THE INFLUENCE OF JOINT VENTURE COLLABORATION ON THE PERFORMANCE OF MULTINATIONAL PHARMACEUTICAL COMPANIES IN SOUTH AFRICA

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02 January 2022

List of Acronyms

ADF	Augmented Dickey-Fuller
AI	Artificial intelligence
ANDDI	African Network for Drug and Diagnostic Innovations
ARDL	Auto-regression distributed lag
ARVs	Antiretrovirals
BI	Boehringer Ingelheim
CAFS	Consolidated annual financial statement
Capex	Capital expenditure
CEEDD	Centre of Excellence for External Drug Discovery
CHC	Consumer healthcare
CMO	Contract manufacturing organisation
CRO	Contract research organisation
CTI	Centre for Therapeutic Innovations
DNA	Deoxyribonucleic acid
DT	Deutsche Telekom
ECT	Error correction term
EH	Essential Health
FDA	Food and Drug Administration
FDI	Foreign direct investment

FMCG	Fast-moving consumer goods
FMCGC	Fast-moving consumer goods company
FT	France Telecom
GMP	Good manufacturing practices
GSK	GlaxoSmithKline
HCD	Human capital development
HTS	High-throughput screening
IASB	International Accounting Standards Board
IFRS	International Financial Regulatory and Standards
IH	Innovative Health
IoT	Internet of things
IP	Intellectual property
IT	Information technology
J&J	Johnson & Johnson
JIPC	Jordanian insurance public company
JSE	Johannesburg Stock Exchange
JV	Joint venture
KBV	Knowledge-based view
MNPC	Multinational pharmaceutical company
MDR	Multiple drug resistance

NDA	New drug administration
NHREC	National Health Research Ethics Council
NME	New molecular entity
NTD	Neglected tropical disease
OTC	Over-the-counter
PM	Portfolio management
PMG	Pooled Mean Group
PoC	Proof of concept
PWC	Price Waterhouse Coopers
R&D	Research, and development
RBV	Resource-based view
ROA	Return on assets
ROE	Return on equity
ROI	Return on investment
SAHPRA	South Africa Health Products Regulatory Authority
TB	Tuberculosis
TCT	Transactional cost theory
UK	United Kingdom
UPD	United Pharmaceutical Distributors
URERC	Unisa Research Ethics Review Committee

US	United States
USA	United States of America

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ABSTRACT

This study investigated the influence of joint venture collaboration on the performance of multinational pharmaceutical companies (MNPCs) conducting business in South Africa. The study sample consist of five international MNPCs engaged in joint venture collaboration agreement, and four local South African non-joint venture collaboration pharmaceutical companies for the purpose of comparison.

The study collected dataset from the consolidated annual financial statements over the period between 2010 and 2019. Firm performance was measured using return on assets, return on equity (ROE) and return on investment (ROI) as dependent variables. Market share, research, and development (R&D) expenditure and capital expenditure (capex) were independent variables, representing market-seeking, knowledge-seeking and efficiency-seeking motives of the company respectively.

The study employed Pedroni residual cointegration test to gauge whether the variables have a long-run relationship. The pooled mean group (PMG) estimator was adopted under the auto-regression distributed lag (ARDL) for both sample-wide and firm-specific estimations.

The findings of the study in the sample-wide estimations were that joint venture collaboration had a significant positive influence on the performance of MNPCs in the long run. However, in the short run, only market share mattered for the performance of the joint venture in the study. When compared with non-joint venture firms in the study, the driver of positive performance in the long run and short run was market share, while capex had a negative effect in both long run and short run. There were also firm-specific differences.

The practical implication of the findings of this study is that, in the long run, joint ventures enhance firm performance; however, market-seeking is the strongest driver of firm performance in the short run. Pharmaceutical firms should therefore pursue joint venture collaboration for long-term survival and intensify efforts to grow market

share or seek new markets for short-term growth and survival. Firm-specific differences indicated the need for firm-specific strategies as suitable.

KEY TERMS:

Joint venture Collaboration; Collaborative agreement; Multinational pharmaceutical companies; Performance; Return on asset (ROA); Return on equity (ROE); Return of investment (ROI); Profitability ratio; measurement of performance; Pharmaceutical market; South Africa.

CHAPTER ONE
BACKGROUND OF THE STUDY

1.1 Introduction

Multinational companies, especially multinational pharmaceutical companies (MNPCs), are regarded as business enterprises with resources and capability to carry out business operations across international borders (Aregbeshola, 2017a). The MNPCs, like other business enterprises, are sometimes confronted by viability threats and pressure to deliver expected performance. These threats may include loss of revenue because of expiration of patent rights, underfunding of healthcare systems, and increasing regulatory hurdles. The introduction of new cost-effective medicines,[1] and the lower development costs are some important approaches employed to combat challenges that threatened the viability of MNPCs.

In a study, Paul, Mytelka, Dunwiddie, Persinger, Munos, Lindborg and Schacht (2010) suggested that like other multinational companies, strategic interventions to cushion the threat to the viability of MNPCs should consist of forging sustainable and effective collaborative arrangements (such as joint venture collaboration initiatives). The aim is focused on spreading the costs of R&D in the creation of new medicines, as well as innovative approaches that may have emanated from collaborations.

This study seeks to investigate the influence of joint venture collaboration on the performance of the MNPCs in South Africa. In the study, the performance of firms as measured by ROA, ROE and ROI and how they are enhanced by joint venture joint venture collaboration was considered. To that extent, and for easy of comprehension, the meaning of the term ‘performance’ in this study was restricted to financial performance. Objectively, the study investigated the influence of joint venture collaboration on the performance of MNPCs, as measured by ROA, ROE and ROI

[1] Generic medicines are biosimilar to patent branded medicines.

over a short-run and long-run period. In comparison, non-joint venture firms were also analysed to see what drives long-term and short-term performance in the absence of joint venture collaborations.

Furthermore, Strouhal, Stamfestova, Kljucnikov and Vincurova (2018) suggested that the financial performance of companies is a strong indicator of both failure and success of a business. This is because financial performance determines the long-run sustainability of such business. The authors argued that a short-run loss-making business may still be considered as being successful where the long-run financial objectives of the business were achieved and not under threat.

Strouhal et al.'s (2018) suggestion indicated the extent to which the financial objectives of a company would determine its leverage on competitors, growth and long-run sustainability. This explains why the attainment of strategic financial objectives is key to any business, especially pharmaceutical companies that operate across many international borders.

Given the categorisation of South Africa as an emerging economy with a wide-ranging industrial capability, Ebrahim-Khalil (2016) reported the existence of a well-developed pharmaceutical market in South Africa. This market comprises a network of manufacturers, distributors, retailers and dispensers.[2] Consequently, this organised system has placed considerable pressure on the value chain.

Amuasi (2009) placed emphasis on the main regulatory demand that focused on the provision of equitable, cheaper and cost-effective medicines as an important component of healthcare services in South Africa. The regulatory demand sometimes created an increasing potent agitation to lower the cost of medicines, which began in the early 2000s.

[2] Refers to the hospital pharmacies and the dispensing general practitioner doctors.

Amuasi (2009) further revealed that, a few years ago, South Africa experienced significant changes in the administration and structuring of business in response to a volatile pharmaceutical market environment. Some of this was created by increasing price competition and innovation in research towards drug development. And some arose from combined pressure to drive up sales revenue and optimise profitability.

Therefore, alleviating the cost effect of price competition and new drug development led to the adoption of joint venture collaboration between MNPCs. Amuasi (2009) agreed with the suggestion that the aim of such collaboration was to establish a strategic business partnership, by combining resources to reduce operational costs and maximise profit for the shareholders.

Although, Cohen, William, Lineen and Manard (2016) made inquiries into the intricacies of joint venture collaboration agreements in various market segments in South Africa, the literature on the pharmaceutical market is scanty, and the strategic importance of profitability ratios as a driver of joint venture collaboration has not been explored adequately. This study was motivated by this identified gap and thus created a need to reveal the importance of performance within the purview of the strategic joint venture alliance between MNPCs carrying on business in South Africa.

The phrases ‘joint venture collaboration’ and ‘joint venture alliance’ may be used interchangeably, and so may the phrases ‘profitability ratios’ and ‘financial ratios’. These terminologies are largely used as synonyms in the literature.

Kabajeh, Al-Nu’aimat and Dajmash (2012) and Saleem and Rehman (2011) revealed that financial ratios have been identified as a good measure of performance of companies. This study relied on this revelation, thus designed to investigate the effect of identified financial ratios on the performance of selected MNPCs involved in joint venture collaboration agreements. The performance was investigated over a period of 10 years, to gauge the extent to which a joint venture alliance had enhance the performance of the partners.

The financial ratios employed were ROA, ROI and ROE. These financial ratios were employed as the measurement tools to investigate how joint venture collaboration

between MNPCs could significantly influence their performance. Buttressing the importance of financial ratios, Gartner (2016) reveals that fewer than half of businesses understand how financial ratios have contributed to achieving their strategic objectives. Thus, it is important to digest the importance of the effects of ROA, ROE and ROI on the financial performance of the joint venture collaborations of MNPCs under study.

In conclusion, this study was able to suggest possible interventions towards improving the performance of MNPCs undertaking joint venture collaboration. The key findings from the study, as well as recommendations, are expected to influence the performance strategy of local pharmaceutical companies. A successful research outcome pointed in the direction of a possible strategic joint venture collaboration that may be employed as a business approach to reduce the cost burden of researching and developing new drug.

1.1.1 Defining joint venture collaboration

Williams and Vonortas (2015) define a joint venture collaboration as a business alliance in which partners come together to contribute resources, irrespective of the proportion, in the form of skills, technical know-how, funding, properties and equity to develop a new business entity with a specific purpose in mind.

In a supporting argument, Zamir, Sahar and Zafar (2014) express that a joint venture collaboration business is a business that is jointly controlled by two or more firms in the alliance. The aim is directed to achieving specific business objective(s). The newly formed business entity will be charged with the duty to achieve specific business objective(s). The parent company often retains the power to influence major decisions concerning the joint venture alliance activities.

Ebrahim-Khalil (2016) supported these findings of Zamir et al. (2014). The major goal of a joint venture collaboration between MNPCs is for the alliance to secure or acquire access to new machinery, training, technology transfer (efficiency-seeking) and expertise (knowledge-seeking).

According to Meier, Lutkewitte, Mellewigt and Decker (2016), the creation of joint venture collaborations between companies has become a means of strategic alliance to foster interdependence between the partners in the alliance. Parameswar and Dhir (2016) argue that interdependence between joint venture alliance partners influence the opportunism and trust, partner control and performance that was rooted within the alliance design. The resulting alliance design could strengthen the partner interdependence through inter-partner learning, restructuring of partner skills (knowledge-seeking) and transfer of technology (efficiency-seeking) within the alliance.

Madhok, Keyhani and Bossink (2015) identify three types of interdependence within a joint venture alliance occurring between companies. These are pooled interdependence, sequential interdependence and reciprocal interdependence.

Pooled interdependence occurs where partner companies in the collaborative agreement pool resources to create mutual benefits. For example, Pfizer and BioNTech engaged in a joint venture collaboration (Eschner, 2021) and formed a pooled interdependence alliance leading to the production of Pfizer-BioNTech vaccines to offer immunity against COVID-19.

Sequential interdependence occurs where one partner's objective is met by the joint venture, whereas the second partner's objective is met by a joint venture mediated through the first partner. Sequential interdependence is common in joint venture alliances where a parent company is a minority partner.

And lastly, reciprocal interdependence is said to take place where there is a mutual dependence between joint venture alliance partners.

1.1.2 Benefits of joint venture collaboration

Joint venture collaborations offer MNPCs wide opportunities to exploit various benefits. Zamir et al. (2014) discuss various benefits offered by joint venture collaboration to MNPCs.

1. Joint venture collaboration was employed to reduce entry barriers into new international markets by overcoming political, economic and social barriers. In most cases, entry barriers prevent multinational corporations from operating in offshore markets. Aregbeshola (2017b) reveals that in practical business, countries largely prevent the incursion of foreign organisations, with the aim to protect the business of developing domestic organisations and to boost domestic industrialisation. MNPCs may bypass this barrier by creating joint venture collaboration with local partners or domestic competitors in the host country to form joint venture alliance partnership.

2. The competitive power of local markets is protected or blunted by joint venture alliance activities. This is because foreign investors usually partner with domestic competitors. Hill & Hult (2019) argue that this process ameliorates the possible damage of competition from foreign multinationals, thereby reducing any form of rivalry between the alliance partners.

3. Hill and Hult (2019) indicate that a joint venture alliance is often used to increase distribution networks by acquiring a major distribution network in the host market. This was the obvious strategy employed by the soda drinks conglomeration between Pepsi and Coca Cola in United States of America (USA).

4. Aregbeshola (2017b) indicates that a joint venture collaboration alleviates the huge burden of manufacturing costs and other sunk costs associated with the production, especially, of new medicines. In this way, other production-related risks are spread across the joint venture partnership interests.

5. Joint venture alliances may be used to gain access to intangible assets such as brand name, expertise, as well as tangible assets such as technical know-how, innovation and new knowledge. Zamir et al. (2014) highlight that alliance partners may be willing to share their competitive secrets with partners to achieve the strategic objective of collaboration. Although there may exist the

danger of alliance partner becoming a strong competitor in the market if the alliance fails and dissolves before achieving its objective.

6. In pharmaceutical companies, the joint venture alliance allows MNPCs to enter new markets and expand its market share (market-seeking). This is made possible as partners, under the term of the collaboration agreement, allow free access, with limited (or no) obstruction, to the markets in which each of them operates. This is particularly essential for alliances that focus on developing new drugs, with huge potential for deliveries into multiple markets upon development. This is evident in the race towards the development and approval of COVID-19 pandemic vaccines among several pharmaceutical companies. Johnson & Johnson (J&J) made its deliveries of its COVID-19 vaccine into Africa Pharmaceutical market through joint venture collaboration with Aspen Pharmacare, as will be discussed below.

7. Joint venture alliances allow MNPCs to gain efficiency by achieving economies of scale and vertical integration. This strategic approach allows pharmaceutical companies to produce a huge quantity of new drugs as they target multiple markets. By so doing, they reduce the unit cost of production as they reap the benefits of economies of large-scale production.

   Nkosi and Kimberly (2021) discuss the joint venture collaboration between Aspen Pharmacare, which is a South African local pharmaceutical company, and J&J of the USA. This collaboration allows Aspen Pharmacare to manufacture Janssen[3] Covid-19 vaccines from Gqueberha factory in Eastern Cape. This initiative will allow J&J to distribute its Janssen vaccines across the African countries.

[3] Janssen is the name of the COVID-19 vaccine manufactured by J&J

8. Through the integration of resources, joint venture alliances often trigger MNPCs to improve performance, productive capacity and attain competitive advantages. The pool of resources by partners make it possible to optimise production capacity, reduce wastage and leverage capability to increase profits (Zamir et al., 2014).

In contrast, Amuasi (2009) argue that a joint venture alliance could be forged as a convenient alternative to foreign direct investment (FDI). Aregbeshola (2017b) counter-argues this position by stating that FDI is seen as a preferred approach in locating an offshore market or operational site, and the cost incurred by a fledgling MNPC could be huge. Besides the huge sunk costs, the risk of operating in unchartered territory with various uncertainties and risks could make hardly reversible investments, such as FDI, dangerous and financially inexpedient. However, the deployment of a joint venture collaboration could aid the transfer of good business practices and good manufacturing practices (GMP), to obtain or secure funds as well as to achieve cost-competitive advantage in the pharmaceutical market sector.

In addition, skills, technology transfer and expertise of MNPCs could be enhanced through association with well-established and experienced local pharmaceutical companies by way of collaboration in the form a joint venture alliance. This could particularly be helpful to MNPCs that are attracted by expansion in South Africa, one of the most advanced economies in the developing world.

Amuasi (2009) supports this sentiment with an example of comprehensive technology transfer obtained by the formation of a strategic joint venture collaboration between Eli Lilly and Aspen Pharmacare in respect of manufacture of Capreomycin and Cycloserine, for the treatment of multiple drug-resistant (MDR) tuberculosis (TB) for the South African and regional markets.

However, David (2010) argues that the cost structure and huge development costs of new medicines place an unpleasant pressure on MNPCs. The pressure to maintain growth, increase scale, revenue, market share and competitive advantage make joint venture collaboration a significantly important business practice. Such joint venture

collaborative partnership assists MNPCs to satisfy the quest for equitable and cost-effective pharmaceutical products.

Cohen et al. (2016) believe that part of the pressure placed on MNPCs arises from off-patent period-end and drug pipeline contraction, which is capable of eroding revenue earnings and resulting in a negative consequence on the financial performance of the MNPCs.

The leader of this study was convinced that joint venture collaborations may be made by MNPCs to circumvent entry barriers to protected markets, as well as to overcome the operational and financial challenges that could confront MNPCs in the development of new medicines and optimising profits.

1.1.3 Brief information on the selected pharmaceutical companies

Flowing from the argument above, the MNPCs selected for this study were observed to be suitable for the research study: Adcock Ingram, Ascendis Health, Clicks, Life Healthcare, Eli Lilly, GlaxoSmithKline (GSK), Novartis, Pfizer Laboratory, and Sanofi. These companies carry on pharmaceutical business in South Africa. In the following paragraphs, a synopsis of these companies will be presented.

Adcock Ingram: According to documented evidence from Adcock Ingram (2021a, 2021b), Adcock Ingram is a leading South African pharmaceutical manufacturing company listed on Johannesburg Stock Exchange (JSE). Adcock Ingram was first listed on the JSE in 1950, the first South African pharmaceutical company to be so listed. Adcock Ingram has its business operation headquarters in Johannesburg, but in 2008 it established business operation in India. Adcock Ingram carried on business in over 14 markets on the African continent and has product ranges from prescription and over-the-counter (OTC) medicines to fast-moving consumer goods (FMCGs).

Ascendis Health: Ascend Health is a South African-based pharmaceutical company with focus on health and wellness. The company was founded in 2008 and listed in the healthcare sector of the JSE in November 2013. Ascendis Health was incorporated in the Republic of South Africa and the group embarked on an international growth

strategy in 2015. The growth led to the acquisition of four businesses in Europe: Farmalider (Spain), Remedica (Cyprus), Scitec (Hungary) and Sunwave Pharma in Romania (Ascendis Health, 2021).

Clicks Group: Clicks (2020) revealed in its overview that Clicks Group was founded in 1968; it has been listed on the JSE since 1996. As a result of some changes in South African legislation in 2003, which permitted corporate ownership of pharmacy, the Clicks Group ventured into the retail pharmacy market, with the opening of the first Clicks pharmacy in 2004.

The Clicks brand is the local leading health and beauty retailer in South Africa. Clicks sets its premises in convenient locations in an attractive shop format offering value for money. Clicks acquired United Pharmaceutical Distributors (UPD) in 2003 to supply full-range wholesale pharmaceuticals and provide the distribution network capability for Clicks' business strategy.

Life Healthcare Group: Life Healthcare (2020) reported in its integrated annual report that Life Healthcare Group Holdings Limited is a South African-based global, people-centred, diversified healthcare organisation listed on the JSE.

Life Healthcare's vision is to be a global people-centred, diversified healthcare organisation. The vision embraces solid fundamentals and a distinctively high-quality asset portfolio capable of sustainable growth.

Eli Lilly: According to Eli Lilly's annual report (2020), Eli Lilly was incorporated in 1901 in Indiana, USA, with its head office in Indianapolis. The company discovers, develops, manufactures and markets products in a single business segment – human pharmaceutical products. The mission statement of the organisation is to 'unite caring with discovery', to create medicines that make life better for people around the world. In September 2018, Elanco Animal Health Incorporated (Elanco), an animal health business previously wholly owned by Eli Lilly, completed an initial public offering of its common stock, which trades on the New York Stock Exchange.

Further to this, in March 2019, the company completed the disposition of the remaining ownership of Elanco common stock. Eli Lilly manufactures and distributes products through facilities in the USA, Puerto Rico, and eight other countries. Eli Lilly and Boehringer Ingelheim had a global joint venture collaboration agreement to develop and commercialise a portfolio of diabetes products, including Trajenta®, Jentadueto® and Jardiance®.

GlaxoSmithKline (GSK) South Africa: GlaxoSmithKline (2020a) revealed the premise location of the parent GSK headquarters to be in London, United Kingdom (UK). GSK is proud of the existence of three global businesses that discover, develop and manufacture innovative pharmaceutical medicines, vaccines and consumer healthcare products. In 2018, its global turnover was approximately R600 billion, while about R70 billion was invested in R&D the same year.

GSK's pharmaceutical business focuses on immunology, human genetics and advanced technology to identify promising new medicines. The vaccine business delivers over two million vaccine doses per day. These vaccines include Shingrix® for shingles and Bexsero® for meningitis B. The consumer healthcare business focuses on pain relief products (e.g. Voltaren®), oral health products (e.g. Sensodyne®), skin health products, nutritional products and digestive health products.

Novartis South Africa: According to Novartis (2020), the group headquarters is in Basel, Switzerland, and its offshore operational expanse is huge. It further reveals that Novartis adopts innovative approaches to uncover new medicines that improve life expectancy and personal healthcare. The company adopts innovative science and technology in producing possible medicines that address known ailments and healthcare challenges that confront society. Novartis has committed huge resources to uncover and develop ground-breaking treatments of novel ailments. The deployment of leading scientific approaches, both in the manufacturing and supply chain system, yield successes.

Besides, Novartis embraces a vision to be a reliable frontrunner in shifting the practice of medicine, by adopting a corporate strategy that positions the organisation as a

pace-setting focused medicines company powered by state-of-the-art treatment platforms and data management.

On its operational structure, the company adopts divisional approaches that focus on each of its mainstream business formation, namely:

(1) Innovative medicines: Innovative patent-protected prescription medicines that are specifically guarded for identified pharmacological formulation. This division deals mainly with the original formulation.

(2) Sandoz: Generic pharmaceuticals and biosimilars. This division deals with generic formulations. This division was created to lower the costs of medicines for low-income earners and largely developing and underdeveloped economies.

Pfizer Laboratory: Pfizer's headquarters is located in New York, USA according to Pfizer (2020). Pfizer presents a business portfolio that includes medicines, vaccines and consumer healthcare products. The annual report indicated that revenues were derived from the manufacture and sales of biopharmaceutical products as well as from joint venture collaboration alliances. Furthermore, Pfizer manages commercial operations through two distinct business segments: Pfizer Innovative Health (IH) and Pfizer Essential Health (EH).

Pfizer IH focuses on developing and commercialising novel, value-creating medicines, such as internal medicine, oncology, inflammation and immunology and vaccines, as well as consumer healthcare products. Pfizer EH includes legacy brands that will be discontinued, branded generics, generic sterile injectable products and anti-infectives. EH also included the R&D organisation and contract manufacturing business.

Sanofi SA: Sanofi is a French MNPC established in 1994, with headquarters in Paris, France. Sanofi (2019) states that Sanofi is a leading global healthcare MNPC. The company focuses on patient needs, engages in research, development, manufacture and marketing of therapeutic products. Sanofi is well known for its strategic business focus on profitable market segments – pharmaceuticals, consumer healthcare (CHC) and vaccine development and distribution through Sanofi Pasteur.

The report further documents that joint venture collaborations are vital for its business survival and sustainability. This is because several of its products, whether on the market or under development, are in-licensed products. This kind of license agreements relies on third-party rights or technologies for continued production and distribution to end-users.

The report presents that Sanofi and MSD terminated a long-term vaccine-orientated joint venture collaboration, and the company entered into another market expansion joint venture collaboration with Boehringer Ingelheim (BI) in 2016. This transaction aimed at swapping Sanofi's animal health business for BI's CHC business. In another drive to expand its market share, Sanofi finalised the acquisition of Ablynx, a Belgian biopharmaceutical company engaged in the development of Nanobodies® in 2018.

1.2 Research problem statement

The problem that this study seeks to investigate is whether or not joint venture collaboration influences the performance of the MNPCs, and whether this influence is in the short run or long run. The firms under study are also looked at on a firm-specific basis. The extant literature focuses on the structural formation of joint venture arrangements in various market segments, and not the influence of joint venture alliances on profitability ratios and consequential influence on performance among the MNPCs, indicating a research gap.

Few literatures have documented the effect of joint venture collaboration on firm performance as measured by ROA, ROE and ROI, especially from the perspective of the pharmaceutical industry in South Africa.

The problem statement for this study was to investigate whether joint venture collaboration influences the performance of the MNPCs using ROA, ROE and ROI as measurements of performance.

