

Using cluster analysis, it was found that potential new businesses could be classified according to whether they are positioned in locations with low competition, a high density of doctors, and relatively simple access to the location, larger proportions fall in the higher turnover brackets. This is true even though location was not found to be a significant driver. However, location comprised a number of separate variables and, accordingly, the cluster analysis found that being in a mall was more important than type of road access.

To conclude this research, it would seem that there are identifiable factors that affect the profitability of pharmacies and which should be considered when establishing a new pharmacy. The factors identified do not necessarily, however, assist the Department of Health in developing a specific mark-up value for medicines. There also appears to be

other factors that need to be tested in order to determine the complete set of factors that drive the profitability of pharmacies.

6.3 Areas for future research

This research found that the factors identified do not make up the full set of factors that drive pharmacy profitability. As a result, the following future research can be performed in an attempt to close these gaps:

- Testing of the same factors affecting profit using a different methodology, such as logistic regression or Tobit regression.
- In building up the location index, the percentage values used in the determination of the index could be altered in relation to the results of the cluster analysis.
- A model could be developed from the dispensing fee to determine the fee structure needed in order for a pharmacy to break even.
- Detailed testing of the product mix could be performed by splitting the turnover of a store between the different medical categories, such as medicines, OTCs and non-medical.
- Further work could be carried out to determine whether a relationship exists between customer loyalty and store performance.

These areas of additional research would build on the research presented in this paper. In addition, they might provide pharmacies with a competitive advantage which could be used to remain profitable. Finally, the research could provide the Department of Health with a basis on which to formulate a dispensing fee and SEP, to ensure that pharmacies earn sufficient profit to remain in business and that medicines are provided to customers at the lowest possible cost.

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Appendix B Questionnaire

Name of pharmacy:

Location

Physical location: _____

Place a cross in the corresponding box that best represents your pharmacy

Physical size of the pharmacy:

Less than 100m^2	<100 – 150 m^2<	<150 – 200 m^2 <	<200 – 250 m^2 <	<250m^2

Physical size of the dispensary

Less than 25m^2	<25 – 50 m^2<	<50 – 75 m^2 <	<75 – 100 m^2 <	<100m^2

Number of doctors' practices in the area:

Less than 1	< 1- 3 <	<3 – 5 <	<5 – 7 <	<7

Number of other pharmacies in close proximity:

Less than 1	< 1- 3 <	<3 – 5 <	<5 – 7 <	<7

Location

In a Mall or Clinic	Within a km of Mall	Within a small shopping complex	Within a km of small shopping complex	Roadside
Main Road	Within a km of Main Road	Major Road	Within a km of Major Road	Busy side Road

Turnover from Scripts (R'000):

> R 400	< R 400 – R 800 <	< R800 – R 1200 <	< R 1200 – R 1600 <	< R 1600

Total turnover (R'000):

> R 500	< R 500 – R 1000 <	< R1000 – R 1500 <	< R 1500 – R 2000 <	< R 2000

Average inventory (R'000):

> R 250	< R 250 – R 750 <	< R750 – R 1250 <	< R 1250 – R 1750 <	< R 1750

Circle the appropriate answer for the questions below:

"Business" relationships with doctors: **Yes/No**

Do these doctors have particular prescription patterns? **Yes/No**

If yes, do you carry stock according to these patterns? **Yes/No**

What are your Operating Hours? _____

Do you advertise? **Yes/No**

Do you form part of a pharmacy group: **Yes/No**

If Yes, which one: _____

Are you able to achieve financial benefits from such a group? If yes, what type of benefit?

_____

Do you obtain discounts for making bulk purchases on medicines: **Yes/No**

Do you obtain discounts for making bulk purchases on other items: **Yes/No**

Are a large percentage of your customers repeat customers: **Yes/No**

Business experience

Do you have any business experience: **Yes/No**

Do you use any management accounting techniques or tools, such as cost-volume-profit: **Yes/No**

Have you studied for any business degree or diploma: **Yes/No**

If Yes, What Qualification: _____

Professional questions:

Do you receive any form of royalties from doctors for sending patients to them: **Yes/No**

Do you pay any form of royalties to doctors for them suggesting your pharmacy to their patients: **Yes/No**

Information technology

Do you have computer facilities: **Yes/No**

Do you use Inventory Management Software: **Yes/No**

If No, how do you Manage Stock Levels: _____

Are your Stocks based on patient patterns or do you carry all available medications: **Patient Patterns/All**

Additional services

Do you Deliver Medicines to Patients: **Yes/No**

Do you offer other Medical Services, such as cholesterol tests, blood pressure tests, etc. If Yes, What services: **Yes/No**

Are there any Ancillary Services you offer, such as ear piercing, etc. Please specify the services:

_____

Financial data

What percentage of sales are cash and credit: _____

Average number of scripts per day: _____

Average value of scripts: _____

Percentage of turnover from scripts: _____

Percentage of turnover from other items: _____

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