Various documented studies have investigated the role of organisational fit as a determinant of successful collaborative arrangement, especially those in the form of joint ventures (Nam, 2011; Mo, 2012; Andra & Broll, 2012; Nemeth & Nippa, 2013). It

is the intention of every company that enters a joint venture collaboration to achieve corporate objectives (Lin & Ho, 2013). While these studies focused on the administrative formation of joint venture arrangement, they have not paid attention to the ultimate performance of the partners. This merits the need for a study of this nature to fill the gap in existing literature. In the process, the study also looks at what drivers of firm performance in non-joint venture firms in South Africa for comparison purposes.

Figure 1.1 encapsulates the problem statement of this study. The problem statement is presented diagrammatically, indicating the direction of influence that joint venture collaboration MNPCs may have on the corporate performance, measured with ROA, ROE and ROI. The model depicts the performance motives upon which joint venture collaborations are often formed. Market-seeking motives enhance MNPCs market performance, while efficiency seeking motive rest upon technological equipment transfer leading to an improvement in the process through which pharmaceutical products are manufactured.

Furthermore, knowledge seeking motive ensure collaborative innovation, R&D and drugs design. In the presence of these motives, the problem statement is raised to investigate whether joint venture collaboration influences the performance of the MNPCs using ROA, ROE and ROI as measurements of performance.

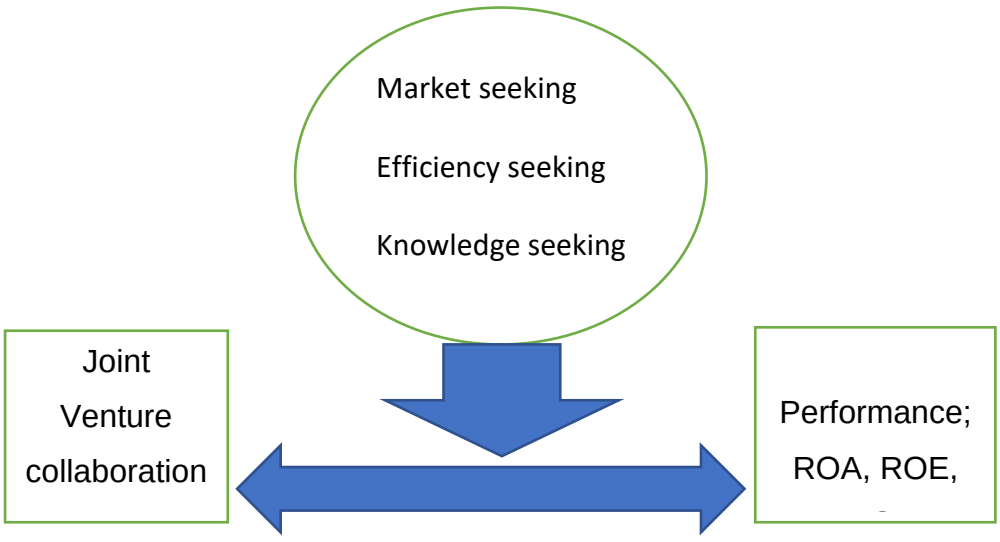


Figure 1.1: Model of the research problem statement

Source: Own adaptation.

1.2.1 Importance and relevance of the research problem statement

The importance and relevance of the stated research problem statement in the study was supported by the work of Cohen et al. (2016). These authors reveal that, since the last decade, the effect of off-patent period-end, drug pipeline contraction, the rising cost of research and drug development, and the cost of production have been observed. These unpleasant factors have created decreased revenues, increased operational expenses and regulatory stiff, leading to a shift in dynamics in the global pharmaceutical markets. These adverse effects caused a consequent response from MNPCs to consolidate production and manufacturing activities through the creation of joint venture collaborative agreements. The adverse pressure placed upon MNPCs by both the operational and regulatory environments needed to be managed.

David (2010) suggested that the adoption of management tools would be necessary to maintain growth, increase the scale of production, optimise the revenue, increase the market share, and leverage competitive advantage. Profitability ratios like ROA, ROE and ROI have been adopted as management tools in a study by Kabajeh et al. in 2012. These considerations made joint venture collaboration a significantly important business practice for most of MNPCs.

The strategic joint venture collaboration can be adopted by MNPCs to satisfy the quest for equitable, cheaper and cost-effective pharmaceutical products that are crucial for the healthcare in South Africa.

It can be argued that the management tool capability of profitability ratios was largely suppressed in the extant documented literature. As a result, the problem statement of this study was tailored to investigate whether joint venture collaboration influences performance of the MNPCs while adopting ROA, ROE and ROI as a measurement tool.

1.3 Research questions

Joint venture collaborations allow MNPCs to gain efficiency by achieving scale economies of production, forward (distribution network) and backward

(resource/supplier network) as well as vertical integration through integration with partners' resources. The alliance often triggers MNPCs to improve performance, the productive capacity of the existing market product, attain competitive advantages, and increase profits (Zamir et al*.,* 2014). However, the research questions were centred on the specific focus of the study, which is the juxtaposition of the joint venture collaboration with the financial performance of the sampled MNPCs. To that extent, the research questions raised were as follows:

1. What is the influence of joint venture collaboration on the performance of MNPCs, by considering ROA, ROE, and ROI as measures of performance?
2. Is there significant outcome of the joint venture collaboration relationship adopted by the sampled MNPCs and the performance?
3. Is there any company-specific difference in outcome of the performance of the joint venture MNPCs compared to the local non-joint venture pharmaceutical company in the short run and long run?

1.4 Research objectives and Hypothesis

The objective of this study was to state clearly the main issues that require investigation. The objectives of the study are only achievable by probing the research problems and by answering the research questions. Saunders, Lewis and Thornhill (2016) define research objective as a clear, unambiguous and specific statement that identifies or outlines what the researcher intends to investigate and the outcome of carrying out the study. Thus, this study aims to achieve the following objectives, based on the identified problem statement that underpins the rationale for this study:

1. To examine the influence of joint venture collaboration on the performance of MNPCs by considering ROA, ROE, and ROI as measures of performance.
2. To investigate the significant outcome of the relationship between joint venture collaboration and the performance of sampled MNPCs.
3. To examine any company-specific differences in performance of the joint venture MNPCs and local non-joint venture pharmaceutical companies in both the short run and long run.

In line with the research objectives stated above, the study formulates the research hypothesis. Salkind (2012) defined research hypothesis as a statement of inequality between variable under investigation, and that research hypothesis often gives an idea of directional or non-directional relationship between variables under investigation. The study applies Cusum test to gauge the validity of the research hypothesis.

Cusum test ((Brown, Durbin & Evans, 1975) is based on the cumulative sum of the recursive residuals. In cusum test, the null hypothesis (H_0) is that the regression coefficients in the stated equation are equal (or stable) in all sequential subsamples. In other words, if the null hypothesis is true, the indication is that there is no structural break in the times series observed, then the model of interest is stable. *(H_0)* and *(H_α)* denote null hypothesis and alternative hypothesis respectively. The followings hypotheses are thus proposed:

Hypothesis 1

Hypothesis *(H_0)*: Joint venture collaboration does not influence the performance of MNPCs.

Hypothesis *(H_α)*: Joint venture collaboration does influence the performance of MNPCs.

Hypothesis 2

Hypothesis *(H_0)*: There is no significant outcome in joint venture collaboration relationship with MNPCs and the performance.

Hypothesis *(H_α)*: There is significant outcome in joint venture collaboration relationship with MNPCs and the performance.

Hypothesis 3

Hypothesis *(H_0)*: There is no company-specific difference in outcome of the performance of joint venture MNPCs compared to the local non-joint venture pharmaceutical company in the short run and long run.

Hypothesis *(H_α)*: There exits company-specific difference in outcome of the performance of joint venture MNPCs compared to the local non-joint venture pharmaceutical company in the short run and long run.

1.5 Research design

Salkind (2012) defines research design as the approach and framework of an investigation employed by the researcher to carry out both the collection and analysis of data. The research design employed in this study consists of identifying the study subjects. These are five MNPCs engaged in joint venture collaboration and four non-joint venture local pharmaceutical companies. The datasets required for this study, were pooled from secondary data available on Mc Gregor BFA (IRESS) database and annual reports of identified MNPCs from the websites. These datasets were subject to analysis using empirical measurement, initial diagnostics, estimation techniques such as cointegration and PMG estimator. These empirical and econometric tools were deployed to gauge the level of relationship between the variables of interest.

Quantitative approach choice was made to test the possible relationships between variables of interest in a scientific manner and by following a strategic scientific procedure to ascertain possible relationships among variables of interest. The quantitative approach permitted the use of mathematical equations or models that are based on subject-related theories about a phenomenon of interest (Saunders et al., 2016). It allows for deductive reasoning from which a logical conclusion may be drawn (Leedy and Ormrod, 2016).

Creswell (2014) expresses that research designs are varieties of planned investigation within methodological choices (qualitative, quantitative and mixed approaches) that provide specific direction for procedures in the research investigation.

1.5.1 Research methodology

The research methodology adopted in this study involved the collection of publicly available secondary data as explained section 1.5, followed by an analysis of the dataset and subsequent interpretation of the findings. The available secondary data

are easy to collect, easily measurable without notable ambiguity. Creswell (2014) states that research methodology is a step-by-step process of data collection. The process often involves the analysis of the collected dataset, and interpretation of the findings. The study findings may be compared to the body of existing literature to position the new findings within the literature.

In this study quantitative methodology was favoured because the approach enables the achievement of the research objectives by answering the research questions. According to Saunders et al. (2016), quantitative methodology involves the use of a specially designed scientific strategy of inquiry, within a controlled environment that enables possible reproducibility and ensures the validity of findings. Therefore, adoption of quantitative methodology enables the application of the specific mathematical equations and or models needed to explain the relationship between the independent variables (joint venture, market share, R&D and capex) and the dependent variables (ROA, ROE and ROI).

Through the application of quantitative methodology, the relationship between the variables reveals the position from which deductive inference are made and logical conclusions are drawn about the strategic influence of the joint venture collaboration on the performance of MNPCs researched. Leedy and Ormrod (2016) support this notion by confirming that a quantitative approach allows deductive reasoning, which can be followed by drawing logical conclusions from the findings on the target samples.

1.5.2 Data collection

The study samples were five international MNPCs engaged in joint venture collaboration agreements. They were Eli Lilly, GSK, Novartis, Pfizer and Sanofi. Due to data limitation, four control group samples were obtained. Adcock Ingram, Ascendis Health, Clicks Group and Life Healthcare are all local South African non-joint venture collaboration pharmaceutical companies. These companies are active market participants in South African pharmaceutical market.

The study collected dataset from the consolidated annual financial statements over the period between 2010 and 2019 (10 years). ROA, ROE and ROI are used as dependent variables measuring the performance of the firms. The percentage (%) interest holding in the joint venture collaboration, revenue generated (market share), R&D expenditure and capex were independent variables in the study.

In line with the discussion under research methodology above, the audited consolidated annual financial statements and reports of selected MNPCs were retrieved from the archives. In addition, reputable databases, such as the McGregor BFA (IRESS) database, were utilised to extract relevant secondary dataset for this study. The use of secondary sources for data collection excludes the incidence of the experimental approach, which has been adopted extensively in respect to previous studies (Saleem & Rehman, 2011; Kabajeh et al., 2012; Cohen et al., 2016).

1.5.3 Data analysis and techniques

The dataset obtained from the databases were analysed using a quantitative analysis approach to explain the relationships between the variables involved in the study. Leedy and Ormrod (2016) confirm that the quantitative methodology is relevant to explain, predict, confirm and validate the outcomes from the known variables, essentially, when standardised measurement instruments are utilised in data collection.

The datasets were subjected to various diagnostic approaches and statistical analyses. These diagnostic exercises are considered necessary to understand the behaviour of the dataset so that appropriate estimation approaches can be deployed. In the data analyses, the influence of joint venture collaboration, R&D, revenue (market share) and capex were tested against ROA, ROE, and ROI (profitability ratios) to explain and predict the performance of the pharmaceutical companies.

The data analysis approach employed specific basic econometric tools of investigation to subject the dataset to empirical measurement in the form of scattered graphs, descriptive statistics, cross-correlation analysis and unit root tests. After these initial (pre-estimation) diagnostics, estimation techniques such as cointegration and PMG

estimator were deployed to gauge the level of relationship between the variables of interest in the long run and the short run.

1.5.4 Reliability and validity of the measurement instruments

It was expected that the use of audited consolidated annual financial statements extracted from reliable databases as sources of dataset sufficiently guarantied both reliability and validity of the measurable indicators, because quantitative methodology allows deductive reasoning and logical inference from findings (Leedy & Ormrod, 2016). It is essential to ensure the reliability of the study parameter in order to accept that the findings were reliable, because of the possibility of generalisation that is largely built into the chosen quantitative methodology.

Leedy and Ormrod (2016) describe research reliability as the consistency with which a measuring instrument yields the same result when the entity being measured has not changed and given the same parameter estimates. The use of pre-estimation and post-estimation diagnostics is a strong intervention to alleviate fears of both validity and reliability of the dataset, even though the dataset was extracted from reliable databases.

The descriptive statistics were deployed to investigate the distribution pattern of the dataset to ascertain the consistency of the dataset. The cointegration test and unit root tests were conducted to strengthen the validity of the estimation approach and the reliability of the findings. These approaches boost the reliability of the dataset and ensure the validity of findings.

1.6 The significance of the study

Few literatures have reported the effect of joint ventures on firm performance. The majority of the literature focused on the structural formation of joint venture collaboration, and not investigating what would be the influence of joint venture collaboration on the performance of the MNPCs as measured by ROA, ROE and ROI. This creates a research gap.

This study thus fills this research gap. This study reveals the influence of joint venture collaboration on the performance of MNPCs as measured by ROA, ROE and ROI, over the short run and long run.

The study also investigated what drives the performance of local non-joint venture pharmaceutical firms in South Africa over the same sample period, and which of the three independent variables are relevant, i.e. market-seeking, knowledge-seeking and efficiency-seeking motives.

The findings from this study could be a useful source of knowledge with which managers of business, especially pharmaceutical companies, may ensure the performance of their firms and ultimately survival and growth in the long run. Also, it may ensure the right strategic focus in the short run, using what drives firm performance in the short run. The findings of the study are expected to add to the body of academic knowledge in field of pharmaceutical business practices.

1.7 Data limitations and scope of the research study

This study was faced with data limitations. Sacred Heart University (2020) describe the data limitations of a study as the components of the research design or research methodology that are capable of influencing the application and or interpretation of the results and outcome of the research study.

The data limitations encountered in this study related to the sample and the selection of the sample. The study samples were five MNPCs in joint venture collaboration agreement. The performances of these companies (samples) were measured with ROA, ROE and ROI over a short-run and long-run period of 10 years (2010–19).

The firms used for comparison were four local South African pharmaceutical companies that were not in joint venture collaboration agreements.

The criteria for the selection of the samples were that each firm must be operational in South Africa, have published annual financial statements and whether or not they had entered into joint venture collaboration agreements.

The challenges encountered from the sample and sample selection created limitations to the study. The study was supposed to have employed five test group samples and five comparison group samples. In practice, the researcher could only access four local South African companies for the comparison group study.

The reasons for these data limitations were that few local South African pharmaceutical companies were listed on the JSE, as can be observed from the list published in the IRESS, formerly McGregor, software. IRESS is trading and market data software for traders and investors.

There was also limited access to data due to the restrictions placed on companies' operation as a result of the COVID-19 pandemic. Access to financial managers who may assist in acquiring financial information was restricted on account of the 'work from home' policy.

Also, some managers were reluctant to furnish their company's financial information for fear of espionage by competitors, ignoring the fact that companies' annual financial statements are supposed to be in the public domain under section 30 of the Companies Act, Act 71 of 2008. Section 30 mandates a company to prepare an annual financial statement within six months of the end of its financial year.

Where the annual financial statements were accessible, all the pharmaceutical companies published consolidated annual financial statements (CAFS) to reflect the financial contributions of subsidiary divisions. Eli Lilly (2020) claimed that the presentation of its CAFS to be in line with the IFRS 9 regulation, whereas this study would have employed the specific annual financial contributions of the pharmaceutical subsidiary division of each sampled pharmaceutical company.

IFRS 9 is an accounting standard gazetted and published by the International Accounting Standards Board (IASB). IFRS 9 specifies how a company should classify and measure financial assets, financial liabilities and some contracts to buy or sell non-financial items, but only came into effect on or after 1 January 2018.

Another data limitation observed during the study was that the local non-joint venture companies sampled were found to have no significant R&D expenditure. This was contrary to the substantially significant R&D expenditure by the joint venture MNPCs under investigation. The insignificant R&D expenditure by local pharmaceutical companies impacted the explanation of the knowledge-seeking motives of MNPCs when compared to local South African pharmaceutical companies.

However, to make a comparison, for the performance and economic growth of the local non-joint venture pharmaceutical companies, human capital development (HCD) expenditure was adopted as a proxy for R&D expenditure for the knowledge-seeking ambition. This was an innovation specific to this study under the circumstances.

Nickolas, Boyle and Jackson (2021) argue that human capital comprises the knowledge, expertise, special skill sets and experience endowed in employees. Resourceful training and education of the employees results in HCD. Knowledgeable and skilled workforces acquire great potential to increase productivity, create economic growth and increase performance. Qamruzzaman, Jianguo, Sharmin and Yingjun, (2020) support the argument that knowledgeable and skilled employees enhance productivity and the dynamics in economic activities leading to improved company performance.

This argument supported the idea of adopting HCD expenditure as a proxy for knowledge-seeking objective of non-joint venture local pharmaceutical companies.

1.8 Chapter overview

Chapter One – Background of the study: This chapter introduces the readers to the background and summary of the study. The chapter presents a brief highlight of the variables observed, the research problem statement from where research questions were derived, as well as the objectives of the study. It also mentions a few literature sources, research design and chosen methodology. This includes a brief explanation of sources dataset, empirical and statistical analysis that were employed to determine the findings for subsequent logical interpretation and inferences.

Chapter Two – Appraisal of joint venture collaboration: This chapter discusses the theories and principles underpinning the concept of joint venture collaboration from the previous work of other researchers. The chapter concludes by reporting the specific South African dynamics in this regard.

Chapter Three – Global trends in MNPCs: This chapter investigates the work of various researchers on the topic of the recent developments in the pharmaceutical industry. The chapter focuses on the specific challenges that confront the industry and the need to be strategic in their approach to the challenges, especially to optimise revenue and reduce the costs of medicines for end-users. The chapter is relevant to big pharmaceutical companies' business operations in different regions and markets across the globe.

Chapter Four – Research methodology: This chapter explains the framework of the research methodology employed to address the research questions, objectives and proposition of the study. This chapter discusses the source of the dataset, the variables and their relevance to the study. The chapter explains the rationale behind the adopted empirical framework and econometric measurements, in respect of diagnostic methods, estimation techniques and model specifications.

Chapter Five – Results analysis and interpretation – joint ventures: This chapter discusses the estimation process of the dataset, the model specification relevant to the study. The chapter also explains the analysis of the dataset, using econometric measurements and subsequent analysis of the results and interpretation of the findings of the study.

Chapter Six – Results analysis and interpretation – non-joint ventures: This chapter elaborates the estimation process of the dataset, the model specification relevant to the study. The chapter also explains the analysis of the dataset, using econometric measurements and subsequent analysis of the results and interpretation of the findings of the study as related to non-joint venture pharmaceutical companies.

Chapter Seven – Summation of findings, conclusions and recommendations: This chapter presents the concluding expression of the study. The chapter introduces the

readers to the summary of the findings, the alignment of the objectives of the study with the research hypothesis and the conclusions. The chapter discuss the relevance of the contribution of the study, the recommendation from the study as well as the recommendation for possible future research.

CHAPTER TWO
APPRAISAL OF JOINT VENTURE COLLABORATION

2.1 Introduction

This chapter discusses the applicable economic theories and principles underpinning joint venture collaboration between companies and narrowed to MNPCs. The chapter reviews the conceptual framework of the joint venture collaboration as discussed in the literature. This relates to the actual working processes, and the formation of the joint venture collaboration agreement. The chapter also discusses the various cost drivers that influence the growth and performance of the companies engaged in joint venture collaboration, and the challenges arising from the collaboration, and the tools and models employed to overcome the challenges that may confront the joint venture alliance. The various forms of joint venture performance measurements are discussed. The chapter concludes with profitability ratios as a tool for measurement of the financial performance of MNPCs.

2.2 Theoretical framework in joint venture collaboration companies

The preliminary literature review presented in Chapter One presented a brief summary of the reasons that underpinned the framework of the institutional structure of a joint venture collaboration between companies. The joint venture collaboration is regulated by the documented collaborative agreement consented to by the alliance partners. However, several other conceptual viewpoints underpinning the collaborative agreements between multinational companies in various business sectors have been documented in the literature. Therefore, there exists a need to exercise deeper review of the literature to uncover some of these concepts and to relate them to this study.

It is thus worth mentioning that some of the major theories applicable to this study were transactional cost theory (TCT) (Corse, 1937; Williamson, 1990), organisational learning theory (knowledge-based view) (Penrose, 1959) and resource-based view (RBV) theory (Barney, 1990). These theories were adopted to explain the reasoning behind the creation of collaborative agreements, especially joint venture

collaborations.

2.2.1 Transactional cost theory

According to CFI (2020), transaction costs may be the costs incurred but are not accrued to the parties involved in the financial transaction. These costs may be regarded as sunk costs consequent to economic activities and related transactions that take place on the market platforms. The market can accommodate as many companies as possible, with a realisation that quite a few of the market participants are clearly dominant in the market.

The CFI argue that every market participant exists in hierarchies due to the effect of transaction cost economies. The diagrammatic depiction of this theory is presented in Figure 2.1 below.

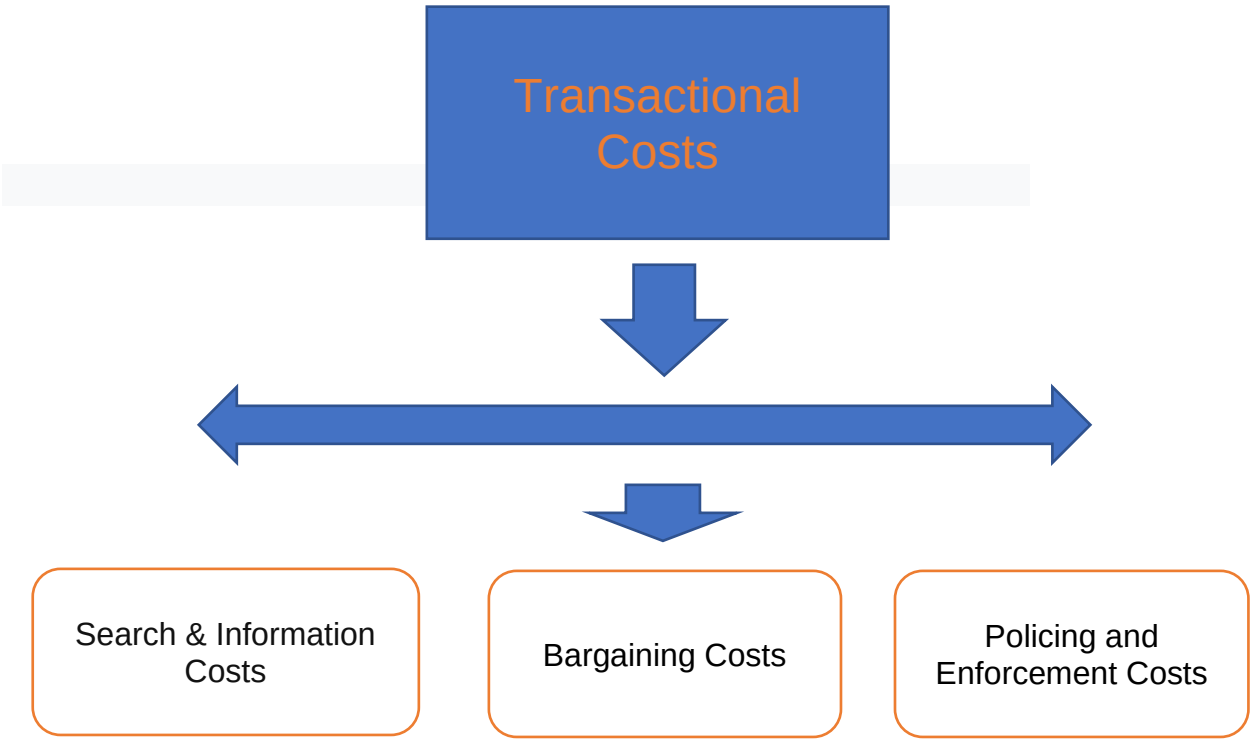


Figure 2.1: Types of transactional costs

Source: CIF (2020).

From Figure 2.1, three major components of transactional costs can be identified,: search and information costs, bargaining costs and policing and enforcement costs. Each of these costs will be discussed briefly in the following paragraphs.

2.2.1.1 Search and information costs

Search and information costs are sunk costs that are expended on various activities that cover internal research and scouting on potential joint venture partners. Even though, joint venture collaboration is complex and challenging to establish and managed successfully. It is important to compile as much information as possible on potential partners. This process is essential for a guided understanding of the partners and to enable proper strategic planning.

2.2.1.2 Bargaining costs

Intense negotiations are conducted before the conclusion of joint venture collaborations. Due to the complex nature of joint venture collaboration agreements, the negotiation process may be cumbersome and time-consuming. Therefore, the longer the period of negotiation process, the more cost (bargaining costs) expended on the process.

2.2.1.3 Policing and enforcement costs

Joint venture collaboration requires written agreements that are legitimate and legally binding. Efforts are made to ensure that all parties fully understand the content and composition in the form of monitoring the signed collaborative agreement. Thereafter, resources are committed to the enforcement of the agreement. The cost may increase where there is a breach of the signed agreement, which may require possible litigation and termination of the joint venture collaboration.

Superficially, decreased transaction costs may be attributed to the efficient use of scale economies and optimal utilisation of resources committed to the formation of joint venture collaboration. This process may be considered as generating revenue while concurrently saving costs. Dadfara, Dahlgaarda, Breggea and Arzaghib (2014)

argue that the concept of transaction costs is mainly concerned with the minimisation of costs associated with transactional activities. The costs could be extended to production costs in the joint venture alliance, as long as it is activity based.

Haskell, Veilleux and Beliveau (2015) are of the opinion that TCT is compatible with the idea of optimal utilisation of financial resources, although evidence of opportunistic behaviour was observed in the discharge of the operations of the joint venture alliance partners. The lack of trust and commitment among alliance partners could lead to opportunistic behaviour, which might result in the ultimate collapse of the joint venture alliance.

In the same study, Haskell et al. (2015) presented an alternative argument that the fundamental objectives or motives of joint venture alliances are conceptually underpinned by the knowledge-based view understanding of the partners. This argument reveals that joint venture collaboration partners value the importance of knowledge-based resources they are committing into the alliance. This commitment sometimes gives rise to a feeling of reasonable apprehension of training a potential competitor on one hand, while ensuring the success of the joint venture alliance on the other hand.

2.2.2 Knowledge-based view theory

The knowledge-based view (KBV) of a firm was defined by Encyclopedia (2021) as a management concept of organisational learning that provides firms with strategies for achieving competitive advantage. Kianto et al. (2020) accept that continuous learning, development and renewal are observed to be the strength driving organisational capabilities and competitiveness. This is because knowledge and competencies are important factors of production.

Dadfara et al. (2014) suggest that knowledge-based resources may present a difficult front to imitate and are complex in social presentation. The joint venture alliance partners equipped with multiple knowledge bases and capabilities could have the upper hand from a wide range of competitive advantage. This upper hand in

competitive advantage makes it difficult for competitors to match their capability while the partners would offer better ROE to stakeholders.

Other proponents of the KBV theory, such as Kianto, Ritala, Vanhala and Hussinki (2020), argue that the emphasis on both tangible and intangible knowledge (human resources and organisation learning/knowledge management) are the most significant resource of a company. This proposition holds true in situations where the strategic objective of joint venture alliance partners was focussed and directed towards learning or knowledge-seeking.

Based on these arguments, it is necessary to suggest that effective knowledge management is a fundamental asset for companies who engage in joint venture collaboration. Most MNPCs could have tapped into the benefit from this asset.

Dadfara et al. (2014) suggest that corporate knowledge is inherent within the corporate system. The critical areas that use up organisational knowledge reserves are organisational or corporate culture, corporate identity and branding, company policies and codes of ethics, operational routines and job schedules, corporate systems and operational guidelines, and behaviour of employees. These researchers are of the opinion that KBV is the by-product of transactional costs perspectives and resource-based views.

The organisational learning focused on the source of knowledge embedded within an organisation. MNPCs often utilise joint venture collaboration to enhance and facilitate organisational learning. MNPCs achieve this corporate learning through robust harvesting of corporate knowledge reserves (knowledge management). The broad benefits of corporate learning and knowledge management include assisting the organisation to develop sustainable competitive advantage.

Dadfara et al. (2014) emphasise the effectiveness of the network and inter-organisational perspectives to managing collaboration in joint venture alliances. The implementation of this strategic approach aims at achieving a network of inter-company collaboration that is well embedded within a diverse knowledge base.

2.2.3 Resource-based view theory

Madhani (2010) defines resource-based view (RBV) theory as a conceptual framework that focuses on the key resources and capability possessed by a company to establish a sustainable competitive advantage in the market. To this extent, RBV theory postulates that a company consists of a unique bundle of resources and capabilities, with which it could potentially develop a sustainable competitive advantage.

Collins (2020) shares the concept that greater firm-level employee-based resources incorporated in firm resources enhances the capability of the firm and allow firms to be able to effectively manage and deploy these employee-based resources for competitive advantage.

This theory suggests that a company can only attain superior competitive advantage if its fundamentals are underpinned by resources and capabilities that are scarce and cannot very easily be replicated by other companies. These resources could include lean and efficient production processes, a highly qualified and experienced senior management team, efficient technological capability, vantage location and enduring customer loyalty, as well as patents and brand names. These assets are developed and acquired over a long operational period, and they could be a source of long-term competitive advantage for a company.

In a joint venture collaboration, these assets are shared with alliance partners, either wholly or partially. Hill and Hult (2019) refer to joint venture collaboration as a cooperative arrangement between potential or actual competitors. There exists a potential danger in divulging a business secret and valuable resources to joint venture partners, and the repercussion may be training a potential competitor that already knows and understands the strength of the competitive advantage, thereby having the capability to replicate, acquire or neutralise these sources of competitive advantage.

2.3 Conceptual framework of joint venture collaboration

The conceptual framework applicable to this study explains the various activities contained in the joint venture collaboration between partners. The major searchlight

was directed towards unveiling how joint venture alliance partners manage the processes needed to attain the set objectives. This relates to relevant and workable institutional structures and, if managed properly, joint ventures collaboration would be expected to enhance performance and enhance the fulfilment of the joint venture alliance set goals.

According to Shah (2014), a multinational joint venture collaboration is a collaborative formation between two independent companies, one of which is a parent company situated outside the border of the country where a joint venture collaboration was established. The author does not refute the claim that both companies contribute and commit resources to the operations of the alliance, and they assume joint responsibility for organisational decision-making.

Zamir et al. (2014) claim that multinational joint venture alliances have been growing exponentially in size and geographical dispersion over the past decades. This form of strategic foreign expansion was popular among multinational corporations when venturing into emerging economies.

Hill and Hult (2019) refer to joint venture collaboration as a cooperative arrangement between potential or actual competitors, especially between companies from different countries, where the alliance may stretch from formalised joint venture to short-term contractual agreements. In most instances, the venture is meant to engender cooperation on a specific task, which may include the development of a new product.

In other literature, Walter, Kellermanns and Beishim (2010) describe joint venture collaboration as voluntary agreements between two or more independent companies that come together to form a joint venture alliance company. These authors contend that the partnership is meant to achieve specific objectives, which often include to develop and commercialise new products, to transfer and share knowledge, as well as to transfer and share technologies or services. In MNPCs, joint ventures alliances are often centred on joint R&D, to formulate production agreements, to design product marketing, and to establish distribution agreements. In some instances, the agreement may also be established to share technological capability in the discovery of new

medication or vaccine, and also to transfer embedded skills and competences within the alliance network.

In conclusion, given the above argument, it can be said that joint venture alliances enable MNPCs to overcome both burdens of newness and smallness.

2.3.1 Types of strategic business collaboration

2.3.1.1 Equity shareholding

This is a form of business collaboration in which a company becomes a minority shareholder in the partner company by investing in the new firm's equity (Williams & Vonortas, 2015). New equity is not created in the process, but there is a change in stock ownership that changes the capital structure formation of the new partnership (Zamir et al*.,* 2014).

An example of this business collaboration was adopted in 1999 by Renault and Nissan. Both companies entered into a strategic alliance through a cross-shareholding agreement, whereby each company purchased a minority equity stake in the other. This arrangement translated into Renault holding a 43.4% stake in Nissan, while Nissan holds 15% of Renault's stake. Each company retains its identity and organisational culture, along with vested financial and strategic interests in joint production of engines, batteries and other key components (Williams & Vonortas, 2015).

2.3.1.2 Joint venture collaboration

This is a form of business collaboration through which the alliance partners contribute resources and equity to grow a new business entity to carry out a specified business objective. According to the BUYIN website, Deutsche Telekom (DT) and France Telecom (FT) formed a 50/50 equity-backed joint venture firm known as BUYIN in 2011. The new business alliance is charged with the responsibility to manage the procurement of terminal devices, mobile communications networks and fixed network equipment for the two telecom parents. The alliance business was charged with the

responsibility of reducing overall operational costs to the tune of R18 billion over the first three years of business operation. As a result of the built-in operational success of the business alliance, DT and FT strived to expand the focus of the new business formation. As a result, the joint venture collaboration explored other areas such as IT infrastructure and telecommunication gadgets (Williams & Vonortas, 2015).

2.3.1.3 Contractual (non-equity)

This is another form of strategic business collaboration that was forged to advance a specific business objective, but without equity ownership. That is, it comes to bear when a joint venture alliance is formed but without provisions for management structure. In that way, a formal management structure is not needed for the operation of the strategic alliance, and the arrangement usually takes the form of short-term contracts (Zamir et al*.,* 2014).

This form of strategic business alliance is formed without a stringent ownership structure or equity commitment. In this arrangement, there is no shared ownership or dedicated administrative structure in the operational functioning of the arrangement. In a practical sense, the non-equity-based arrangement usually assumes the form of licensing deals, technology exchange agreements, sourcing relationships and co-marketing arrangements (Williams & Vonortas, 2015).

For instance, AirAsia (Malaysia) and Jetstar (Australia) teamed up to form a contractual type of joint venture collaboration as a way of reducing operating costs. This type of non-equity-based alliance enabled the two airlines to explore opportunities to jointly procure aircraft as a way of imposing some level of leverage on aircraft manufacturers. The airlines established cooperation on passenger handling in Australia and Asia (code-sharing), pool aircraft components and spare parts. Also, the airline alliance partners were able to jointly procure engineering and maintenance supplies and services from the manufacturers at a bargain price. From the onset, the alliance was expected to reduce costs, pool expertise and result in cheaper fares for both airlines (Williams & Vonortas, 2015).

David (2010) concedes that pharmaceutical companies required cost economies and speed to introduce new products to the market. Therefore, strategic joint venture collaborations were employed to maintain growth, increase operational scale economies, optimise revenue, improve market share and strategically achieve competitive advantage.

A strong motivation for the establishment of joint venture collaboration between MNPCs was issued by Stewart and Maughn (2011), who revealed that the recent economic downturn has made taking advantage of strategic opportunities through international alliances more appealing. They argue that strategic business alliances allow multinational companies to access the global marketplace more economically, quickly and effectively, although, legal and political, regulatory, cultural, language and currency differences in countries make joint venture collaboration a challenging choice.

2.3.2 Factors affecting joint venture collaboration.

This study focuses on strategic joint venture collaboration as a type of business approach that is often employed by most MNPCs globally. Williams and Vonortas (2015) suggest that the international economic situation used to be one of the potent underlying factors leading to an increase in the formation of strategic business alliances. They argue that factors such as globalisation, technology change, skills and competence, expertise, economic liberation, and privatisation were identified as key change players in joint venture collaboration. These factors are briefly highlighted below.

2.3.2.1 Globalisation

Globalisation could be said to have exerted stronger influence on the global economy, creating a surge in the formation of joint venture collaboration as a business strategy. Hill and Hult (2019) suggest that the increasing interdependence of countries as a result of trade liberalisation through globalisation has pushed transnational companies into new markets and new product lines. Therefore, to achieve a successful business

strategy, most MNPCs, including samples in our study, embrace strategic joint venture collaboration with local partners to circumvent restrictions in the host country.

2.3.2.2 Technological changes

According to Williams and Vonortas (2015), technological advancement proactively influences the concept of globalisation and contributes towards the popularity of joint venture collaboration between companies. Over the past decades, the development of technological gadgets, interfaces and platforms has changed the face of business. This can be attributed to the business conduct of multinational pharmaceuticals. The rate of technological advancement has altered the conventional *modus operandi* of drug development, drug manufacturing, online distribution, supply chain and faceless customer base.

Technological changes enhance increasing competition in the global environment and create pressure to achieve competitive advantage. Technology is generally regarded as one of the drivers of globalisation, and the broader expansion of technological use and global penetration. This technological penetration has enabled a greater number of countries across different geographical locations to do business together more efficiently.

2.3.2.3 Core competency

Pratt (2017) refers to core competency as a firm capability to provide a base from which growth of a business would be sustained, a place from which new opportunities may be annexed to deliver valuable products to consumers. Core competency enables the firm to create sustainable competitive advantage and is not readily replicated by another firm.

Williams and Vonortas (2015) explain that the increase in the intensity of competition in global market sectors has made firms focus on critical business functions. Multinational corporations have embraced strategic joint ventures collaboration as an

indispensable tool to concentrate business operations on core competencies. Other less important business units were outsourced through partnership.

MNPCs often produce core products and outsource non-core products through joint venture collaboration. In the contemporary business environment, businesses rarely produce every product on their portfolio.

2.3.2.4 Economic liberalisation and privatisation

Williams and Vonortas (2015) revealed that most countries have reduced or removed economic restriction in respect of trade and tax regulation. This consideration has made easier the formation of joint venture collaboration between companies. The removal of restrictions has enhanced the unprecedented flow of international capital in the form of both FDI and portfolio investment among MNPCs engaged in joint venture collaboration.

There exists an increase in the share of the intake of the flow of capital to developing countries. These commercial activities have changed the nature of international business interactions, which has been supporting the economic progress of several developing countries.

Privatisation of government entities and government assets in pharmaceutical companies that are owned by the state government has had a significant influence the method of international business approach. MNPCs have created various joint venture collaborations to benefit from the outcome of economic privatisation.

Williams and Vonortas (2015) believe that the transferring of technology packages by mechanism of foreign investment, capital goods acquisition and licensing of products or patency have been replaced by formal and semi-formal business approaches. These mechanisms were employed for gaining access to existing technologies and entry into regional pharmaceutical markets. These new business approaches entail the formation of inter-organisational networks, as will be discussed in the section below.

The authors conclude that inter-organisational networks similar to networks in joint venture collaboration have assisted pharmaceutical companies with the resource and financial capacity to achieve multiple objectives within the prevailing international market competition. These business approaches have resulted in a rise in interdependency among companies at a global level.

2.3.3 Performance objectives of firm engaged in joint venture collaboration

The weaknesses in joint venture collaboration are revealed by Prescott and Salli (2010), who counter-argue that a joint venture collaboration does exist with its shortcomings. These weaknesses are, among others, unexpected frustrating experiences, insufficient time for planning and strategy, and lack of adequate strategy for the termination of the joint venture collaboration.

A study on international joint venture collaboration as a business strategy and performance resulting thereof will be discussed below. This discussion was extracted from the findings of the research work on joint venture collaboration between companies in the Baltic States.

Larimo and Nguyen (2015) classify the benefits of joint venture collaboration in respect of performance under three major characteristics. The parent company-specific characteristic, investment-specific characteristics, and inter-partner relationship-specific characteristics.

2.3.3.1 Parent company-specific characteristics

The benefits espoused by these factors are discussed in the paragraphs below, especially as they resonate with the performance of MNPCs operating in the South African.

(a) *The objectives (motives) for joint venture collaboration*: These motives are found in the inherent objectives of the companies engaging in the joint venture collaboration. These objectives include ensuring that foreign investment is motivated by market-orientated issues to gain entry and access to the local markets. There was the

opportunity to benefit from the pool of skilled labour force contributed by joint venture alliance.

Marinov and Marinova (2001) emphasise that the major motive of companies engaged in collaboration is the aspiration for the business to entrench itself in the market competitively. Competitive advantage creates a strategic long-term position in the market, especially the pharmaceutical market segment. These strategic motives are beneficial to the multinational firms and MNPCs, but are less beneficial to competitors in the local market.

Larimo and Nguyen (2015) categorise the objectives for forming joint venture collaboration into three groups. These are market-seeking objectives, efficiency-seeking objectives and learning- or knowledge-seeking objectives. The authors argue in respect of the market environment studied that the market-seeking objectives are easier to realise, as they involve the reduction of entry costs to the market.

The learning- or knowledge-seeking objectives are more challenging to realise, because they are more costly and incur additional spending to facilitate and acquire learning objectives. The partners in the alliance will have to the incur higher transaction costs accrued to the management of the alliance partners. These are transactional costs to monitor the behaviour of the alliance partners and fund the negotiation process within the alliance partners.

The authors affirm that the efficiency-seeking objectives often take longer to acquire and achieve than other objectives. In Glaxosmithkline (2020b), it was confirmed GSK seeks to improve its capabilities and create efficiencies in its functions. This is because the MNPC that engages in joint venture collaboration intends to reach the level of efficiency desired by the parent company.

Larimo and Nguyen (2015) conclude that joint venture collaboration that focused on the market-seeking objectives and learning- or knowledge-seeking objectives perform better than the joint venture collaborations that focus on efficiency-seeking objectives. Market-seeking joint venture collaborations are commonly found in the form of FDI.

They perform better than efficiency- and learning- or knowledge-seeking joint venture collaborations, especially MNPCs.

(b) *Foreign direct investment and joint venture collaboration experience*: Nguyen (2009) argues that the existence of prior joint venture alliance experience by companies, prior experience in FDI, and a prior understanding of the management of joint venture collaboration are important. These experiences have a positive impact towards the achievement of successful and sustainable joint venture collaboration outcomes.

As a result, companies are able to reduce or exclude transaction costs arising from 'trial and error' behaviour in the management of the joint venture collaboration projects. These experiences are important because, where foreign parent companies have no adequate experience of FDI and management of joint ventures alliance behaviour, they may become pressurised towards achieving the set objectives.

Larimo and Nguyen (2015) are of opinion that the parent foreign companies were often overstretched by the efforts deployed towards monitoring and managing the behaviour of joint venture alliance partners to safeguard their interests. These efforts are costly and lead to increases in the costs of managing the joint venture alliance, which may in turn lower the performance of the joint venture alliance. This opinion is related to the parent foreign MNPCs operating in South Africa.

(c) *Competitive advantage strategy*: Larimo and Nguyen (2015) support the argument that the competitive advantage strategy is divided into cost leadership strategy and the differentiated strategy. Thus, each strategy is important to survive the intensely competitive market. By adoption of the cost leadership strategy, the joint venture alliance pursues reduction in operating costs aggressively. The alliance is able to enforce and achieve the economies of scale, acquire adequate engineering or other skills required to design, and not only plan effectively but efficiently.

In cost leadership strategy, joint venture alliance companies often take advantage of being able to release cost-effective and quality products to markets.

Ebrahim-Khalil (2016) reveals that joint venture MNPCs were licensed to produce cheaper generic medicines in South Africa. In the efforts to achieve greater market share, the better choice is to adopt a cost leadership competitive strategy. This was because the patented medicine often enjoys greater purchase at a high cost, even though the manufacturing company had employed a differentiated competitive strategy.

According to Nguyen and Larimo (2009), the joint venture alliance adopts a differentiated strategy when it engages in production of unique products, which often requires more resources and capital cost to develop. Sometimes it added other features to the products, so that the joint venture alliance may charge a premium price for these products.

Ebrahim-Khalil (2016) emphasises that joint venture MNPCs, which are licensed to produce patent medicines in South Africa, are known to adopt a differentiated competitive strategy. This strategy induces an increase in the operating costs and consequently raises the retail prices of such patent medicine.

(d) *Joint venture partners asymmetries size*: According to Larimo and Nguyen (2015), there is no direct relationship between the joint venture partners asymmetric size and the performance of the joint venture collaboration partners.

2.3.3.2 Investment-specific characteristics

The international investment-specific characteristics are not significantly different from what is obtained in various markets across the globe. Therefore, the arguments below will explain the market experience of MNPCs.

(a) *Ownership arrangement*: Fey and Beamish (2001) present an argument that the multinational joint venture collaboration in Russia reveals the existence of a negative relationship in ownership arrangement in joint venture collaboration and the subsequent performance of the alliance formed.

Larimo (2010) counter-argues that the performance of the joint venture alliance has no direct relationship with the ownership arrangement. Therefore, Larimo and Nguyen (2015) conclude that there is no direct relationship between the ownership distribution of the joint venture alliance and the performance of the alliance formed.

(b) *Mode of establishment*: Larimo and Nguyen (2015) establish that FDI can be created by the acquisition of establishment partly or wholly or as a greenfield investment to achieve a target performance. The work of Larimo (2010) on joint venture collaboration does not present a clear relationship between mode of establishment and the performance of the joint venture alliance.

In a similar study, Puthusserry, Khan and Rodgers (2018) reveal that joint venture alliances employ equity and non-equity modes of collaboration to advance foreign businesses. The researchers conclude that joint venture collaboration provides a safe means to expand foreign market and successful globalisation. This is because MNPCs adopt a joint venture collaboration mode of entry and this method is enhanced by prior experience, social network and knowledge of the market.

Larimo and Nguyen (2015) conclude that there is a positive relationship between greenfield modes of entry of joint venture collaboration and joint venture performance.

(c) *Target (foreign) country uncertainty*: Ebrahim-Khalil (2016) is of the opinion that, in a host country such as South Africa where uncertainty hangs over the prevailing economic and political conditions, and government policies that are challenging to the business operations of MNPCs. Government policies on taxation, importation, licences, repatriation of earnings and expropriation of assets have created operational challenges for MNPCs.

Larimo and Nguyen (2015) conclude that these uncertainties may increase the problems affecting the short-term and long-term planning of the business operation of the joint venture alliance. The authors confirm that there is a negative relationship between perceptions of environmental uncertainty and joint venture alliance performance.

2.3.3.3 Inter-partner relationship-specific characteristics.

It has been revealed that there are a positive relationship and similarity in style of management between foreign and local parent companies and the performance of the joint venture alliance (Larimo & Nguyen, 2015).

Research studies on other market segments have reported the influence of the profitability ratios on the performance of the company observed. Kabajeh et al. (2012) examine the relationship between the ROA, ROE and ROI ratios together and separately with Jordanian insurance public companies (JIPCs) on the performance of the companies, based on the market share price.

The results reveal a positive but low relationship between each of ROA ratio separately and ROI ratio separately with JIPCs profit performance. However, it is observed that there is no relationship between the ROE ratio separately with JIPCs profit performance.

Similarly, Saleem and Rehman (2011) undertook a study of impacts of liquidity ratios on profitability in oil and gas companies in Pakistan. The findings reveal that there is a significant impact of only liquid ratio on ROA, while no significant impact on ROE and ROI is observed.

In conclusion, the work of Kabajeh et al. (2012) and Saleem and Rehman (2011) indicate that profitability ratios are an integral instrument to determine the performance of joint venture alliance companies. This conclusion creates a gap to investigate the influence of joint venture collaboration on the performance of MNPCs in South Africa while considering the effect of ROA, ROE and ROI.

2.4 Working processes of the joint venture collaboration

Arguments were presented in the preceding chapter that a joint venture collaboration is a cooperative arrangement that specifically focusses on achieving particular tasks, such as developing a new product. The agreement and the organisational structure may work in favour of the joint venture collaboration, even though the implementation

of joint venture strategies may be problematic. In specific terms, certain strategic decisions relating to joint venture collaboration need to be made by the alliance partners to achieve set objectives. These sets of decision-making processes are regarded as the 'working processes' of the joint venture collaboration. These working processes are briefly explained in the following sections:

2.4.1 Decision-making processes

Walter et al. (2010) argue that alliance-related decision-making processes are institutional activities due to the company and alliance partners. These decision-making processes specifically deal with the strategic decisions taken in respect of how much resources to commit to the alliance formed, what proportion is to be contributed and what value should be added. These decision-making processes deal with the nature of precedence that may need to be followed when making a commitment in the future.

Specifically, the decision-making processes relate to the manoeuvring of quality and the unwelcome consequences of decision taken by the parent pharmaceutical company that may affect the formation and implementation of a specific joint venture collaboration.

The authors explain the distinction between the company-level and alliance-level decision-making processes. The company-level decision-making processes refer to those decisions that are taken completely and peculiarly to the target organisation. However, alliance-level decision-making processes refer to decision-making processes concluded exclusively at the boundary between partners organisations, such as decisions taken within the steering committee of the alliance or decisions taken at the level of the joint venture management team.

2.4.2 Selection of joint venture collaboration partner(s)

The selection of partners to the joint venture collaboration arrangement is one of the major decision-making processes. Roy (2012) emphasises that the selection of partners to create a strategic joint venture collaboration is one of the critical alliance

partner-related decision-making processes. A successful decision requires some deep knowledge about the standing and influence of the international alliance partner in the target industry.

Haskell at al. (2015) confirm that the selection of partners to a strategic joint venture collaboration by the parent multinational company is considered to be a decisive task and a major decision-making process. The decision-making processes consist of a deep knowledge of complementary resources and acquired skills that are possessed by the potential partner, and whether the partner is in good standing and capable of contributing those critical resources (Roy, 2012).

However, Haskell at al. (2015) believe that joint venture collaboration may be formed and directed towards production objectives, R&D objectives, technology exchange, and transfer or marketing objectives. Therefore, the criteria for the selection of the partners for a joint venture collaboration will include consideration of the resource-based capacity and special skills endowed in the prospective alliance partner. The special skills would be useful to achieve and sustain competitive advantage at a lower cost.

The authors refer to MNPCs that form joint venture collaborations directed towards production objectives. The selection of partner will be based on the endowed specialised technical know-how and skills found in the selected partner. These specialised skills are necessary for the production of quality biotech products at a reasonable cost and marketed at a competitive price. Sometimes, the financial limitations of MNPCs may lure the joint venture alliance to seek partners who are prepared to share in production costs to achieve low-cost production.

2.4.3 Collaborative mode of entry

Gomes, Weber, Brown and Tarba (2011) claim that the collaborative entry mode adopted by the firm to gain access to the foreign market is an important institutional decision. This is because the joint venture collaborative arrangement often empowers multinational companies to access the necessary resources for existence and growth in the foreign market.

Liu (2017) emphasises that the collaborative entry mode had been observed to facilitate the growth processes of the joint venture alliance in the foreign market. These growth processes are derived from the critical role played by the collaborative entry mode. The role enables the firms to export their products to the target local market, assist the firms to overcome resource constraints in the foreign market and strengthen the firm to manage uncertainty in the foreign market.

2.4.4 Management team and managers

Walter et al. (2010) support the opinion that the continuous flow of resources, such as technology, human capital and shared business systems, is often managed by both partners at the company and alliance levels. Accordingly, joint venture alliance managers are expected to digest processes and make sense of the ambiguous and complex business information generated. It is important that the managers understand interdependencies between the interests of the partners in the alliance and choose the most promising decision alternative. Also, the cooperative interests of the joint venture alliance and the competitive interests of the market need to the clearly separated. The spilt or separation of conflicting and or competing interests enables managers to make careful and balanced manipulative decisions that are necessary to support the continuity and overall success of the joint venture collaboration.

Walter et al. (2010) conclude that power and control relationships, as well as information asymmetry between partners, are observed to interfere with the sharing of information within the alliance. This creates a challenge towards predicting the contingencies that may arise in the alliance-related decision-making processes. Thus, joint venture collaboration has become an indispensable tool for cost reduction in the operation of the MNPCs. This is because it drives the entire operation towards efficiency and determines the potential success of the joint venture collaboration.

2.4.5 Organisational capacity

Moore (2017) reports that the organisational capacity of firms to access technology, human capital and shared business systems such as new business opportunity risks, financial responsibility and workload are managed by the joint venture alliance

partners. Organisational capacity is an important component of the joint venture collaborative alliance decision-making processes; therefore it must be considered and put to use efficiently.

According to Kramer, Mainelli, Lammarino and Diez (2011), the organisational capacity and networking capacity of the joint venture collaborative alliance are tools employed to create valuable innovation and achieve competitive advantage. The authors ascertain that organisational capacity embodies human capital, including training and knowledge acquired by the employees. The organisational capacity also embodies structural capital in respect of the capital investment expended by the alliance to attract customers and build customer relationships.

On the other hand, organisational network capacity embodied the knowledge sourced from external relationships of the joint venture alliance with other organisations in the market. In summary, organisational capital adds up to the structures that can transform individual know-how in a collective manner to benefit and improve the performance of the joint venture collaborative MNPC.

Three features are said to be required for organisational capital resources for innovation to be apparent (Kramer et al., 2011): organisational infrastructure for innovation, intra-firm knowledge transfer frameworks to create the innovation and new management and coordination tools for interdisciplinary projects.

2.4.5.1 Organisational infrastructure for innovation

Joint venture alliance MNPCs often adopt two dimensions of drug R&D infrastructure. This has been observed to have a significant impact on the knowledge-creation process. The extent of decentralisation of drug R&D units are also influenced by the nature of the organisational infrastructure. The approach and strength of top-down corporate strategies should be balanced with the bottom-up flow of information. In addition, the proper direction of the flow of knowledge from subsidiary units into the mainstay company has been observed to be determined significantly by the organisational infrastructure for innovation.

For example, a German pharmaceutical company adopted the organisational infrastructure for innovation approach by consolidating its preclinical drug research projects after it had concluded a merger agreement with another German MNPC. However, the mainstay organisation continues to independently carry out its drug clinical research projects in several other pharmaceutical markets. This form of decentralised system enhances efficiency and speedy decision-making in operations.

2.4.5.2 Intra-firm knowledge transfer framework

Cresswell et al. (2020) support the assertion that knowledge transfer will be effective and sustained where there exists informal networking that mutually benefit the alliance partners sharing the knowledge. Therefore, it is important to convergence organisational and technological goals among the joint venture collaborative partners.

Kramer et al. (2011) revealed the three paths through which internal knowledge transferred may be achieved and managed. The first path involves face-to-face contact with all interviewed prospect partners. This approach could be adopted as a means of effective and efficient internal and external communication process. This path is important at the commencement of complex technologically-involving projects, where a wide knowledge gap exists between the company and alliance collaborators.

The second path includes the application of information technology-based support structures, such as workshare platforms, directories, intranet-based document systems or wikis to partner MNPCs that need to be interviewed.

The third path involves the selection of companies with existing and well-developed specialised business units that are endowed with adequate intra-firm knowledge transfer and integration capabilities. The companies should possess the ability to gather and compare internal research data and results against external sources of such data or results. The companies selected for the collaboration should exercise the capability to identify, understand, select and connect to the sources of available external knowledge.

These companies should have sufficient knowledge and skills to complete the missing

pieces of information that cannot be sourced or developed externally. More so, the company should be able to integrate and comprehend internally and externally sourced knowledge to create useful and accessible complex combinations of knowledge for the joint venture collaboration partnership.

2.4.5.3 New management and coordination tools for interdisciplinary projects

This feature is essential for organisations to acquire adequate capacity to be able manage and coordinate the joint venture collaboration. Spithoven et al. (2010) confirm that innovative activities are dependent on the diversity of varieties of sourced know-how, knowledge transfer and skills. Therefore, the companies need to adopt organisational approaches that are capable of managing knowledge exchange across different disciplines adequately and effectively.

Cresswell, Sheikh, Franklin, Krasuska, Nguyen, Hinder, Lane, Mozaffar, Mason, Eason, Potts and Williams (2020) are of the opinion that policy interventions are required to enhance incentives to share knowledge and lower the barriers to knowledge-sharing across the organisations. Also, there is a need for flexible formal interventions as and when necessary and to promote informal knowledge-sharing.

2.4.6 Network capacity

Network capacity is another tool employed by the joint venture collaborative alliance to create needed innovation and to achieve competitive advantage. Network capacity involves industrial network capital and scientific network capital. Kramer et al. (2011) identify three key dimensions of capital investment employed by the MNPCs to coordinate both industrial network capital and scientific network capital.

2.4.6.1 Industrial network capital investment

Industrial network capital investment involves decision-making processes, the first of which is to identify the collaborative partners in the industry. This decision upholds the identification of alliance partners with the capability to establish knowledge for the

network. The second is the creation of knowledge and diffusion with the aim to build the capacity to produce knowledge and generate value in the network. The third is the decision to build capacity to collaborate with other pharmaceutical companies in the network on a continuous basis. Glaxosmithkline, (2020b) report that it continues to simplify and focus on the manufacturing network, with the intent to ensure a steady supply chain for the new specialty medicines.

Identifying industrial collaboration alliance partners: Kramer et al. (2011) are of the opinion that the framework for industrial network capital investment anchors on the capability of the joint venture collaboration firms to identify and select potential alliance partners. It is important for the firms to be able source partnerships where external know-how and skills may be obtainable, bearing in mind the nature of skills a potential partner should possess and the willingness to contribute knowledge to the network. Pharmaceutical companies should be equipped with the knowledge of what the market will be expecting from the alliance, as regards know-how and skills in the final output.

According to the authors, the selection of potential research collaborators by pharmaceutical companies may be sought internally or externally. Sometimes, the pharmaceutical companies took the responsibility to source and select potential collaborative partners. In other instances, the R&D equipment and functional facilities of the pharmaceutical company may become the platform for research projects in the network. It has been observed that the selection of external potential alliance partners may be initiated by competitors, the customers or the suppliers, and sometimes from contract research organisations (CROs). For example, MNPCs may create joint venture collaborations with biotech companies or with CROs that are creating innovations, discoveries, R&D and rendering post-approval services. This was seen when Pfizer selected BioNTech (Biotech) to jointly develop and commercialise COVID-19 vaccine (BNT162b2). Pfizer and BioNTech will equally share the costs of development for the BNT162 program (Pfizer Annual Report, 2020:2).

Creating knowledge and diffusion: Kramer et al. (2011) emphasise that the exchange of knowledge between the collaborative partners in the network is dependent on the stage of the development of the product as well the nature of the partner in the

network. In industrial collaboration, there are technology partnerships, which are responsible for focusing on the preclinical phase of R&D, and product-specific collaborations that are required for product development processes. These collaborations may either be bilateral or multilateral in nature. Pfizer (2020b) report that it collaborated with science-based platform-services organisations. These organisations were to provide technical expertise and other services to R&D projects and allowed quicker and effective reaction to the growing needs. These activities were made possible through the sharing of resources among projects candidates and targets across therapeutic areas and developmental phases.

Continuous collaboration capacity: Kramer et al. (2011) emphasise that the existence of value of a network is derived from the maintenance and continued sustenance of the relationship within the joint venture collaboration. Specialised management teams such as R&D alliances or R&D liaison management are employed to support and strengthen industrial network capital investment.

2.4.6.2 Scientific network capital

Kramer et al. (2011) confirm that scientific network capital involves collaborations between firms and the scientists in the academic institutions to establish a knowledge network for R&D projects. In scientific network capital, the decision-making processes involve undertaking of dimensions relating to drug R&D activities. The decision focusses on the identification of academic collaboration alliance partners to create a template for research and innovation. As such, it creates knowledge and value in the collaboration network, with the intent to exercise continuous collaboration with other companies in the network.

Identification of academic collaboration alliance partners: The authors are of the opinion that R&D collaborations with academia are regarded as valuable activities and efforts are sought by MNPCs to increase the collaboration at the global as well as country scale, via the identification of competent scientists' partners. Consequently, MNPCs often devise a specific process to identify the research strength of universities and design an efficient procedure to interact with academic institutions. Novartis

(2020:35) confirms that its Innovative Medicines Division enters into business development collaborations with academic and other institutions to develop new products.

Capacity to produce knowledge in the network and create value from the network: Kramer et al. (2011) reveal that joint venture collaborative firms are using universities and academic institutions as the tools to identify and source academic and institutional researchers to form alliance partners. This decision is important for the creation, validation and evaluation of the potential innovative idea for commercial purposes. The partners in innovative collaboration assist the pharmaceutical companies to develop a basic understanding of new research innovations and findings. The collaboration also strengthens the absorptive capacity of the pharmaceutical companies by incorporating these findings into the intra-company R&D network. The authors conclude that MNPCs' collaboration with academic alliance partners creates access to human capital engineering, which is the base of support for research, innovation and talent creation. The joint venture pharmaceutical companies adopt efforts to sustain the collaboration. These efforts include single research contracts, access to industrial data, funding joint research projects, shared facilities, academic funding, donation of equipment to the universities research laboratory and sometimes sponsoring professorship.

Continuous collaboration capacity: Kramer et al. (2011) are of opinion that continuous collaboration capacity requires strategic management of industrial collaborations. The authors suggest that legal measures are often required to bypass major obstacles towards successful joint venture collaborations. At the same time, managers in the employment of MNPC with research backgrounds work with academic researchers of universities in the alliance partner to alleviate the hurdles that may emerge from the collaboration.

2.5 Joint venture collaboration in multinational pharmaceutical companies

Haskell et al. (2015) agree that joint venture collaboration may be formed between multinational companies to target different objectives in the form of in-licensing,

cooperation in R&D, out-licensing and contract manufacturing. The authors suggest that the main motives for joint venture collaboration, the specific objectives for forging the collaborative agreement, the types of joint venture alliance formed the and success of the joint venture alliance need to be considered in accordance with the content of the agreement. Joint venture collaboration motivates MNPCs to discover new medications, perfect a formulation and commercialise its production. Novartis (2020:11) reveals that commercial success enables the company to maintain and grow business in the face competition from generic and biosimilar medicines.

To this extent, a study conducted on multinational joint ventures strategy and performance by Larimo and Nguyen (2015) categorises the motivation for joint venture collaboration by firms relative to performance into three major motives. These are parent company motive, investment-objective motive and inter-partner company motive. In that study, it is indicated that companies in joint venture collaborations adopted market-seeking, efficiency-seeking and learning- or knowledge-seeking motives as means to achieve superior market performance. These authors allude to the fact that joint venture alliance partners set clearly defined strategic objectives and sharpen a unique focus. In this way, the success of the alliance becomes very easily measurable, and sustainability can thus be easily established.

Walter et al. (2010) emphasise that, in the studied market environment, market-seeking motives were more realistically achievable because the cost of entry are sourced from the alliance partner. Learning- or knowledge-seeking motives were more difficult to achieve because this motive requires more spending to facilitate the learning goal. However, efficiency-seeking motives may take longer to achieve than other motives.

Schuhmacher, German and Gassmann (2013) argue that for a joint ventures alliance to reach the level of efficiency desired by the parent firms, the alliance partners may incur higher transaction costs in partnership management, monitoring partner behaviour and negotiation procedure. These decision-making processes often become expensive to maintain, and therefore decrease the financial convenience needed for the progress of the alliance.

2.6 The praxis of joint venture alliance operations

There were discussions on the working decision-making processes of the joint venture collaboration under section 2.4 of this study. These discussions underpin the assumption that joint venture collaboration between MNPCs are practical, reasonable, lawful and realistic business operations. The collaboration can achieve specific measurable performance according to the established indicators.

Walter et al. (2010) suggest that the practical process and operation of the joint venture alliance must be directed towards realistic objectives. It should be understood that the joint venture alliance is known to be an effective means to achieve a variety of motives, ranging from growth, learning, cost-saving, international expansion to risk sharing, which are commonly used by MNPCs and other high-technology industries. It is point noting however, that Walter et al. (2010) are sceptical that joint venture alliance collaboration may be susceptible to opportunistic behaviour and conspicuous shortcomings from alliance partners. These shortcomings are the risk of proprietary knowledge leakage, disproportional rent appropriation, or free-rider problems emanating from poorly defined goals and weak measurable indicators of success.

The authors conclude that joint venture alliance partners in MNPCs should make strategic decisions to operate effectively and efficiently during the lifespan of the joint venture collaboration. These decisions revolve around a careful selection of alliance partners, the clear delineation of the scope of the alliance, the careful design of governance architecture and monitoring systems, the optimal allocation of resources, measurable indicators of alliance success and the determination of dissolution procedures.

2.7 Cost drivers for growth and performance

Because this study focusses on the performance of joint venture collaborations, the cost drivers needed for the performance and growth of the joint venture alliance between MNPCs will be discussed in this section.

Schuhmacher et al. (2013) identify various cost drivers for performance and growth.

These include the efficacy of the innovation models adopted by the alliance, cost structure of R&D initiatives, organisational capacity to optimally allocate critical resources, as well as the ability of the alliance to create and maintain effective and reliable operational networks. All these identified cost drivers are considered important to the realistic and efficient performance and growth of the alliance collaboration.

In the paragraphs that follow, we look at the critical importance of each of the cost drivers in order to decipher their influence on the realisation of alliance performance.

2.7.1 Innovation

Schuhmacher et al. (2013) report that the main growth driver in pharmaceutical companies is innovation. A new discovery is a motivation for MNPCs to open R&D activities to gain exogenous innovation through the approach known as the open innovator model. These authors categorise the open innovator model into four types, namely knowledge creator, knowledge integrator, 'knowledge translator' and knowledge leverager. The knowledge leverager is the most current among open R&D model. However, it is important to define each type of the open innovator models according to the studies reported by Schuhmacher et al. (2013).

2.7.1.1 Knowledge creator open innovator model

The knowledge creator is defined as an inbound choice in innovation management of R&D projects, which is combined with a lower level of externally acquired R&D projects when compared with the industry standard. Knowledge creators often depend on internal innovation management of R&D projects, but where a project is acquired externally, it is developed mainly with internal resources and know-how.

Schuhmacher et al. (2013) identify BI and Novartis as two examples of MNPCs that employ the knowledge creator open innovator model, built on internal R&D projects, skills and know-how. These activities boost the performance and growth of these firms. Despite that, these activities are supported by focused licensing, collaboration with universities and academic partnerships.

2.7.1.2 Knowledge integrator open innovator model

The knowledge integrator is described as the open innovator model with a preference of using internally generated innovation. This model largely dependent on internal resources and know-how. In pharmaceutical companies, knowledge integrators accommodate an in-house knowledge generation and adaptation, by relying on resources, capabilities and competences that are generated internally. According to Schuhmacher et al. (2013), this model depends on the full utilisation of endogenous resources. The authors report that Sanofi improved its growth and business performances through the adoption of knowledge integrators. This was used to create value from its in-house expertise in R&D management.

2.7.1.3 Knowledge translator open innovator model

The knowledge translator was defined as an option to use resources and knowledge generated externally to the pharmaceutical company to process internally generated innovation. The knowledge translator open innovator uses R&D projects that have been initiated primarily through internal research, thereby using outsourcing, collaborations and partnerships to manage the R&D projects efficiently. GSK has been maintaining an upward projection in growth and performance in its pharmaceutical business. This partly stems from the adoption of knowledge translator open innovator model, which has been successful over the years (Schuhmacher et al., 2013).

2.7.1.4 Knowledge leverager open innovator model

The knowledge leverager focuses on externally generated innovation together with enthusiastic innovation management. The knowledge leverager acquires drug candidates, technologies and knowledge externally, outside the pharmaceutical company, and applies leverage to reap the best value out of the available internal and external resources. The combination of these critical exogenous innovation and endogenous resources lead to the discovery and development of new drugs (Schuhmacher et al., 2013).

McCallister (2013) reports that Shire adopted the knowledge leverage open model to

stimulate performance and growth of its business. Shire established the most radical concept in the pharmaceutical sector, in which the whole R&D organisation operates virtually as a knowledge leverager. Shire adopted an open collaboration model, which functions together with its partnered venturing model, as a means to provide valuable tools to access external innovation.

A diagrammatic illustration of the interaction between these models is presented in Figure 2.2:

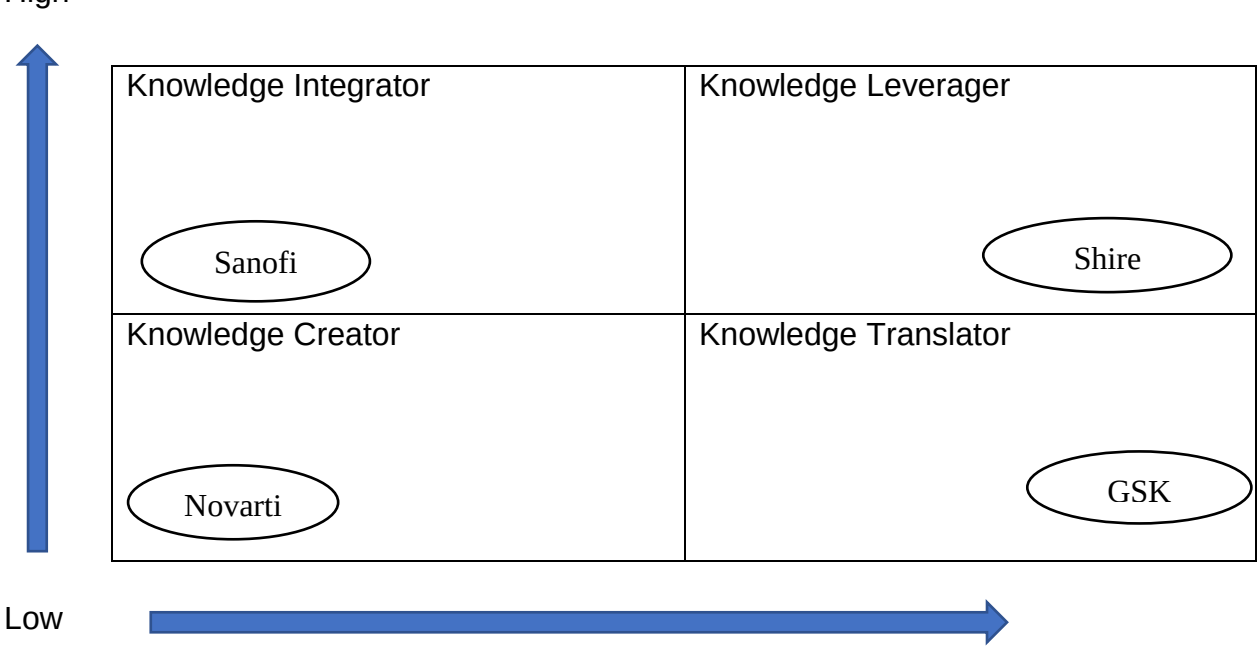


Figure 3.2: Four new types of innovation model and examples of each represented by the MNPC

Source: Schuhmacher et al. (2013:1135).

In a previous study on the importance of open innovator models, Hunter and Stephens (2010) highlight the challenges faced by global pharmaceutical companies, in pursuit of increased complexity, new technologies, the availability of highly qualified experts outside the traditional pharmaceutical companies and the increased pressure on time

and cost. These challenges have induced MNPCs to realise the full potential of open innovation as they continue to sustain external sources of innovation by accessing ideas, technologies and R&D projects that are externally sourced by the company.

2.7.2 Research and development

The literature reveals that R&D is an important cost driver required to achieve growth and performance by MNPCs. Evaluate Pharma (2015) present the total worldwide R&D spending of pharmaceutical and biotechnology companies: spending grew hugely from US$ 108 billion in 2006 to US$ 141 billion in 2015.

Scannell, Blanckley, Boldon and Warrington (2012) agree with the industry-wide analysis, which reveals some of the actual challenges that confronted pharmaceutical R&D. According to the author, these challenges mainly emanate from the pressure to lower the costs associated with the number of new molecular entities (NMEs) that are launched on the market. For the same reason, Schuhmacher, Gassmann and Hinder (2016) reveal that Novartis launched 13 NMEs between 2006 and 2014. Given the huge costs that are associated with NMEs without a substantial increase in R&D productivity, the viability and survival of MNPCs may be jeopardised. This statement supports the need for greater R&D spending to achieve greater growth and performance in MNPCs.

2.7.3 Tools and models applied to overcome R&D challenges

MNPCs generally apply a variety of strategies to cover the huge costs associated with R&Ds, and to mitigate a number of other challenges that spread through a typical R&D initiative. Some of the approaches adopted by MNPCs are highlighted and synoptically depicted below.

2.7.3.1 Joint venture alliance between MNPCs

Joint venture collaborations are widely adopted by MNPCs to secure entry into host countries' pharmaceutical markets. One of the aims of the cross-country business operation is to create growth and improve global market performance of the products.

This approach is a popular tool to share cost-related risks that may accompany the cost of production. Collaborative arrangements have been used to reduce expenses that are associated with R&D innovation, and to improve the commercialisation of products in the host country (Walter et al., 2010).

2.7.3.2 R&D cost cuts

The objective of joint ventures in MNPCs is to increase R&D efficiencies through optimal resource utilisation. This objective is achieved by reducing R&D costs, which often involves other processes such as retrenchment of non-core R&D support employees. It may require that the R&D projects be outsourced to other service providers. This action is used to reduce the cost expended on the operation of management overheads, the maintenance of production equipment and the reduction in the amount expended on infrastructure (Schuhmacher et al., 2016). Such decision increases the growth and performance of the pharmaceutical company.

According to Grogan (2013), GSK in 2012 expressed an ambition to realise annual savings of about US$1 billion by 2016 on its R&D expenses. This ambition was realistic when the company executed a combined reduction in both the size and amount expended on its R&D activities. This action enabled a focussed and more accurate costing of production operations. Likewise, in 2014, Merck & Co. decided to reduce its expenditure on R&D activities by reducing the cost of production of some of its line products, and by decreasing the number of administrative staff to 8,500. During that year, the company was able to make as much as US$1.2 billion in financial and cost savings (Staton, 2014).

2.7.3.3 Portfolio management

Portfolio management (PM) presents another approach to increase R&D efficiency. The objective is to create a better space to focus on PM. Consequently, the reduction of expenses and cost of production and other related projects may be achieved, and the ROI for the organisation ultimately increased from the growth and performance achieved.

DiMasi, Grabowski and Hansen (2014) argue that a decrease of about 30% was achieved in the average time from the start of a pharmaceutical research project to its completion in clinical trials. The value-based PM activities, value-based decision-making processes, reduce the cost of R&D projects. However, Schuhmacher et al. (2016) counter-argue that, where there is anticipated failure during R&D activities, efforts should be made to ensure that value-based PM is sufficient to compensate for any failures in the drug R&D project in process. The R&D project may fail and not be concluded because of inadequate technical experience and skill, market uncertainty or risk accompanying the market entry.

Citeline (2013) emphasise the importance of a larger project portfolio to compensate for drug project failures. For example, the corporate R&D pipelines of the top MNPCs include almost 1,000 drug projects in development phases: GSK has 261, Roche 248, Novartis 223 and Pfizer 205 drug projects in their portfolios.

2.7.3.4 Outsourcing

KPMG (2012) report that most joint venture collaborative MNPCs have been observed to adopt the practice of outsourcing and collaborations with service providers. This outsourcing practice has formed part of the value chain from drug research to development, to marketing activities and manufacturing processes.

PharmSource (2018) places monetary value on this in respect of growth and business performance: it reports that the global drug discovery outsourcing market was about US$11.5 billion in 2014. The revenue generated by contract research organisations conducting clinical trials was about US$17.9 billion in 2014.

2.7.3.5 Innovation centres

According to Schuhmacher et al. (2016), a scrutiny of the business activities of joint venture collaboration MNPCs reveals that innovation centres are the driving force for creativity and innovation. These innovation centres were employed to bring together a company's internal and external experts in order to integrate internal and external know-how to solve drug R&D challenges.

In 2017, GSK launched its innovation centre, the Centre of Excellence for External Drug Discovery (CEEDD). This is an externally-focused R&D centre that facilitates drug-discovery strategic alliances for research processes up to clinical proof-of-concept (PoC) in conjunction with other external alliance partners who are engaged in the work of drug development across all therapeutic areas (Outsourcing-Pharm, 2008).

At GSK, these external drug discovery activities by the innovation centres are carried out in conjunction with the in-house scientific consultancy Scinovo*,* which manages the interface between external alliance partners and internal scientists (GSK, 2020b). However, CEEDD has helped GSK to fill early-stage drug pipelines that consist of up to 50% of externally sourced R&D projects (Schuhmacher et al*.*, 2016).

Pfizer Laboratories has engaged the services of an innovation centre as a strategic partner. In 2010, Pfizer established the Global Centre for Therapeutic Innovation (CTI), which is an open innovation model that focuses on the funding of global strategic partnerships between Pfizer and academic medical centres. The main purpose of this joint venture collaboration is that Pfizer will be providing funding, human resources and technologies to the projects, while the academic strategic alliance partners will contribute the model for the hypotheses of new drug mechanisms (Pfizer, 2020b).

2.7.3.6 Open source

The literature confirms the appropriate decision-making processes to use the open-source model of innovation to achieve growth and business performance in MNPCs. Schuhmacher et al*.* (2016) suggest that the open-source approach should be based on transparency between alliance partners, freedom to operate within and among the alliance partners, the availability and access to products, as well as outcome reports for all parties. This approach includes revision and improvement of collaborative contributions, with no financial reward for contributors, but recognition for the effort.

The open-source approach brought R&D gains to the alliance partnership between GSK, Alnylam Pharmaceuticals and the MIT. The alliance formed the pool for open innovation against neglected tropical diseases (NTDs) and subsequently led to a

platform that provided open access to 2,300 patents who were in need of treatment for some NTDs (Investors.regeneron, 2018).

Further, Strauss (2010) and Munos (2010) claim that the open-source approach was undertaken by the Open-Source Drug Discovery initiative (Osdd, 2008) in 2008 to provide affordable healthcare for neglected diseases and the African Network for Drugs and Diagnostics Innovation (ANDDI).

While supporting the open-source approach, Harrison (2012) point to the GSK collaboration with Bayer and Novartis in the Global TB alliance. Global TB Alliance's strategic model involves minimising overhead and infrastructural costs to optimise research capability to achieve the development of new TB drugs. This was achieved by putting together the R&D skills of its staff with the resources generated from the partners (Globalhealthprogress, 2020). It is noteworthy that GSK currently applies the open innovation model to other therapeutic areas, including infectious and rare diseases, as well as to its clinical trials of NMEs.

2.7.3.7 Crowdsourcing

The literature reveals that crowdsourcing is an important R&D tool used by MNPCs to invite new ideas into target research proposals, which are often sourced to compensate for the draining R&D pipelines after positive evaluation (Schuhmacher et al*.* 2016).

Lessl, Schoepe, Sommer and Schneider (2011) confirm that Bayer Healthcare initiated a crowdsourcing platform called Grants4Targets in the year 2009, where grants of between US$500–1,000 and US$10,000–2 million were offered to anyone who submitted a target structure that contributes to Bayer Healthcare research focus.

In another related example, Schuhmacher et al*.* (2016) confirm that Eli Lilly is a pioneer and leader in the crowdsourcing of new idea for R&D among MNPCs. Eli Lilly created several crowdsourcing initiatives, including InnoCentive® and YourEncore, both of which are functioning independently.

YourEncore (2020) is described as an expert network working in the technology industry. This resource provides expertise in the field of life sciences, consumer goods and the food industry. It provides support and assistance to companies, including joint venture pharmaceutical companies, by enabling the companies to access technological know-how, which is useful to overcome challenges that may arise from R&D projects. YourEncore renders expertise to some specific fields such as preclinical and clinical development, clinical operations, pharmacovigilance, regulatory affairs, manufacturing, quality management, organisational effectiveness and safety.

Another good example is InnoCentive (2020), which is a global network of experts from which MNPCs may draw technological information. About 365,000 registered problem-solvers from approximately 200 countries have been documented on the site. The problem-posting MNPCs that registered an alliance partnership with InnoCentive to secure innovative ideas are Eli Lilly, Procter & Gamble, AstraZeneca, Syngenta and NASA.

2.7.3.8 Virtual company model

The literature defines a virtual R&D model as a designed organisation aimed at providing services, with a limited number of internal staff who are empowered to obtain external resources, for specialised companies, especially MNPCs. This model requires technologies as well as available facilities that on-demand develop or create efficient and effective drugs, as well as measurable R&D project outcomes (Schuhmacher et al*.* 2016). The virtual R&D model was applied by Chorus, an entity of Eli Lilly, and the company claimed a reduction in capital requirements and financial risks. The company also recorded a substantial reduction in overhead costs as well as higher research project flexibility, coupled with limited infrastructure expenses, leading to a reduction in both time expended and costs in pharmaceutical R&D (Owens, 2015).

The information available on the Chorus website reveals that the virtual R&D model was used to reduce R&D time and resource wastage by selecting the right portfolio of low-risk projects (Choruspharma, 2020). Virtual R&D has been used effectively to manage the project pipeline by accessing projects and resources from the outside

flexibly as well as accessing resources cost-efficiently. Owens (2015) reports that about 25% of Chorus's budget was fixed overhead costs, while the remaining 75% were allocated to the external costs of the R&D drug projects. This is an indication of a lean administrative system that ensures that the bulk of the costs are allocated to the main focus of the alliance, which is optimal utilisation of resources towards the discovery of new drugs in a way that engenders profitability.

2.8 Joint venture collaboration performance measurement

Parung and Bititci (2006) define the performance of collaboration in terms of the meeting of the partners' joint strategic goals. The goals of the joint venture partners sometimes differ, but Varamaki, Kohtamaki, Jarvenpaa, Vuorinen, Laitinen, Sorama, Wingren, Vesalainen, Helo, Tuominen, Pihkala and Tenhunen (2008) report that joint venture collaboration performance is often in the form of the exhibition network culture, including network resources and competencies, network model of activities, performance of internal processes, customer perspectives and financial perspectives.

Strouhal et al. (2018) emphasise that the level of the financial performance of companies has been used to assess the success or failure of firms, and the level of fulfilling the pursued corporate objectives and competitive advantage. However, the performance often increases if the company can fulfil the target values that were set from the beginning and, hence, performance improvement is the goal of management and planning at all levels of control.

The importance of monitoring the performance measurement of firms is highlighted in the literature. Larimo, Nguyen and Ali (2016) recommend that a performance measurement monitor is important to joint venture alliance MNPCs to develop effective strategic plans, evaluating the achievement of the objectives and the determination of the reward for managers. However, Schmid and Kretschmer (2010) highlight the difficulties associated with performance measurement due to cross-border variations in accounting standards, the nature of parent or local company boundaries, and the geographic scope of operations. Some of the other difficulties observed by these authors include the variation in the capability and competence of the joint venture

collaboration management team and the diverse nature of the stakeholders of the alliance, such as shareholders and or local political actors.

Nevertheless, Larimo et al. (2016) emphasise that joint venture alliance pharmaceutical companies are not always created to achieve conventional business goals, such as profit and market share, but also exist for qualitative objectives such as organisational learning, co-opting, or creating competitive advantage, technology transfer or innovation collaborative arrangements. However, parent companies have their objectives in creating international joint venture alliances and, as such, performance should be measured against these objectives. These authors caution that qualitative goals are difficult to measure accurately, and they suggest financial indicators as the most accurate measure of success.

This supports the study gap and motivates the basis for this study to investigate the performance of the joint venture collaboration MNPCs, using financial indicators (ROA, ROE and ROI) as measures.

Sushil and Sagar (2013) counter-argue that limited research dealing with the performance measurement framework is available and this has become a major challenge for MNPCs. However, joint venture management teams of MNPCs are faced with the challenge of selecting the most appropriate indicators to measure the performance in joint venture MNPCs.

Supporting the objectives of this study, Shah (2014) reveals that multinational joint venture collaboration performance measurement has been underpinned in ‘traditional constructs’ of financial ratios (e.g. ROI) and survival in the marketplace (e.g. market share), with less emphasis on the ‘subjective construct’ of performance because profitability ratio may impact on the performance of an organisation more conspicuously than qualitative measures.

2.8.1 Operational performance measurement

The subjective construct of performance measurement includes some of the non-financial performance measurement factors listed below.

Skill and know-how transfer: Hafeez and Akbar (2015) reveal that human resource management practices in joint venture collaboration between MNPCs have been observed to be positively and significantly related to employee performance, training and development. However, the performance is defined as the achievement of specific tasks measured against predetermined or identified standards of accuracy, completeness, cost and speed.

On the other hand, Afshan, Sobia, Kamran and Nasir (2012) hold that greater performance by the employees could be achieved through improving production process, the availability of new technology and staff motivation rather than through joint venture alliance. This opinion is shared by Latif, Jan and Shaheen (2013) when they conclude that the responsibilities of joint venture collaboration managers is to create and maintain motivated employees and improve human capability through training and development, to achieve the required job satisfaction expected from the employees.

Abdul and Aamer (2011) argue that the role of employees is great and challenging in MNPCs and their success or failure often manifests through their performance, while Hafeez and Akbar (2015) counter-argue that employee training is key and cannot be reduced as it enhances the performance of employees. Therefore, staff training creates and develops skilled and motivated employees, which in turn renders a superior performance in the company.

2.8.2 Administrative performance measurement

Organisational culture: Eduardo and William (2013) argue, in the context of organisational culture, that leadership is the ability to organise forces including employees that create an organisation that can respond and recover quickly in a prevailing difficult circumstance. This quality is an important asset to the joint venture collaboration managers, who needs to create a progressive forward-looking discussion between internal and external constituents of the collaboration.

The author contends that resilient-building leaders seek to create an ongoing exploration of the external forces likely to deter the company's future growth and

success and creates an anticipation of the likely interruption in the performance of the company, while energising the company to achieve the set targets.

The authors give guidance that for a resilient joint venture collaborative pharmaceutical company to prioritise confidence in its future growth and performance, it should create an unbiased analysis and interpretation of information that points to the arising challenges.

2.8.3 Market performance measurement

The traditional construct of performance measurement is indicated in terms of market performance indices, such as market orientation, along with competitive advantage and financial performance measurement factors such as profitability ratios.

Market orientation: Craig, Julian, Mohamad, Ahmed and Sefnedi (2014) define market orientation as an organisational culture that has a set of shared values and beliefs in putting customers first in business planning. A practical application of this orientation suggests that MNPCs should focus not only on customers but on competitors and inter-functional coordination as well.

Customer orientation: According to Singh (2009), customer orientation is the heart of market orientation, and it should be directed towards the satisfaction of the customer. The customer orientation element demands knowledge of the needs and wants of the customers. Therefore, MNPCs are expected to develop better products than competitors to meet the customers' satisfaction and create superior market performance.

Competitor orientation: Craig et al. (2014) propose that pharmaceutical companies should be equipped with the knowledge to understand and identify the short-term strengths and weaknesses and long-term capabilities and strategies of competitors. As a result, knowledge of competitors is needed to achieve a sustainable competitive advantage for the MNPC, thereby creating higher market performance.

Inter-functional coordination: Craig et al. (2014) support the opinion that inter-

functional coordination to create a platform where all departments are recognised is important to the marketing function and has a role to play in customer satisfaction. The authors note that both customer and competitor orientations are engaged in generating and gathering market intelligence about the customers and the competitors, and also the dissemination of market intelligence throughout the pharmaceutical company. By so doing, the joint venture alliance will be creating a competitive advantage to achieve better market performance than competitors.

Competitive advantage: Salah (2014) also suggests that competitive advantage is the ability of a company to attract and lure customers to buy, build prestige and quality for the company and its products. This ability is not limited to achieving and increasing perceived value by customers and their satisfaction but creating the resources to provide added value to the customers at a premium.

Salah (2014) reports that joint venture collaborative MNPCs could enjoy optimal performance in the market when its competitive advantage strategies offer capabilities (technology and innovation), resources (material and human), market opportunity (economic, political, social), customer requirements (quality and user friendly) and an updated degree of unrivalled competition in the market.

2.8.4 Financial performance measurement

Gerschewski and Xiao (2015) reveal that the financial measurement of the performance of joint venture collaborative MNPCs is observed to include a variety of traditional indicators, such as profitability, growth and cost position. The financial performance measurement is often dependent on the reliance on cost information and financial data, which are short term in nature, and on information about sales, such as sales volume, the ratio of foreign sales to total sales and sales growth.

2.8.4.1 Financial ratios

Kabajeh et al. (2012) argue that financial ratios are the oldest simple and practical financial and planning analytical tools employed by accountants and financial analysts to make economic decisions. Such economic decisions include investment and

financial evaluation decisions.

The authors define the financial ratio as the relationship between two pieces of individual quantitative financial information connected in some logical way relative to money and market. Therefore, a meaningful financial indicator could be used by different financial analysts not only to gauge the financial position of a company, but to measure its market shares. Thus, financial ratios were classified according to their specific use in financial analysis as profitability ratios, liquidity ratios, activity (operational) ratios, debt ratios and market ratios.

2.8.4.2 Profitability ratios

Strouhal et al. (2018) argue that the measurement and evaluation of financial performance are restricted to the assessment of profitability in most research studies because they are one of the most important elements of financial performance. The other elements are liquidity, activity and indebtedness.

Kabajeh et al. (2012) agree with other researchers who use of the return on assets employed (ROA), return on equity (ROE) and return on invest (ROI), as the profitability ratio of measurement of performance. This principle is adopted as the basis for measurement of the performance joint venture collaborative MNPCs in this study.

The authors describe the profitability ratio as a financial indicator employed to measure the earnings generated by the company, especially the joint venture MNPC, during a period, based on the level of sales, assets, capital employed, net worth and earnings per share. Because profitability ratios measure the earning capacity of the MNPC, it is an indicator of growth, success, control and overall performance.

Karam and Sushila (2012) argue that there is a relationship between intellectual capital efficiency with financial performance and market valuation in the pharmaceutical companies in India. This argument supports the performance measurement methodology adopted for this study.

Return on assets: The literature review indicates that profitability ratios, such as ROA,

are often used for measuring financial performance in research studies. The financial indicators, including ROA, can be measured both objectively based on the data derived from financial statements and subjectively using scales, because data may be influenced by the employed accounting standards (Klecka & Camska, 2015).

Return on equity: Return on equity (ROE) measures the shareholder's rate of return on their investment in the company. ROE ratio measures a company's profitability by revealing how much profit a company generates with the money shareholders have invested (Kabajeh et al*.,* 2012).

Return on investment: Return on investment (ROI) measures the company's efficient utilisation of the invested capital. In other words, it is the expression of the company's ability to generate the required return, based on using and managing the invested resources by the shareholders (CFI, 2020).

Kabajeh et al*.* (2012) while studying Jordanian insurance public companies, claim that pool analysis of ROA, ROE and ROI ratios together revealed a strong and positive relationship with share prices (performance). On the contrary, the separated analysis revealed a positive but low relationship between each ROA and ROI ratios with market share prices. Even though the separated analysis indicated no relationship between the ROE ratio with market share prices, it is financially expedient to incorporate the variables in a joint system estimation for robust results.

In conclusion, various literature studies referenced in this chapter have not investigated the influence of joint venture collaboration on the performance of multinational firms, especially employing ROA, ROE and ROI as indicators for the measurement of performance in pharmaceutical companies. This study gap supports the objective of this study to investigate the influence of strategic joint venture collaboration on the performance of MNPCs in South Africa, using the ROA, ROE and ROI as the choice of financial indicators for the measurement.

2.9 Lessons from the literature

The literature reveals how the resource-based view (RBV) of the company,

organisational learning, and knowledge-based view (KBV) theories explain the fundamentals underpinning the strategic joint venture collaboration in MNPCs with guided focus and measurable objectives. These theories espouse on how resource and competencies lead to increased competitive advantage and performance (Haskell et al., 2015).

A review of the literature reveals that reduced drug R&D efficiency may pressure the MNPCs to realign the R&D concepts. Companies that aim to be the top innovators in the pharmaceutical industry may adopt the knowledge creator or knowledge integrator open innovator models. Any company that intends to become a pharmaceutical company that leverages knowledge may modify operational processes accordingly, in respect of increasing the absorptive capacities by implementing open innovation processes. This is best achieved by hiring people who are open-minded, able to work with different cultures, and aware that innovation needs to be accessed globally.

The results from the above are dynamic capabilities and interpersonal skills; creating and developing more strategic alliances and active involvements in innovation networks as well as developing managerial abilities to take advantage of external partnerships (Schuhmacher et al., 2013). Shire provides an example of a MNPC that was acclaimed to have established the most radical concept in the pharmaceutical sector, in which the whole R&D organisation operates virtually as a knowledge leverager. Shire has an open collaboration model, which functions together with its partnered venturing model and provides valuable tools to access external innovation (McCallister, 2013).

The argument by Kabajeh et al. (2012) on the importance of profitability ratios as a measure of earnings and financial capacity of the MNPC led to our acceptance of ROA, ROE and ROI as indicators of growth, success, control and performance of the MNPC. These measurement variables are useful tools to creditors to establish whether MNPCs would be able to satisfy their interest obligations. These tools enable shareholders to be able to predict the rate of ROI. The claims of knowledge in the literature support the focus of this study to investigate the influence of strategic joint venture collaboration on the performance of MNPCs in South Africa.

2.10 Chapter summary

This chapter detailed the business (economic) theories upon which agreements between MNPCs in various business sectors, including the pharmaceutical sector, are underpinned, especially in South Africa. Specifically, a strategic joint venture alliance was claimed to be conceptually underpinned by the resource-based view of the company and organisational learning theory and knowledge-based view (Haskell et al., 2015).

However, the strategic joint venture collaboration was described as a voluntary agreement between independent companies to develop and commercialise new products, technologies or services and may encompass joint ventures, joint R&D or production agreements, marketing or distribution agreements, and technological exchange (Walter et al., 2010). The alliance involves a decision-making process such as the selection of a partner, the scope of the alliance, the design of governance and monitoring systems, the allocation of resources, or the determination of dissolution procedures (Walter et al., 2010).

The management teams and managers manage the trust, procedural justice, conflict, and behavioural integration, while the joint venture agreement regulates procedural rationality, openness, responsiveness and politics. However, a strategic joint venture collaboration is a realistic practical process and operation (Walter et al., 2010). It is worth mentioning that internal challenges are often predominated by the strength and weakness of the joint venture MNPCs in response to the prevailing market conditions, while external challenges are indicated by opportunities and threats posed to the joint venture MNPCs by the prevailing market conditions.

However, several cost drivers, including innovations, R&D, organisational capacity, and network (industrial and scientific) capacity, have been identified to influence the growth and performance of the joint venture MNPCs. The open innovator model was often adopted by MNPCs and has been categorised into four types: knowledge creator, knowledge integrator, knowledge translator and knowledge leverager (Schuhmacher et al., 2013).

CHAPTER THREE
GLOBAL TRENDS IN MULTINATIONAL PHARMACEUTICAL COMPANIES

3.1 Introduction

This chapter reviews the previous studies carried out by various researchers on global trends in MNPCs, narrowed to MNPCs in South Africa, in respect of strategic joint venture collaboration approaches, business principles applied to overcome various challenges facing the strategic collaborative partners, and how these business alliance approaches influence the performance of the MNPCs.

Machi and McEvoy (2016) refer to the literature review as a critically analysed, well-thought-out written document that relates to the relevant literature on a research topic, presenting a logical write-up that establishes a thesis delineating what is currently known about the subject of the study. Therefore, this chapter explores the work previously done on the subject matter in the research topic.

3.2 Historical trends of multinational pharmaceutical companies

The review of literature carried out in this chapter covers the historical trends of MNPCs within the past 20-year period (1995–2015). The MNPCs of choice include GlaxoSmithKline (GSK), Novartis, Sanofi, Eli Lilly and Pfizer. These companies are chosen because of their presence in South Africa and because they fall into the category of the study's sample frame.

Gautam and Pan (2016) reveal that these MNPCs employed different business approaches, which created a significant footprint over the past 20 years. Other studies highlight the challenges facing the above-listed MNPCs, due to declining productivity or performance (Khanna, 2012), changes in the business models and approach (Kessel, 2011) and the growth of emerging pharmaceutical markets across the continent, was seen as key revenue contributors (Looney, 2010).

Gautam and Pan (2016) claim that between 1990 and early 2000, various business models were developed for MNPCs. These models enabled large market presence, diversified R&D focused on multiple global hubs, and primary healthcare activities, creating a large quota contribution to revenues. In contrast, Gautam and Pan (2016) argue that the current business model of these MNPCs shifted to that of a lean focused pharmaceutical company with an emphasis on R&D within key innovation bio-clusters and growing revenue from sources such as specialty products, biologics and various emerging pharmaceutical markets.

3.2.1 Key business models employed during the historical periods of MNPCs

Gautam and Pan (2016) conducted studies on MNPCs business model over two continuous 10-year periods, 1995–2005 and 2005–15, to investigate the changes and trends over the past 20 years. From these studies, the authors identify four key trends impacting the MNPCs business model, classified as follows: the massive to lean and focused business model; the move from research hubs to bioscience hotspots business model; the primary to specialty business model; and the West to East pharma market entry business model.

3.2.1.1 The massive to the lean and focused business model

The studies of Gautam and Pan (2016) reveal that from 1995 to 2005, the business model of these MNPCs was tagged ‘bigger is better’, which ballooned their global business operations in the form of creating large R&D hubs. There were populations of sale representatives, multiple manufacturing premises, and matrixed company governance. The establishment of these business activities was justified by economies of scale, diverse portfolios, and massive healthcare businesses to overcome declining R&D productivity.

Contrary to the above, since late 2000 to date, Gautam and Pan (2016) observe that the MNPCs business model shifted and began to embrace a lean and more focused model, which was characterised by divesting non-core assets and focusing on strengthening capacity and capability. The shift in model approach projected the growth and performance of these MNPCs. Galxosmithkline (2015) reported in a press

release an ambition to increase performance by completing a three-part transaction with Novartis to acquire Novartis's global vaccines business. This transaction enabled GSK to swap oncology, consumer health, and vaccine specialty with Novartis, leading to GSK increasing focus on the consumer health and vaccines business, while Novartis focused on the oncology business.

3.2.1.2 Research hubs to bioscience hotspots business model

Gautam and Pan (2016) uncovered an unintended consequence of the widespread acquisition between MNPCs between 1995 and 2005, which was triggered by a decline in R&D activities, resulting in the creation of multiple research hubs globally.

The authors report that during the second decade, MNPCs displayed contrasting business models marked with a desire to localise within bioscience hotspots. Localised bioscience hotspots enable the scientists to work closely and share information with external researchers and clinicians. Therefore, the scientists were able to develop and progress the drug pipelines through an open collaborative approach.

Some of the MNPCs have created internal biotech units through partnership with contract manufacturing organisations (CMOs) for strategic drug discovery alliances. Spinner (2020) reports the extension of strategic joint venture for drug development between Pfizer with Parexel.

Schuhmacher et al. (2016) scrutinises the business activities of MNPCs and reveals that innovation bioscience hotspots are the driving force for creativity and innovation. Bioscience hotspots are employed to bring together internal and external experts within the company to create a better integration between internal and external know-how to resolve drug R&D challenges.

Alexy, Criscuolo and Salter (2013) reveal that GSK created its Centre of Excellence for External Drug Discovery (CEEDD), an externally-focused R&D centre that facilitates drug discovery collaboration up to clinical PoC with external partners working across all therapeutic areas.

3.2.1.3 Primary care to specialty medicines business model

Gautam and Pan (2016) describe the era of the blockbuster drug (primary care and small molecule medicines), which prevailed among MNPCs between 1995 and 2005, as having accounted for about 80% of revenue for most big MNPCs' portfolios.

A single blockbuster drug, Lipitor®, catalysed the strategic joint venture collaboration to form Pfizer-Warner Lambert, while Celebrex® created the strategic joint venture collaboration to form Pfizer-Pharmacia. These blockbuster drugs were among the top-selling primary care and small molecule medicines from 1995 to 2005.

Gautam and Pan (2016) reveal the trend in a shift from developing primary care and small molecule medicines; and increasingly creating drug pipelines to specialty medicines and biologics during 2005 to date. This trend has been driven by an increase in knowledge in the behaviour of molecular entities, coupled with a better understanding of the biology of the underlying disease. The newer knowledge has assisted in the development of target sites on which medicines exert their effects.

The authors emphasise that the shift in model approach increases diversification in science and technology innovations for biological components. It has also led to the discovery of effective personalised medicines and accompanying diagnostic technologies, thereby leading to the implementation of favourable regulatory structures and acceptance of timelines for medicines. Drug innovations have enhanced the implementation of economically profitable pricing systems and the underlying reimbursement on medicines supplied.

It is important to indicate that specialty medicines do not exist without market shortcomings. For some of the MNPCs, their percentage revenue dropped over the past five years due to patent expiration of some top-selling specialty medicines, e.g. Zypreza® for Eli Lilly and Taxotere® for Sanofi (Gautam and Pan, 2016).

3.2.1.4 West to East pharma emerging market entry business model

According to Gautam and Pan (2016), America, Canada and Europe presented the leading major pharmaceutical markets in 1995 to 2005. None of the joint venture MNPCs listed for this study derived more than 20% revenue from the emerging market during this period. Later, the shift in business model discovered Asia, Latin America, Russia, the Middle East and Africa to be the arrowhead of growth in revenue during 2005 to date. The discovery was sustained due to strong demand and improvement in the macroeconomic fundamentals of these regions.

The authors agree with the report that GSK and Pfizer experienced significant revenue growth from emerging markets as a proportion of global revenue, because of patent expiry of products in the USA, Canada and Europe during this period.

Gautam (2015) supports the opinion that China is the second-largest pharmaceutical market in the world, backed by government and private capital. The support was directed towards the growth of a talent pool of Western-trained researchers, homegrown professional researchers and an evolving life sciences ecosystem. Gautam and Yang (2014) agree with the opinion that there has been a continued increase in China's innovation capabilities and discovery of new drugs.

Our observation on the various shifts in the business model approach is that an increase in revenue was achieved with each model shift. There was business growth and improved performance by the MNPCs. These performances are measurable by the use of profitability ratio indicators such as ROA, ROE and ROI, as adopted by our research study.

3.3 Trends in business development of joint venture collaborative multinational pharmaceutical companies globally and in South Africa

Ramnarian (2020), a partner director at Price Waterhouse Coopers (PWC), reveals that the pharmaceutical industry in South Africa consists of more than 200 pharmaceutical companies. These companies are valued at more than US$3 billion.

The largest dominant players in the South African pharmaceutical sector are Aspen with 34%, followed by Adcock Ingram with 25%; Clicks and others shared the rest.

Kowallik (2018), a researcher at Novartis South Africa, presents a detailed discussion on global and South African MNPCs in light of their gradual emergence into a wealth of experience in innovative medicines. In this regard, more effective new drugs with fewer side-effects are being licensed globally, and consequent massive drug R&D investments are noted. These have created renewed hope for patients and availing next-generation digital technologies to support drug innovation, R&D, as well as improved healthcare delivery.

3.3.1 Pharmaceutical R&D and new molecular entities

Scannell et al. (2012) point out that the actual challenge for pharmaceutical R&D arises from the pressure of the costs of the number of new molecular entities (NMEs) launched to the market over the period considered.

Liu, Thomas and Felder (2019) confirm that Novartis, a research-based MNPC, launched 13 NMEs between the year 2006 and 2014. Denise, Massaki and Ram (2010) describe how new drug administration (NDA), with food and drug administration (FDA) in the USA, involves extensive analysis of clinical testing methods as well as reviews of labelling information and manufacturing methods. In most cases, such applications required about two years to be processed, notwithstanding average testing periods are more than eight years.

Kowallik (2018) compares the new drug application in the USA to South Africa. The licensing of new drugs in South Africa requires a waiting period of five to seven years, although progress is continuously being made to reduce the period of new drug licensing. This cannot be compared to the 18 months to two years experienced in most of the Western world.

DiMasi, Grabowski and Hansen (2016) claim that MNPCs often institute basic and applied research initiatives that bring about processes involving drug discovery programmes. These processes result in the synthesis and isolation of compounds that

may be tested in assays and animal models in preclinical development of drugs. The authors were unhappy that FDA approval for the marketing of a new drug usually has an unpleasant fundamental impact on the growth and performance of pharmaceutical companies.

Kowallik (2018) reports that a significant increase, the year 2007 and 2011, because of the step-up in drug innovation. This statistic includes biological drugs that are manufactured using a living system such as microorganisms, plant or animal cells (biotherapeutics).

3.3.2 Biotech developed drugs and traditional method developed drugs

DiMasi et al. (2016) present a brief explanation of the concept of the social cost of research discoveries and developing new compounds. These costs included private sector costs, government-funded, and non-profit expenditures directed towards clinical research of compounds, through which new drugs may be developed. Here the difficulty was to identify and measure non-private expenditure.

The author reveals that the full capitalised cost per approved new compound is similar for traditional method drug development and biotech drug development. But the biotech drugs have a higher average clinical success rate than small molecule drugs. This variation in cost was observed in 2005 in the USA, when the cost was in US$1.3 billion for biotech and US$1.2 billion for traditional development.

3.3.3 Personalised cell and gene therapies

Kowallik (2018) indicates that MNPCs are exploring personalised cell and gene therapies as means of regenerative medicine to present effective medical care. In support of these efforts, immune-cellular therapy has been discovered to have used a patient’s T-cells to fight cancer and these technologies received a breakthrough therapy designation by US health regulators in 2018.

The author reveals that preventative medicine, in which the biological pathways responsible for some debilitating chronic medical conditions are continuously

investigated by researchers, and some promising treatments, have been achieved. These biological products include products employed for the prevention of Alzheimer's disease, migraine, and recurrent cardiovascular diseases.

Pepper, Alessandrini, Pope, van Staden and Green (2019) highlight the challenges posed for personalised cell gene therapy when introduced into the healthcare sector in South Africa. Personalised cell and gene therapy has enormous technological demands, requiring intensive resources. The South African regulatory system is not developed enough to withstand the present ethical, legal and social considerations. The high cost expended in these innovative medical care opportunities may be repulsive to South African patients.

However, the acquisition of digital technologies by pharmaceutical companies has rendered useful assistance to drive progress both in R&D and healthcare delivery systems in South Africa.

3.3.4 Automatic data analysis and presentation

The literature highlights the recent use of machines such as automation and big data analytics. These machines are used to support traditional laboratory investigation. They are used as predictive modelling tools, used to enhance the ability to predict therapeutic outcomes and tailored treatment (Kowallik, 2018).

The author stresses the importance of artificial intelligence (AI), internet of things (IoT) technologies and mobile devices, which have been used to improve efficiency in the patient-monitoring processes and therapeutic outcome assessments. Smartphone applications have been developed by pharmaceutical companies in collaboration with global leaders in AI. These smart devices are used by community health workers to monitor the general health of patients, to dispense inpatient and outpatient medication, and as a referral tool to local clinics in South Africa and elsewhere.

3.3.5 Telemedicine (testing and diagnostic devices)

Villines (2020) reports on telemedicine as a method of providing medical care remotely through video chat on smartphone applications. Telemedicine allow access to primary care consultations, psychotherapy and some medical emergency services. Kowallik (2018) emphasises the importance of the use of testing and diagnostic devices for monitoring chronic conditions such as chronic obstructive pulmonary disease and diabetes. These devices are connected to smartphones and are capable of detecting lung physiological conditions and measuring blood glucose levels. The data are subsequently transmitted directly to the specialist physician expected to treat or diagnose the patient.

Villines (2020) highlights the benefits that telemedicine renders to patients and healthcare professionals. Telemedicine is of benefit to patients because patients spent less time in hospital and save on other costs. It improves patient access to healthcare from any geographical location and enables easier access to preventive care. Patients' access to healthcare in the comfort and privacy of home thereby slows the spread of infection from the hospital. Telemedicine services permit healthcare providers to enjoy reduced overhead expenses from office space. There is increased revenue earned by attending more patients, and remote treatment created less exposure to illness and infections.

Kowallik (2018) is of opinion that the use of smartphones in telemedicine plays a crucial role as a connecting link to a specialist physician with resulting optimal diagnosis and medical care outcome.

3.3.6 Cost of capital estimates and source of finances for approved new drugs

Regarding the cost of capital estimates for approved drugs spent by MNPCs. DiMasi et al. (2016) reveal that pharmaceutical companies (USA & Europe), and other research-intensive industries, generally finance most of the R&D projects through equity, rather than through debt, notwithstanding a situation when the cost of debt is significantly below the cost of equity. Berndt, Nass, Kleinrock and Aitken (2015)

support this opinion because servicing debts requires a stable source of cashflow, the ROI from R&D projects are skewed and highly variable, thereby distorting the possibility of uninterrupted cash flow.

DiMasi et al. (2016) describe the total cost estimates of new drug R&D as the sum of pre-human and clinical period cost estimates. The pre-human period was said to include discovery research as well as the preclinical development period.

The authors give the specific US example that the total out-of-pocket cost per approved new drug is US$1.395 billion, while the fully capitalised total cost estimate is US$2.558 billion. The time cost is the difference between capitalised cost and out-of-pocket cost, and it accounts for 45% of the total cost.

The literature analysis of the historical trends in the business of joint venture collaboration MPCs in South Africa and the rest of the world is important to our study. This information positions our study in the know-how of what has been transacting the global pharmaceutical business. The analysis reveals the latest in drug development activities and innovations, as well as the technological devices and spending thereon.

3.4 Factors influencing R&D efficiency in joint venture collaboration multinational pharmaceutical companies

Paul et al. (2010) carried out studies on drug R&D. The studies reveal that several factors may impact negatively on the R&D efficiency in joint venture collaboration MNPCs. It is observed that an inadequate number of projects in early R&D phases impacts negatively on R&D efficiency.

Scannell et al. (2012) confirm that complex technical drug research for new drug targets are followed by preclinical and clinical studies. This exercise could potentially trigger some level of impatience or diminished patience from both regulators and society. Good examples are yellow fever vaccine and HIV vaccine.

Because of diminished patience from both regulators and society, DiMasi et al. (2014) argue that the factors impose a negative impact on R&D efficiency and could

potentially create a higher burden for approval by regulatory authorities. There are negative implications on the reimbursement of NMEs when compared with existing approved drugs. There is also a negative effect of licensing, co-development or joint venture collaboration on the clinical development and approval durations.

Comanor and Scherer (2013) caution that the negative impacts on R&D efficiency may have resulted in a decrease in the number of research-based MNPCs that were prepared to take the financial risk of drug R&D activities without any collaborative effort with other partners.

3.5 Challenges facing joint venture collaboration in multinational pharmaceutical companies

MNPCs in a joint venture alliance face the same challenges as their counterparts in the fast-moving consumer goods do. This is essentially because of the similar business environment they experience.

The work of various researchers relating to these challenges is discussed below. The challenges are coordination and cooperation, alliance-design related challenges, partner selection, post-formation dynamics-related challenges, divergent mission/goals, market objective challenges, and cost leadership versus differentiation strategy decision challenges. Other challenges arising from international alliances – culture of the host partner, technological capability of the partners, social capital, as well as equity and non-equity joint venture alliance arrangements, are discussed.

According to the literature, the ability of the partner companies in the joint venture alliance to combine resources creates a strong base for the alliance to use pricing objectives to influence cost, competition, consumers and control the market to its advantage (Garrett, 2011). Sometimes, it may be possible for a joint venture alliance company to use its strength-base to manipulate policy, law, socio-media, and acquire technology to influence external challenges in the business environment to its advantage.

3.5.1 Internal challenges

3.5.1.1 Alliance design-related challenge

Gulati, Wohlgezogen and Zhelyazkov (2012) report that the joint venture alliance or collaboration design regulates the relationship arrangements that are negotiated by alliance partners at the creation of a joint venture collaboration. The components of these arrangements include the legal structure of the alliance, normally regulated by written contract. Other arrangements are equity components like alliance partner contribution and creation of joint venture collaboration partnership where each alliance partner is a stakeholder.

Gulati et al. (2012) highlight that joint venture collaboration design consists of specific contractual obligations that would relate to processes in respect of sharing and managing information. These obligations apply to managing opportunistic behaviour by an alliance partner. Opportunistic behaviour by a partner did result in the imposition of a penalty or triggered the renegotiation of the terms and conditions of joint venture collaboration engagements.

The authors emphasise that the failure by any partner to uphold the set agreement may create tenuous challenges to the alliance. The alliance partners are expected to observe other informal arrangements relating to non-contractual agreements. These include upholding and committing to promises, efficient inter-company liaisons and reasonable flexibility adjustments that may be required in future events.

3.5.1.2 The post-formation dynamics-related challenge

Despite the thoughtful selection of strategic alliance partners and design, the formation and maintenance of the alliance relationship could be relatively challenging. These challenges become apparent during the implementation of collaborative rules, especially relating to opportunistic behaviour resulting in cooperation breakdown (Gulati et al., 2012). The authors warn against the shortcomings that may arise from the set-up design of the alliance, the manoeuvring of internal developments that may cause misunderstanding. The alliance should guide against adjustments that could

change the choice of implementation and efforts to adapt alliance partners to influences of external environment.

3.5.1.3 Mission and market objectives-related challenge

Garrett (2011) argues that a change in the price of a product would cause significant changes to the performance of an organisation. Performance is normally related to product development, advertisement campaigns or product design. But pricing, mission statement and marketing objectives are part of the core decision-making in joint venture collaboration strategies to achieve an improved performance.

Garrett (2011) admits that the mission statement and marketing objectives are regarded as long term or strategic, but pricing objectives could be revisited when deemed necessary in the short term. Joint venture MNPCs are profit-seeking and must at least break even. Therefore, prices must be adjusted to achieve the profit-set.

It is noteworthy that literature (Garrett, 2011) stresses that other companies may cut prices to incur losses for a while, in anticipation to force competitors to withdraw their products from the market. This decision paves the way for long-term market dominance and price manipulation. The aim is to frustrate new entrants who are low on capital (Garrett, 2011).

3.5.1.4 Cost leadership vs differentiation strategy related challenges

Ebrahim-Khalil (2016) reveals that joint venture collaborations between pharmaceutical companies are created for profit-seeking objectives because revenues must exceed all costs.

The author explains that the joint venture alliance pharmaceutical company that adopts the cost leadership strategy employs price competition to motivate consumers to buy its products, as in the case with over-the-counter non-patent medicines. The pharmaceutical company that adopts the differentiation strategy exhibits non-price competition. This action draws the awareness of consumers to value, quality, brand and reputation of a product as found in patent medicinal products.

Roy (2019) is of opinion that the challenges confronted by a company that adopts a cost leadership strategy is not limited to showing the ability to charge s low price but to make a profit. Few cost leaders were observed to be spending less on brand promotion and R&D while much attention was placed on the achievement of high sales growth through lower price offers. This is common to with FMCGCs.

Garrett (2011) distinguishes between MNPCs and FMCGC. Unlike FMCGC, MNPCs are confronted with ethical issues when pricing life-saving products for rich markets and government institutions, where they hope to make huge profits. However, the pricing of similar life-saving products for poor markets cannot be achieved where ethical and social responsibility considerations are of importance.

3.5.2 External challenges

Maier, Moultrie and Clarkson (2012) argue that external challenges arise from strategic joint collaboration formed by high technology, such as biotechnology, MNPCs. This is because each partner experiences scarce resources expertise, and knowledge that is required to develop and market the alliance products. It is not disputed, however, that biotechnology (biotech) companies have been one of the sources of pharmaceutical products that complement the chemistry-based competencies of pharmaceutical companies.

3.5.2.1 Culture and regulations of the country of partner

The literature suggests that no relationship exists between national cultural distance and the joint venture alliance choice of governance (Pangarkar & Klein, 2001). Scillitoe et al. (2015) present a contrary opinion. The authors confirm that greater national cultural distance would result in equity alliance because the resultant formation processes create a perceived mistrust and opportunistic exploitation that may emerge from distant cultures. However, MNPCs normally develop and enjoy national cultural understanding guided by joint venture collaboration agreements.

3.5.2.2 Technological capability of the partners

Scillitoe, Gopalakrishnan and Santoro (2015) explain that there is the context of the joint venture collaboration partner accessing relevant and new knowledge through the local technological generosity of the associated biotech company. Schuhmacher et al. (2013) agree that the technological capability of the joint venture collaboration companies would enhance the R&D activities, resulting in innovation.

GSK had superior technological capability over Novartis. This enabled GSK to swap their oncology, consumer health and vaccine specialty with Novartis. Therefore, GSK increased its focus and became the leader in consumer health and vaccines business (Gautam and Pan, 2016).

3.5.2.3 Implementation of open innovation in MNPCs

Mortara, and Minshall (2011) present explanations on how MNPCs implement open innovation. The researchers argue that MNPCs adopt the open innovation model in different ways according to (1) the innovation requirements, (2) the timing of the implementation, and (3) the organisational culture. Apart from the different methods of adoption, the researchers report that MNPCs employ four approaches to the adoption of open innovation: ad hoc practice, precursor open innovation adopters, open innovation conscious adopters and open innovation communities of practice.

Urbinati, Manzini, Piacentini and Carretti (2021) find that, to pursue radical innovation, pharmaceutical companies implement three different forms of collaboration: equity collaboration, acquisition collaboration and joint venture collaboration. The authors further reveal that the decision-making processes of MNPCs and how a set of both rational and soft factors, like technical, cultural, geographical, dimensional, and human factors, are manipulated in implementing open innovation for radical innovation.

3.5.2.4 Innovation requirement and turbulence of business environment

Mortara and Minshall (2011) confirm that innovation requirements would dictate whether MNPCs require ambidexterity (pursuing both evolutionary and revolutionary

change at the same time). Otherwise MNPCs focus on both inbound and outbound open innovation activities. However, an MNPC may require only to support its current innovation pipelines and then focus on inbound open innovation activities. Sometimes, MNPCs implement activities to support both needs in different moments.

The authors reveal that MNPCs with less disturbed business environments would most likely focus primarily on inbound open innovation activities, while MNPCs experiencing environmental uncertainty may focus on the development of both inbound and outbound open innovation activities.

3.5.2.5 Timing of the implementation and popularity of the open innovation

There is a distinction between MNPCs that adopted open innovation because of the popularity of the model at the time, where coordinated and centralised efforts were made to established open innovation. However, MNPCs that had established the open innovation model before its popularity decentralised the open innovation activities.

It is reported (Gassmann, Enkel and Chesbrough 2010) that the popular adoption of open innovation among MNPCs encouraged companies to direct the open innovation implementation teams to support the change to open innovation.

3.5.2.6 Organisational cultural influences

Mortara and Minshall (2011) reveal that MNPCs with a strong tradition of closed innovation would concentrate on inbound open innovation activities only, despite the need for ambidexterity. MNPCs with traditional ‘extrovert’ organisational culture mostly implemented both inbound open innovation and outbound open innovation activities.

The authors observe that during technological disruptions MNPCs continue to focus on inbound open innovation activities, despite being constrained by the inherent organisational culture.

3.5.2.7 Equity and non-equity joint venture alliance arrangement

Scillitoe et al. (2015) argue that equity and non-equity joint venture collaboration

agreements render positive and negative influences on the partners. This is because equity collaboration permits a greater financial investment, which ensures strategic control of the operational processes of the pharmaceutical company.

The authors contend that non-equity joint venture collaboration permits the biotech company to retain greater control over its technology in respect of the accompanied profit flow. The greater focus on technology by the biotech firm creates lesser gains from commercial activities. The effects of these activities are the minimised partner cost and alliance-specific investments, which may result in termination of the joint venture collaboration agreement.

Schillitoe et al. (2015) emphasises the importance of strategic joint venture collaboration agreements between MNPCs and biotech companies. These include the creating an opportunity to boost the R&D pipeline. The opportunity complements the existing resources, skills, knowledge, and capability in manufacturing, regulatory, standard of care, distribution, and marketing forces. The partners acquire benefits from commercialising the technological expertise learnt from biotech.

3.5.2.8 High-cost investment in R&D

Khanna (2012) expresses disappointment at the practice by global MNPCs to embark on huge investments, but achieving diminished productivity. This occurs irrespective of the size of the company or R&D budget. Therefore, most MNPCs are confronted with scrutiny and challenges arising from low productivity, increasing R&D costs, reducing proprietary products and shrinking drug pipelines.

Mullard (2011) argues that despite the advancement in technological know-how and the high cost of investment in R&D, a lower number of applications for NMEs are successfully approved by the US FDA each year. Khanna (2012) supports the argument, but reveals that the low success rate in the approval of NMEs by the FDA is compounded by the increase in the cost of drug development.

Khanna (2012) claims that low success rates in drug innovation and the costs of failed drug projects are responsible for the high cost of investment in R&D. The author

observes the use of new technologies to reduce timelines and to increase success rates in drug discovery. The adoption of recombinant chemistry, deoxyribonucleic acid (DNA) sequencing, high-throughput screening (HTS) or computational drug design, larger clinical trial sizes and better clinical infrastructure, are largely responsible for increased costs of drug R&D.

3.5.2.9 Loss of patent assets and diminishing drug pipeline

Khanna (2012) states that MNPCs are challenged by starving and diminishing the drug pipeline in response to expiring patented medicines, and the failure to replace these with new or innovative medicines generally results in loss of patent assets (Khanna, 2012).

The author asserts that the loss of revenue from expired patented medicines are seen to be shifting the MNPCs from thriving to surviving establishment. The assertion is supported by reports that most countries' drug regulatory agencies, especially the FDA in the USA, require an extended clinical trial in cardiovascular and diabetics drugs. These regulatory agencies impose stringent guidelines on the registration of medicines in these categories, thereby threatening the sustainability of companies that invest heavily in these lines of medicines.

3.5.2.10 Globalisation leading to shifting research

As a result of the shift in business model from West to East revealed by Gautam and Pan (2016) in section 3.2.1.4 above, most joint venture collaborations between MNPCs and CROs established research centres in China, India and Singapore.

Khanna (2012) confirms that CEEDD is an example of CROs sponsored by GSK. The CEEDD is tasked with promoting drug discovery through external risk innovation reward-shared collaboration. Most MNPCs are able to secure optimum value from the available R&D budget vote. The author explains the mechanism of obtaining optimal value from the R&D budget vote and the benefits of the virtual company model. The mechanism involves the creation of a virtual company model, known to be an efficient and cost-effective research collaboration model.

The benefits of the virtual company model are important to the performance of the joint venture collaboration. The collaboration core team creates strategic objectives for the company and selects preferred CROs to authenticate and progress the research projects towards realisation of set objective. The virtual company model reduces the cost of infrastructure and provides quick and easy access to global technologies; decision-making processes are fast and flexible priorities are granted to research. An example of a virtual company is Chorous, an independent virtual company established by Eli Lily to generate rapid, cost-effective clinical PoC for internal and licensed drug molecules.

3.6 Lesson from the literature

This chapter highlights the trends and progression in the global pharmaceutical business activities of different MNPCs over the past 24 years and, specifically, the identified MNPCs for this study. However, GSK, Novartis, Sanofi, Eli Lilly and Pfizer are recorded to have achieved growth in revenues over the period studied (Gautam & Pan 2016).

When a challenge presents itself, there should be a subsequent reaction to the challenge, which MNPCs demonstrate by adopting specific business models that best suit environmental dictates. According to Gautam and Pan (2016), the previous business model of these MNPCs has shifted to a lean, focused pharmaceutical company with an emphasis on R&D within key innovation bio-clusters and growing revenue from sources such as specialty products, biologics and various emerging pharmaceutical markets.

Other business models adopted are the move from research hubs to bioscience hotspots business model; the primary to specialty business model; and the West to East pharma market entry business model.

However, entry into the emerging pharmaceutical markets by MNPCs is effective to enhance revenue growth and performance, as seen in China, which is the second-largest pharmaceutical market in the world. The huge Chinese market size was supported by government and private capital, growing the talent pool of Western-

trained researchers and homegrown professional researchers, coupled with the evolving life science ecosystem (Gautam, 2015).

Because GSK and Pfizer experienced significant revenue growth and performance from the emerging market as a proportion of global revenue, the strong financial performance enabled these MNPCs to counteract the effect of patent expiry of products in the USA, Canada and Europe during the period under review (Gautam & Pan, 2016).

We learn from this chapter that the joint venture collaboration MNPCs realised progressive performance in their pharmaceutical business through R&D and innovation in dispensing and administration of treatment and medicine to patients. These innovations were the advent of biotech-method developed drugs over traditional-method developed drug. The process included intense spending on pharmaceutical R&D and approval of NMEs, the development and administration of personalised cell and gene therapies, the adoption of automation and data analytics, the design and use of telemedicine (testing and diagnostic devices). The progress recorded by MNPCs is also conditioned on generating the cost of capital estimates and sourcing the finances for the approved new drug.

The internal and external challenges that confront joint venture collaboration arrangements by MNPCs in the pursuit of greater performance has also been discussed. We have learnt of the challenges resulting from coordination and cooperation between the alliance, alliance design and structure, partner selection, post-alliance formation changes, joint agreement on the mission and marketing goals, and the decision relating to the adoption of cost leadership and differentiated strategies summarised from internal challenges. Nevertheless, the culture of the host partner, the technological capability of the partners, social capital, as well as the equity and non-equity joint venture alliance arrangements are external challenges.

Finally, the review of previous studies carried out on strategic joint venture alliances by various researchers on global trends in MNPCs has been narrowed to MNPCs in South Africa. The observations reveal that the strategic business alliance approaches

include joint venture collaboration arrangements, business principles applied to overcome various challenges facing the strategic alliance partners and how these business alliance approaches influence the profitability ratios and performance of the MNPCs.

The extant literature does not reveal the influence of strategic joint venture collaboration on the performance of MNPCs with ROA, ROE and ROI employed as a measure of performance. This is a strong motivation for this study, because it fills the identified gap in documented literature.

3.7 Summary of the chapter

Chapter Three of this study reviewed the previous literature in respect of the trends in the activities and the dynamics of global MNPCs, with a focus on South Africa. The historical trends of selected MNPCs, including GSK, Novartis, Sanofi, Eli Lilly and Pfizer, over 20 years (1995–2015), were reviewed for their performance in respect of growth in revenue, especially in the face of prevailing challenges (Gautam & Pan, 2016).

The chapter explored various business models employed by different MNPCs to overcome these challenges. This involved shifting from massive capital injection and aggressive expansion, through to a lean and focused business model; from research hubs to a bioscience hotspots business model; from primary to specialty business model; and from West to East pharma market entry business model. The MNPCs were observed with an emphasis on R&D within key innovation bio-clusters and growing revenue from sources such as specialty products, biologics and various emerging pharmaceutical markets.

Joint venture collaboration agreements in MNPCs were said to face the same challenges as FMCGCs, because they experience similar business environments. These challenges were grouped as internal, comprising of coordination and cooperation between the alliance partners, alliance-design related challenges. Others were selection of partners, dynamics arising from post-formation of the alliance,

agreement of the mission and market objectives of the alliance, as well as decisions to adopt cost leadership versus differentiation strategy on products.

Also reviewed were the external challenges that arose from international alliances in respect of the culture of the host partner, the technological capability of the partners, social capital influence, as well as equity and non-equity joint venture collaboration arrangements.

A combination of resources by joint venture collaboration partners often creates a strong base for the alliance to use pricing objectives to influence cost, competition, consumers, and control of the market to its advantage. Sometimes, it is also possible for joint venture alliance companies to use their strength-base to manipulate policy, law, socio-media, and acquire technology to influence external challenges in the business environment to its advantage.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

Previous chapters have explained the theoretical framework upon which the study is based, as contained in Chapter Two, and with embedded reference to the pharmaceutical industry in Chapter Three. Chapter Four explains the research design and quantitative methodology adopted by the study, as previously referred to in Chapter One. It also discusses data collection through secondary data sources from related archives, as well as the approach employed for data analysis.

Salkind (2012) defines research design as the approach and framework of an investigation employed by the researcher to carry out both the collection and analysis of data collected. Creswell (2014) states that to achieve reliable and valid research outcomes, the study requires a planned investigation within methodological choices (qualitative, quantitative, or mixed) adopted to provide clear and specific direction for the procedures undertaken during the implementation of the research plan.

The quantitative research methodology adopted in the study involves the collection of secondary data, followed by an analysis of the dataset collected. Saunders et al. (2016) emphasise that quantitative methodology is a deductive approach involving the testing of a theoretical proposition by employing a research strategy that is specifically designed for the investigative purpose. This opinion informed the basis upon which a quantitative methodology was chosen for this research study, because the objective of the quantitative approach is to develop and use mathematical models, theories and hypotheses about the phenomenon. The phenomenon here is the influence of joint venture collaboration on the performance of MNPCs in South Africa.

Creswell (2014) supports our chosen methodology by proposing that the quantitative methodology is a means for testing objective theories by examining the relationship between variables of interest. The quantitative methodology is suitable for this study

because the study is confirmatory in nature. There is available secondary data to be measured, there is no ambiguity about the data to be measured.

Leedy and Ormrod (2016) confirm that a quantitative methodology allows deductive reasoning, which can be followed by drawing logical conclusions from the variables under investigation. The collected dataset is subjected to specific statistical analyses, referred to as the empirical technique.

The first phase of an empirical technique is to diagnose the intricacies and characteristics of the dataset by subjecting the dataset to time series analysis, which includes descriptive statistics, scatter diagrams, cross-correlation analysis and unit root tests. The second phase involves estimating the data as determined by how the characteristics of the dataset influence the objectives of the study, while the cointegration relationship between the variables helps to ascertain the kind of relationship that exists among the variables in all three models of measurement – the ROA, ROE and ROI models. The third phase involves the establishment of long-run equilibrium relationships and the short-run error correction model, speed of adjustment, and short-run dynamics.

4.2 Research framework

Annual data from 2010 to 2019 is used in this study. Table 4.1 details the variables, the sources, and how they are defined. There are three strategic motives behind companies entering into joint venture collaboration, namely knowledge-seeking, efficiency-seeking or market-seeking motives.

Knowledge-seeking strategic motives are measured by the firm-level expenditure on R&D. This is consistent with economic theory of learning by doing. Schuhmacher et al. (2016) state that the increase in cumulative R&D expenditure in the pharmaceutical sector reveals the importance of R&D to the whole industry.

Larimo & Nguyen (2015) reveal that R&D improves innovation, which could assist firms to achieve cost leadership and, barring unexpected developments, improve profitability.

Parameswar and Dhir (2016) was previously quoted to have stated that joint venture collaboration partner interdependence influences opportunism and trust, partner control, and performance. Consequently, partner interdependence becomes strengthened through inter-partner learning, internalisation of partner skills, and transfer of technology. Zamir et al. (2014) agree with the concept that R&D and innovation often result in the emergence of new drug patents that give joint venture collaborations significant competitive advantage over rival firms within the industry.

Efficiency-seeking motives are seen to be related to technological breakthrough and technological transfer acquired through the formation of joint venture collaborations. These activities lead to higher levels of efficiency, lower costs and higher levels of productivity (Williams & Vonortas, 2015). Efficiency-seeking motives are represented by the level of capex into digital and operational infrastructure, which enhances the efficiency and performance of the MNPCs (Larimo & Nguyen, 2015).

Amuasi (2009) believes that technology transfer was acquired through the formation of a joint venture collaboration between Eli Lilly and Aspen Pharmacare. The outcome of such strategic collaboration assisted in the manufacture of Capreomycin and Cycloserine for the treatment of MDR TB for the South African and regional markets.

Market-seeking motives of joint venture collaborations are driving forces meant to secure market access into areas previously unreachable, thereby expanding market access and growing market share (Kabajeh et al., 2012). Market share is assumed to be represented by the level of revenue generated by each firm.

The aim of these three strategic motives of joint ventures collaboration is to improve company-level performance as contained in their annual accounting books of record. This work looks into these strategic motives of joint venture collaboration on the performance of the MNPCs, using ROA, ROE and ROI as measures.

Table 4.1: Sources and definition of variables

Symbol	*Variable Name*	*Source of Data*	*Definition*
Jv	Joint ventures	Annual Reports	Ownership interest holding (%)
RD	R&D	Financial Statement	Research and development expenditure in $millions
Capex	Technology/Efficiency	Financial Statement	Capital expenditure in US$ millions
Mktshare	Market Share	Annual Reports	Firms' percentage market share
ROA	Return on Assets	Annual Reports	Profit relative to assets
ROE	Return on Equity	Annual Reports	Net income relative to shareholder's equity
ROI	Return on Investment	Annual Reports	Profit relative to the cost of investment

4.3 Independent variables

It is important to explain the variables as used in this study, in respect to definitions and sources of the data. There are independent and dependent variables.

Davis (2021) explains that, in research design, independent variables are the phenomena that can be manipulated by the researcher. The dependent variables therefore respond to the effect of the independent variables. As a result, the researcher has the opportunity to manipulate the value of independent variables in order to measure the response produced in the dependent variables.

The independent variables in this study are joint venture (JV), revenue (market share), research and development (R&D) and capital expenditure (capex). This study measures the response of dependent variables (ROA, ROE and ROI) to predict how

the performance of the MNPCs under study and the local South African firms are affected by joint ventures or the absence thereof respectively.

4.3.1 Joint venture

Zamir et al. (2014) hold the view that joint venture collaboration arrangement is measured by the percentage ownership interest holding by the joint venture partners. According to Meier et al. (2016), joint venture between companies have become a means of collaboration towards the formation of interdependence between alliance partner companies. Joint venture collaboration is a significantly important business practice, which often assists MNPCs to reduce the level of pressure placed upon them. The quest to maintain growth through increased revenue, market share and competitive advantage cannot be overlooked, despite satisfying the quest for equitable and cost-effective pharmaceutical products (David, 2010).

Table 4.2: Joint venture MNPCs (ownership interest holding, in percent)

2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
						19.8	80.2
50.0			63.5	55.0		68.0	
			36.5				
13.5						32.0	
				50.0			

Table 4.2 shows the joint venture contribution (percentage ownership interest holding) in the alliance by the MNPCs under observation. The dataset covers a period of 10 years (2010–19). It is important to note that the companies only reported years in which there are changes in their percentage interest holdings in the alliance. For example, Eli Lilly has a 4.5% shareholding from 2010 to 2017, 19.8% shareholding in 2018 and 80.2% shareholding in 2019. The values of the percentage interest holding in the alliance were extracted from the audited annual report of each MNPC.

4.3.2 Research and development and human capital development (knowledge-seeking)

The R&D expenditure and activities are used as a proxy for knowledge-seeking motive of MNPCs in this study. Kenton and James (2020) describe R&D activities of MNPCs to include strategies adopted to innovate and introduce new products into the market in a way that improves the performance of the company.

Drug R&D expenditure denotes the amount the MNPCs spent to achieve learning- or knowledge-seeking motives. The knowledge-seeking strategic motives could be translated into and measured by firm-level expenditure on R&D. Larimo & Nguyen (2015) suggest that research that improved innovation should assist firms to achieve cost leadership, barring unexpected developments, and improve profitability.

Haskell et al. (2015) support the concept of organisational learning theory in view of the fundamentals of joint venture collaboration between MNPCs. These fundamentals explain how resources and competencies are used to increase competitive advantage and company performance.

Because of the insufficient data on R&D expenditure on the part of the local non-joint venture pharmaceutical companies under investigation (Clicks and Life Healthcare), and as explained in section 1.7 above, the researcher has to seek the closest proximity to R&D outcomes. Human capital development (HCD) expenditure performance outcome is considered close enough to the performance outcome achieved with R&D. HCD enhances the human capacity in pharmaceutical firms in innovation and ground-breaking discoveries in pharmaceutical manufacturing. On that basis, it represents the closest variable that could be used and is adopted as a proxy to explain knowledge-seeking objective.

Qamruzzaman et al. (2020) argue that HCD is selected to be one of factors that foster economic growth through innovation and subsequent adaption in technology. The effect reduces the inequality and enhances labour productivity. This is because the existence of human capital in the economic structure boosts economic growth and company performance. Knowledgeable and skilled employees enhance productivity

and dynamisms in economic activities, leading to improved and sustained company performance.

Nickolas et al. (2021) argue that a knowledgeable and skilled workforce acquires great potential to improve productivity, thereby creating economic growth and improving company performance. The position of the authors cited above supports the adoption of HCD in parallel to R&D in this study.

Table 4.3a: Research & development expenditure in joint venture pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	4884.2	5020.8	5278.1	5531.3	4733.6	4796.4	5243.9	5281.8	5051.2	5595.0
GSK	4457.0	4009.0	3979.0	3923.0	3450.0	3560.0	3628.0	4476.0	3893.0	4568.0
Norvatis	9070.0	9583.0	9332.0	9071.0	9086.0	8935.0	9039.0	8972.0	8489.0	9402.0
Pfizer	9413.0	9074.0	7870.0	6678.0	8393.0	7690.0	7872.0	7683.0	8006.0	8650.0
Sanofi	4547.0	4811.0	4922.0	4605.0	4667.0	5082.0	5172.0	5472.0	5894.0	6018.0

Table 4.3a shows the value of R&D expenditure between 2010 and 2019 for the selected MNPCs under study. The value is denoted in millions of respective currencies. The value of R&D expenditure is extracted from the consolidated annual financial statement reported by each MNPC (see Annexure B).

Table 4.4b: Human capital development expenditure of non-joint venture pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	3,448.50	3,678.06	3,782.57	3,940.21	3,905.42	3,735.32	3,847.45	3,836.42	4,050.17	4,416.16
Ascendis					1,726.66	2,799.08	3,988.58	11,360.56	12,762.54	2,738.77
Clicks	1,438.05	1,230.01	1,635.50	1,629.14	1,853.43	2,321.31	2,857.78	3,702.60	4,875.41	5,304.70
Life Health	6,081.61	6,468.33	7,323.00	7,757.00	8,809.00	12,321.00	12,909.00	25,542.00	30,966.00	29,123.00

Table 4.3b shows the value of HCD expenditure between 2010 and 2019 for the non-joint venture local pharmaceutical companies under investigation. The value is denoted in millions of ZAR. The value of HCD expenditure is extracted from the consolidated annual financial statement reported by each MNPCs (see Annexure B).

4.3.3 Capital expenditure (efficiency-seeking)

The expenses on technological equipment and technology transfer are adopted as a proxy for efficiency-seeking motive of MNPCs in this study. According to CFI (2020), capital expenditures (capex) are the expense of the financial resources of a company, especially a MNPC for the procurement of assets, for improvement and for maintenance of long-term assets.

Capex is derived from fixed assets less depreciation and are assets necessary to increase the efficiency and performance of the pharmaceutical company. The long-term assets include technological equipment, properties, intangible assets, patent, licence and infrastructure that are usually non-consumable, physical and fixed assets.

$$Cpx = Fxa - dpr$$

Where Cpx = capital expenditure

Fxa = fixed asset

dpr = depreciation (straight-line).

Table 4.4a: Capital expenditure of joint venture multinational pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	436.6	672.0	905.4	1,012.1	1,162.6	1,066.2	1,037.0	8,826.5	7,996.1	7,872.9
Gsk	7,592.0	8,748.0	8,776.0	8,872.0	9,052.0	9,668.0	10,808.0	10,860.0	11,058.0	10,348.0
Novartis	14,488.0	15,627.0	16,939.0	18,197.0	15,983.0	15,982.0	15,641.0	16,464.0	15,696.0	12,069.0
Pfizer	14,778.0	15,921.0	14,461.0	12,397.0	11,762.0	13,766.0	13,318.0	13,865.0	13,385.0	13,967.0
Sanofi	9,398.0	10.750.0	10,578.0	10,182.0	10,396.0	9,943.0	10,019.0	9,579.0	9,651.0	9,717.0

Table 4.4b: Capital expenditure of non-joint venture pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	755.88	1,066.88	1,460.85	1,614.65	1,447.08	1,355.09	1,285.77	1,304.70	1,362.86	1,385.13
Ascendis					76.44	126.11	335.08	897.39	1,008.58	434.16
Clicks	768.5	806.7	843.3	866.6	933.2	1,003.1	1,107.2	1,274.2	1,554.1	1,723.6
Life Health	2994	3,753.0	4,010.0	4,517.0	5,901.0	7,101.0	7,752.0	11,131.0	12,243.0	12,969.0

Table 4.4a and 4.4b shows the values of capex between 2010 and 2019 for joint venture and non-joint venture pharmaceutical companies under study. The amount value is denoted in millions of respective currencies. Capex is calculated from the consolidated annual financial statements reported by each pharmaceutical companies (see Annexure B).

4.3.4 Revenue (market-seeking)

The revenue generated by the joint venture MNPCs and the local non-joint venture pharmaceutical companies at the end of the financial year is employed and the proxy for the market share achieved by the study sample. Hayes and Anderson (2020) describe market share as the percentage of revenue generated by a particular company, and it is calculated by taking the revenue of the company over a period and dividing it by the total sales of the industry over the same period. This metric is used to give a general idea of the size of a company concerning its market and its competitors. The market leader in an industry is the company with the largest market share. This study elected the use of revenue generated by the pharmaceutical companies, because market share is directly proportional to the revenue generated from the market.

Table 4.5a: Revenue of joint venture multinational pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	23,076.0	24,286.5	22,603.4	23,113.1	19,615.6	19,958.7	21,222.1	22,871.3	21,493.3	22,319.5
Gsk	28,392.0	27,387.0	26,431.0	26,505.0	23,006.0	23,923.0	27,889.0	30,186.0	30,821.0	33,754.0
Novartis	50,624.0	59,375.0	57,561.0	52,716.0	52,419.0	49,44	49,436	50,135.0	46,099.0	48,677.0
Pfizer	67,809.0	65,259.0	58,986.0	51,584.0	49,604.0	48,851.0	52,824.0	52,546.0	53,647.0	51,750.0
Sanofi	32,367.0	35,058.0	35,957.0	31,391.0	31,999.0	34,861.0	34,696.0	36,221.0	35,677.0	37,631.0

Table 4.5b: Revenue of non-joint venture pharmaceutical companies (million)

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	4,440.65	4,453.56	4,559.24	5,445.63	3,615.28	5,528.36	5,949.50	5,936.05	6,540.25	7,164.69
Ascendis					1,617.94	2,816.71	3,918.43	6,435.02	7,954.98	8,055.76
Clicks	13,276.27	14,102.9	15,436.94	17,543.30	19,149.52	22,070.092	24,170.87	26,809.10	29,239.68	31,352.10
Life Healt	8,336.15	9,812.0	10,937.0	11,834.0	13,046.0	14,647.0	16,567.0	20,967.0	23,488.0	25,672.0

Table 4.5a and 4.5b shows the revenue generated from the market between 2010 and 2019 for joint venture MNPCs and non-joint venture companies selected to be investigated. The amount value is denoted in millions of respective currencies. Revenue generated from the market is extracted from the consolidated annual financial statements reported by each MNPCs and non-joint venture local companies. (see Annexure B).

4.4 Dependent variables

Dependent variables are the variables that are measured or tested in the research study (Davis, 2021). The performance of pharmaceutical companies selected in this study is measured from the dependent variables ROA, ROI and ROE. The study by Kabajeh et al. (2012) and Saleem & Rehman (2011) indicate that ROA, ROE and ROI play an important role in the measurement of the performance of MNPCs. However, Parung and Bititci (2006) express the view that the major motives for joint venture collaboration are often overshadowed by the drive and urgency to achieve strategic goals of the alliance partners.

4.4.1 Return on assets

Hargrave & James (2020) refer to ROA to indicate the profitability of pharmaceutical companies relative to the total assets. It presents an outlook as to how efficient the management of the pharmaceutical company is in managing the assets to generate and retain earnings, which are expressed in percentage (%). In other words, ROA is a useful indicator that is employed to measure the performance (efficiency) of pharmaceutical companies.

Table 4.6a: Return on assets of joint venture multinational pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	17.7	13.0	11.9	13.3	6.4	6.8	7.1	-0.5	7.4	21.2
Gsk	4.4	13.3	11.4	13.4	7.0	15.7	1.8	3.8	7.0	6.7
Novartis	8.1	7.9	7.7	7.4	8.2	13.5	5.1	5.8	8.7	9.9
Pfizer	4.2	5.3	7.8	12.8	5.4	4.2	4.2	12.4	7.0	9.7
Sanofi	6.7	5.9	5.1	4.0	4.6	4.3	4.6	8.6	4.0	2.5

Table 4.6b: Return on assets of non-joint venture pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	13.5	17.8	15.6	11.0	26.6	3.6	6.4	8.8	9.8	9.7
Ascendis					5.4	5.7	3.3	2.6	3.1	41.9
Clicks	13.7	15.3	14.4	13.8	14.0	12.6	13.1	13.1	12.8	13.0
Life Healthcare	10.6	17.6	18.8	20.1	26.2	14.0	11.3	3.1	4.9	7.6

Table 4.6a and 4.6b shows the values of ROA in percentage for joint venture MNPCs and non-joint venture local pharmaceutical companies. These values are calculated from the consolidated annual financial statements reported by the companies under investigation for the period of 2010–19.

Klecka and Camska (2015) reveal that ROA, ROE and ROI can be measured objectively based on the data derived from financial statements and subjectively using

scales, because data may be influenced by the employed accounting standards such as IFRS.

ROA as a financial ratio measures the operating efficiency of a MNPC in respect of its ability to generate profits from its total assets. ROA is calculated as profit after tax, divided by total assets and expressed as a percentage (Kabajeh et al., 2012; CFI, 2020).

$$roa = \left[\frac{pat}{ta}\right].100$$

Where, roa = return on asset

pat = profit after tax (net income)

ta = total assets

4.4.2 Return on equity

The ROE measures the financial efficiency of a MNPC through how much profits and growth it has generated from shareholder equity (Anthony & Kenneth, 2011; Daryanto & Daryanto, 2019). A resultant lesser value of ROE in a company financial report indicates that the company is funding its assets inefficiently, or it has low net value for investors (Daryanto & Daryanto, 2019).

Table 4.7a: Return on equity of joint venture multinational pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	46.1	32.1	27.7	26.6	15.5	16.6	19.4	-1.7	29.6	308.2
Gsk	19.0	61.8	70.3	72.0	57.4	94.3	21.4	62.2	110.2	29.2
Novartis	14.3	14.0	13.9	12.5	14.5	23.1	8.9	10.4	16.0	21.1
Pfizer	9.4	12.1	17.8	28.7	12.8	10.7	12.1	29.7	17.5	25.6
Sanofi	10.7	10.5	8.9	6.8	8.0	7.5	8.3	14.7	7.5	4.8

Table 4.7b: Return on equity of non-joint venture pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	20.9	24.6	20.2	15.9	33.7	6.4	11.6	14.9	16.4	16.2
Ascendis					11.5	11.5	7.7	7.1	7.3	223.2
Clicks	49.9	67.4	51.0	54.6	55.2	47.4	44.6	38.7	33.3	34.7
Life Healthcare	23.7	34.1	35.7	35.7	52.5	34.6	29.0	7.2	11.8	16.4

Table 4.7a and 4.7b presents the values of ROE expressed in percentage for joint venture MNPCs and non-joint venture local pharmaceutical companies respectively. These values were calculated from the consolidated annual financial statements as reported by the companies under investigation for the period of 2010–19.

ROE is a financial ratio employed to measure the shareholder's rate of return on their investment in the MNPC. The value Is calculated from net profit after tax divided by the total shareholder equity and expressed as a percentage (Kabajeh et al., 2012; CFI, 2020). ROE reveals how much profit a pharmaceutical company generates through shareholders' financial investment.

$$roe = \left[\frac{pat}{te}\right].100$$

Where, roe = return on asset

pat = profit after tax (net income)

te = total equity.

4.4.3 Return on investment

CFI (2021) describe ROI as a performance measure usually employed to evaluate the ROI or used to compare the relative efficiency of different investments. The ROI determines the return relative to the cost of investment. The ROI ratio measures the company's efficient utilisation of the invested capital, otherwise, it is the expression of

the company's ability to generate the required return, based on using and managing the invested resources by the shareholders.

Table 4.8a: Return on investment of joint venture multinational pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Eli Lilly	25.4	58.8	36.2	17.2	-66.9	-25.3	30.0	8.3	-183.1	-2.2
Gsk	1.2	55.8	15.8	10.4	-4.9	0.5	-25.2	-13.4	29.3	27.6
Novartis	4.2	1.2	2.5	4.2	-9.4	44.9	-7.0	6.9	-84.0	3.4
Pfizer	0.0	-12.9	-4.3	26.2	7.8	-66.8	-28.8	18.2	-5.4	-107.6
Sanofi	0.2	14.5	-65.7	-8.7	81.2	10.9	7.5	-1.6	16.3	5.3

Table 4.8b: Return on investment of non-joint venture pharmaceutical companies

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Adcock	0.0	0.0	37.1	-113.0	-93.9	39.0	-16.2	-53.5	-37.8	-12.3
Ascendis					0.0	0.0	100.0	95.2	66.7	53.1
Clicks	0.0	0.0	54.1	-3.2	65.6	-18.5	35.4	11.8	55.7	-11.3
Life Healthcare	0.0	0.0	100	6.8	-42.3	64.2	9.3	14.4	-8402.8	34.0

Table 4.8a and 4.8b depicts the values of ROI expressed in percentage for joint venture MNPCs and non-joint venture local pharmaceutical companies. These values are calculated from the consolidated annual financial statements as reported by the companies under investigation for the period of 2010–19.

The ROI is a profitability ratio that calculates the profits of an investment as a percentage of the investment, and the higher the ratio, the greater the benefit earned (Daryanto & Daryanto, 2019; CFI, 2020).

The ROI is calculated and measured as net investment divided by the original capital cost of the investment.

$$roi = [CoI - CoI\text{^}/CoI].100$$

Where roi = return on investment

CoI^ = previous cost of investment

CoI = current cost of investment

4.5 Problem statement of the study

According to Considine et al. (2017), the purpose of a research study is to discover new knowledge, and good research starts with a clear, answerable question that addresses an important and significant problem or phenomenon of interest. Therefore, a research question or problem statement provides a sound basis upon which the objectives and hypothesis of the research are formulated.

Most of the studies discussed during the literature review contained in Chapters Two and Three are directed towards investigation of the role of organisation suitability as determinants of the successful collaborative alliance formation. This is particularly so of companies in the form of joint ventures. Even though these studies focus on the administrative formation of joint venture collaboration arrangement, less attention is placed on the ultimate performance of the partners in the joint venture collaborative MNPCs.

Given that companies enter strategic alliances to achieve corporate objectives (especially in the form of bottom-line aspirations) (Lin & Ho, 2013), the relevance of this study is unambiguous and conspicuous. The research problem statement that arose from this study is to determine how the joint venture collaboration will influence the performance of the MNPCs trading in South Africa.

4.6 Data collection

The audited consolidated annual financial statements of selected MNPCs were retrieved from the audited annual reports. The consolidated financial statements for local non-joint venture pharmaceutical companies were extracted from the McGregor

BFA (IRESS) database. The data was collected from 2010 to 2019 (a period of 10 years).

The sampled population in this study consists of consolidated annual financial statements of nine pharmaceutical companies operating in South Africa. Four local South African companies were Adcock Ingram, Ascendis Health, Clicks and Life Healthcare. Five MNPCs in the sampled population were Eli Lilly, GlaxoSmithKline, Novartis, Pfizer and Sanofi.

The research population defines the total number of research subjects that conform to research specifications and exhibited the specified criteria (Creswell & Creswell, 2018). The data sample size in this study was 90. Budiu and Moran (2021) suggest that the exact number of participants employed for quantitative research may differ. The authors recommended a sample size of 40 for quantitative studies, because too few a sample population often makes the resultd of the study not statistically reliable, and too much a sample population may be a waste of resources.

However, five selected joint venture alliance MNPCs must meet the following criteria: they may be listed in their foreign headquarters countries but must have operating offices in South Africa. They must be in a joint venture with other MNPCs and/or with one another, and it must be a player in the global pharmaceutical market to meet the criterion of a MNPC. The required dataset for both independent and dependent variables are derived from the annual report of selected MNPCs under study as indicated in the preceding paragraph, covering a period of 10 years (2010–19).

The four local non-joint venture alliance pharmaceutical companies were employed as a control group.[4] Adcock Ingram, Clicks, Life Healthcare and Ascendis Health[5] are South African companies. The dataset was obtained from the financial statements

[4] South African based non-joint venture alliance pharmaceutical companies.

[5] JSE listed pharmaceutical companies.

extracted from McGregor BFA (IRESS) software. The dataset from the local non-joint venture collaborative companies were to be used as a benchmark to compare the performance relative to South African pharmaceutical market. All the selected pharmaceutical companies subscribe to the International Financial Reporting Standards (IFRS) requirements for financial reporting issued by the IASB.

Disaggregates financial statement for the business operation in South Africa should be used because the context of the study is South Africa. Regrettably, due to data limitations, consolidated annual financial statements were available for all the sampled MNPCs. According to the annual report of the affected MNPCs, the annual financial statements of the business operation were reported to include the subsidiaries as a group (Eli Lilly, 2019).

Sanofi (2020) reports its accounts for its subsidiaries using the full consolidation method, which is based on requirements for the criteria for control as specified in IFRS 10 (Consolidated Financial Statements).

4.6.1 Ethical considerations

Ethical clearance for the study was sought and approved be the Unisa Research Ethics Review Committee (URERC) prior to the commencement of the study. The application to carry out the study was sent to the URERC, the requirements listed therein were met and approval to conduct the study was granted. There was no direct human participant involvement nor a combination of direct human participant involvement and the collection of secondary information.

The study employed secondary data that were already in the public domain.[6] The process and tools used to obtain the dataset did not require consent nor infringe on

[6] Annual reports, website, IRESS database, press release etc.

the privacy of the subjects. The process of collection of data was carried out as explained in section 4.6 above.

The privacy and the confidentiality of records pertaining to the research was secured, the information obtained in course of the research was not used in a manner that is detrimental to individuals or institutions. The research data was securely stored in accordance with the data management measures indicated in the application submitted to the URERC.[7]

4.7 Empirical framework

The empirical research framework is defined by the observed and measured phenomena and derived knowledge from the experience obtained during the research study, rather than knowledge from theory or belief (ENMU, 2021). As indicated earlier, the objective of this study is to establish the long-run and short-run influence of joint venture collaboration on performance in five selected pharmaceutical companies in South Africa that have engaged in joint venture agreements during the period under consideration.

In this study, the focus was on panel data cointegration methodologies. The empirical approach used in this study entailed three key statistical phases.

The first phase was to diagnose the intricacies and characteristics of the dataset. The time-series characteristics were analysed through descriptive statistics, scatter diagrams, cross-correlation analysis and unit root tests. The purpose of the time-series characteristics of the dataset was to determine the type of model that should be used to specify the data and to create knowledge about the empirical methodology that should be used to estimate the data.

[7] Copy available in annexure A.

The second phase involved the estimation of the data as determined by how the characteristics of the dataset influence the objectives of the study using the cointegration test. The purpose of this phase was to acknowledge that the cointegration relationship between the variables is ascertained for all three (ROA, ROE and ROI) models.

The third phase involved determining the long-run equilibrium relationship, the short-run error correction model, speed of adjustment and short-run dynamics. This phase was necessary in order to establish or reach valid conclusions.

The characteristics of the dataset were explored at two levels. The first level entails descriptive statistics, scatter diagrams and cross-correlation analysis. Descriptive statistics involve analysis of the mean, minimum and maximum levels of each variable, and a comparison of the MNPCs among each other.

There were pairwise scatter diagrams of the three measures of MNPCs performance, ROA, ROE and ROI, and the joint venture (percentage interest holding). The scatter diagrams were used to establish how these variables trend together and the implications of such observed trends for further analysis of the dataset. This was followed by a pairwise correlation analysis of all the variables in this study.

Cross-correlation analysis was applied and revealed the direction and strength of the relationship between MNPCs' performance and joint venture (percentage interest holding), as well as the other variables in the model. A positive correlation means a direct relationship between variables, while a negative correlation implies an inverse relationship. The strength of the relationship was depicted by the absolute value of the magnitude of the correlation coefficient. The outcome of the first level informed *a priori* expectations in terms of how the variables are likely to relate to each other in the specified models.

The second level of initial diagnostics established the order of integration of the variables. Where the variables were integrated of a similar order, e.g. *I*(1), then a panel data cointegration approach that requires a similar order of integration was deployed

to estimate the data. In line with Pedroni (1999; 2004), the residual-based cointegration was adopted as the most potent technique in this regard.

Where the variables have a mixed order of integration, then the auto-regression distributed lag model (ARDL) was considered the most appropriate estimation approach. However, Kumo (2012) expresses that the ARDL is not applicable if any of the variables are integrated into the second order.

Where the variables were cointegrated then the coefficients of the basic pooled estimation was applied to determine the long-run relationship between joint ventures and MNPCs performance as measured from the three perspectives. In that case, an error correction model was estimated to establish the short-run dynamics of this relationship. The speed of adjustment back to equilibrium was estimated where there was a deviation from this long-run relationship.

These tests were carried out in EViews 8 using residual diagnostic tests. The descriptive statistics, scatter diagrams, unit root tests and Pedroni cointegration tests were done in Eviews. The unit roots tests include Augmented Dickey-Fuller Fisher Chi-Squared Test (1979), Phillip Perron Fisher Test (1988), Levin et al. (2002) with a null hypothesis of unit roots or that the variables are non-stationary in levels, or as they are prior to any transformations.

According to the report on the EViews website (2021), EViews is a modern econometric, statistics and forecasting package on a Windows-based platform. EViews offers analytical tools that are quick, flexible and efficient to manage data, perform econometric, statistical analysis and generate model simulations with quality graphs. This tool was employed in this study to generate the regression model. These are tests that confirm that the results of the estimation satisfy the assumptions of the classical linear regression model. Heteroscedasticity means that the variance of the errors is homoscedastic. A serial correlation test will establish that the errors are not serially correlated. Furthermore, normality and stability estimations confirm that the errors are normally distributed and stable.

4.7.1 Unit root tests of variables

This study adopted unit root tests of variables as econometric estimation related to time series data and as a methodological framework for time series analysis.

Statistics How To (2021) describe unit root tests as the tests for stationarity in a time series. A time series was said to have stationarity when a shift in time did not cause a change in the shape of the distribution. However, it was accepted that unit roots were one of the causes for non-stationarity. IGI Global (2021) report that a unit root test reveals whether a time series variable is non-stationary using an ARDL model. This test may be employed to determine whether the mean, variance and covariance of a time series were independent if time.

The Dickey-Fuller Test was based on linear regression. The Augmented Dickey-Fuller (ADF) test can be used and valid for larger samples or complex models, although, it was reported to have exhibited a fairly high Type I error rate (Statistics How To, 2021).

The study adopted unit root tests because the response of the variables was determined on time series. The time series is a dataset that tracks a sample over a period of time. The unit root tests were important to this study because we need to establish the non-stationarity of the variables in the time series. The dataset to be analysed in the study was collected from 2010 to 2019, in order to determine how changes had occurred over the years under study. The changes experienced from the measure of performance of MNPCs by ROA, ROE and ROI were determined over a period under study.

4.7.2 Estimation techniques

4.7.2.1 Cointegration

The ADRL method was used in this study to examine the long-run and short-run relationship between the joint venture collaboration and five selected MNPCs under study.

According to Tripathy, Srikanth and Aravalath (2016), where the variables are cointegrated, it can be said that there exists a stable long-run relationship among variables. The authors accept that the ARDL (Pesaran & Pesaran, 1997; Pesaran, Shin and Smith 1999) approach was superior to conventional cointegration techniques. This is because the ARDL method is versatile and can be used irrespective of whether the underlying regressors are pure I(0) or I(1) or mutually co-integrated. The ARDL method was accepted to be robust and a better technique when the sample size is small.

Thus, the ARDL model (Pesaran & Pesaran, 1997; Pesaran et al. 1999) was used to estimate the data to establish the long-run and short-run effects of joint ventures collaboration on firm performance in the five pharmaceutical companies in this study. The data limitation and the relatively small sample size and sample period was encountered in this study. The panel ARDL was employed in this study because of its suitability for the short sample periods and small datasets as experienced in this study. It was indicated to be superior to other cointegration methodologies since it is applicable irrespective of the order of integration (Tripathy et al., 2016).

Evidence of cointegration was obtained with the standard Pedroni (1999, 2004) residual cointegration test, before the estimation of the long-run and short-run dynamics using panel ARDL estimation approach.

Assume an ARDL ($p, q_1, \ldots\ldots q_k$) dynamic panel specification of the form

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \partial_{ij}' X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (1)$$

Where the number of firms i = $1, 2, \ldots\ldots\ldots N$, number of periods $t = 1, 2, \ldots\ldots T$; X_{it} is a $k \times 1$ vector of explanatory variables; ∂_{it} are the $k \times 1$ coefficient vectors; λ_{it} are scalars; and μ_i are the firm-specific effects.

Using the specific variables in the study, i represent the pharmaceutical firms in the study, y is the dependent variables in each model, ROA, ROE and ROI, X_{it} = capital expenditure, R&D or its proxy human capital development, and market share,

explanatory variables in each of the three models. The other variables are as defined above.

Equation (1) is estimated in the ARDL approach in order to test the presence of the long-run relationship among the variables in the study. The variables were JV, R&D, market share, capex, ROA, ROE and ROI. Equation (1) related to this study where, i = 5 MNPCs and t = 10 years in the joint venture model. In the non-joint venture model, i = the four non-joint venture firms used for comparison with the joint venture firms.

The optimal lag length was selected using standard econometric lag order selection, using the Schwarz Information Criteria as the default for each variable in each cross-section of the model. The most frequently occurring lag order selection criteria becomes the lag order for the model (Pesaran et al., 1997, 1999).

If the variables in equation (1) are cointegrated, then the error must be stationary for all cross-sections. A unique characteristic of cointegrated variables would be their responsiveness to deviations from equilibrium. This implies an error correction model in which the short-run dynamics of the variables in the system were influenced by the deviation from equilibrium. Reparameterising equation (1) yields the error correction model expressed in (2) as

$$\Delta y_{it} = \emptyset_i\left(y_{i,t-1} - \theta_i' X_{it}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \partial_{ij}'^{*} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (2)$$

Where $\emptyset_i$is the error-correcting speed of adjustment term.

If the speed of adjustment is zero for the variables JV, R&D, market share, capex, ROA, ROE and ROI, then there will be no evidence of a cointegrated relationship between the variables in under investigation. The speed of adjustment parameter was expected to be negative and statistically significant, indicating the return to a long-run relationship from which there has been a deviation.

4.7.2.2 Pooled mean group estimator

Econometrics studies have advanced the benefit of the use of the panel data approach in empirical studies (Baltagi, 2012; Gujarati, 2014; Wooldridge, 2014). Sibindi (2019) draws understanding from Gujarati (2014) and lists the various benefits of using the panel approach in empirical studies, which were useful to this study.

The panel data estimation technique allows many data points, increasing the degree of freedom, and reducing collinearity among explanatory variables. Therefore, this enhanced the efficiency of the estimation and validity of the findings. Panel data are more effective to study the dynamics of change during the analysis of a repeated cross-section of observations.

This study required a more effective measure and detection of effects that cannot be measured and detected in both time-series and cross-sectional data analysis and efficient analysis sophisticated econometrics models; therefore, the panel data would have been useful. The ability to eliminate bias by ensuring the availability of several units of analysis, as well as the capability of eliminating change occurrence in reliability, made panel data a useful estimation tool for research studies.

According to Gujarati (2014), panel data reinforces the reliability of empirical studies in ways that cannot be feasibly practicable using either cross-section data or time-series data. Notwithstanding the significant merits of panel data, panel data is not devoid of inherent estimation and inference challenges.

For instance, since panel data integrates both cross-section and time-series data, problems that are inherently peculiar to cross-section data like heteroscedasticity need to be eliminated. Also, problems that are inherently unique to time series such as autocorrelation need to be addressed. To eliminate challenges that are inherent in the panel data approach, the panel ARDL estimation was carried out in this study using the PMG estimator by Pesaran et al. (1997; 1999).

Pesaran et al. (1997; 1999) propose an estimator technique that allows for heterogeneous slopes, short-run coefficients and error variances to *differ* across

groups but constrain the long-run estimator to be *equal* across groups. This makes it suitable for estimations that seek to examine dynamic relationships, controlling for long-run effects, short-run dynamics and the speed of adjustment back to equilibrium. This estimation supported the objective of this study and to observe how the joint venture collaboration influences the MNPCs' performance in the in the short run and long run.

In conclusion, the research design, data collection, and various methods of analysis of data were highlighted above. The description of the dependent and independent variables were presented for clear understanding. More importantly, various statistical and econometric estimation tools adopted in the study were explained.

CHAPTER FIVE

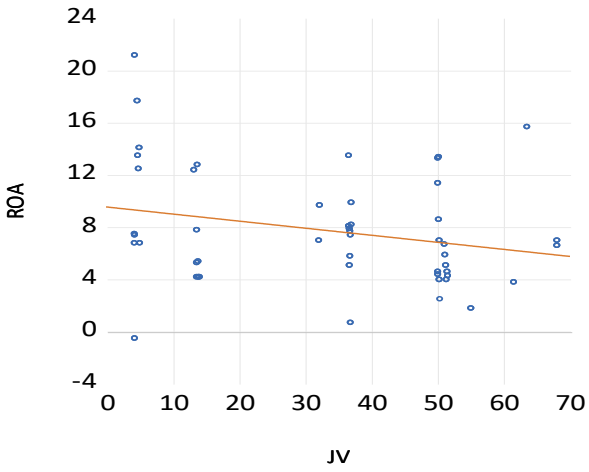
RESULTS ANALYSIS AND INTERPRETATION

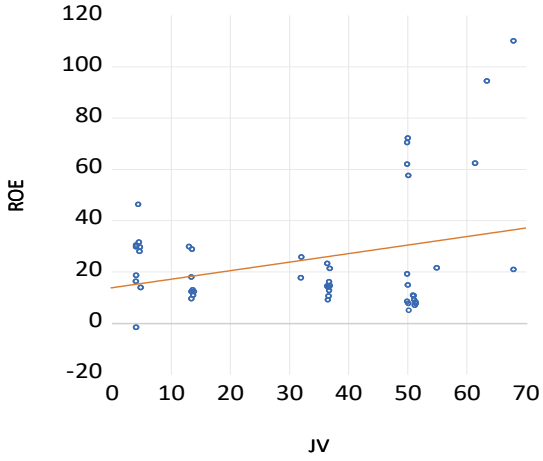
5.1 Introduction

This chapter accesses the collected dataset from the secondary data source, as explained in the previous chapters that dealt with research methodology. This chapter explains the econometric tools that were used to analyse the collected dataset as well as the interpretation of the analysis to be meaningful and useful to the body of knowledge.

5.2 Initial diagnostics

5.2.1 Scatter graphs





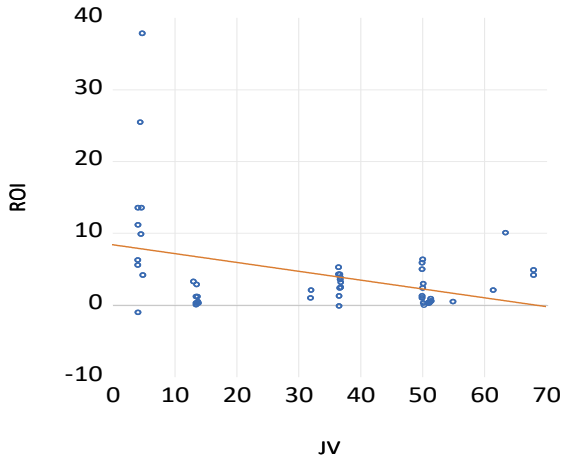


Figure 5.1: Scatter graphs of joint ventures, return on assets, return on equity and return on investment.

The scatter graphs in Figure 5.1 show a mild inverse relationship between JV and ROA and ROI. On the contrary there is a positive and moderate trend between ROE and JV. This is an initial indication of how the structure of firm ownership, as in joint venture among the five pharmaceutical companies in this study, influence company performance, as measured from the three different perspectives.

5.2.2 Descriptive statistics

Table 5.1: Descriptive statistics

	ROA	*ROE*	*ROI*	*CAPEX*	*JV*	*MKTSHARE*	*RD*
Mean	7.78	24.86	4.31	10587.71	33.16	4.40	6297.14
Median	7.00	16.50	2.35	10322..00	36.70	4.35	5376.90
Maximum	21.2	110.00	37.8	18983.00	68.00	15.60	9583.00
Minimum	-0.50	-1.80	-1.10	4366.20	4.10	2.10	3450.00
Std. Dev.	4.40	23.30	6.72	4052.76	20.52	2.23	2037.37
Obs.	50	50	50	50	50	50	50

Descriptive statistics of the total sample are shown in Table 5.1. The mean ROA of the five MNPCs together was 7.78% across the sample period. This represents a rather low level of ROA compared to the maximum ROA among the firms. Looking at the Excel spreadsheet of the dataset, the maximum ROA of 21.2% is attributable to Eli Lilly in 2019. This is because, in 2018, Eli Lilly's revenue in Endocrinology increased 16%, primarily driven by the growth of Trulicity®, Basaglar® and Jardiance®. It is also noteworthy that Taltz® drove the 88% revenue increase in Immunology. Oncology revenue increased 12% due to Verzenio® launched in the USA.

However, in 2017, Eli Lilly registered the lowest ROA among the pharmaceutical firms in this study. This downturn in ROA became manifest in 2017 because, from 2014 to 2018, Eli Lilly maintained relatively flat operating expenses while growing revenue, resulting in consistent improvement in operating expenses as a percentage of revenue (Eli Lilly Annual Report, 2019).

ROE hit a maximum of 110% attributable to GSK in 2018, because GSK posted an operating profit of £5.48 billion in 2018, compared with £4.08 billion in 2017. The increase primarily reflected a favourable comparison with changes in 2017 arising from the impact of US tax reform on the valuations of the consumer healthcare and HIV businesses, and reduced asset impairments and restructuring costs in cost of sales and R&D (GSK Annual Report, 2020b).

Subsequently, a minimum of -1.80% was again attributable to Eli Lilly in 2017. This year seems to have been a crisis year for Eli Lilly, emanating from Neuroscience, which experienced a 16% decrease due to lower volumes for Strattera®, Cymbalta® and Zyprexa®, and Cardiovascular decreased 21% driven by lower volumes for Cialis® and Effient®, all due to patent losses. The mean ROE for all the five firms together is 24.86%. Eli Lilly in 2013 had the highest ROE of 37.8%, above the rather low average of the five firms put together, of 4.31%. The lowest ROE was negative returns of -1.10% attributable to Eli Lilly, once again in 2017. The negative ROE was due to huge loss in revenue experienced by Eli Lilly in 2017, which arose from expiration of patency of some of the Cardiovascular products, as stated above.

Table 5.2: Mean of variables per firm

Firm	*ROA*	*ROE*	*ROI*	*CAPEX*	*JV*	*MKTSHARE*	*RD*
Eli Lilly	10.70	24.11	12.58	5023.64	4.41	2.25	5141.63
GSK	8.44	58.91	4.24	8931.50	56.63	4.49	3994.30
Norvatis	7.43	14.87	2.97	16718.50	36.70	5.47	9097.90
Pfizer	7.30	17.64	1.19	11402.3	17.27	6.43	8132.90
Sanofi	5.03	8.77	0.57	10859.40	50.81	3.38	5119.00

Table 5.2 details the mean of the variables per firm. In terms of how joint venture influenced on the three perspectives to firm performance, the data depicts a mixed picture. Table 5.2 reveals that Eli Lilly has the lowest joint venture percentage ownership, but registers the highest mean ROA, second-highest ROE and ROI, because ROA and ROE increased in 2013 as a result of increased revenues as well as continued cost containment. Over five years (2009–13), Eli Lilly's total shareholder ROE averaged nearly 11% due to the steady dividend stream and increase in the stock price (Eli Lilly Annual Report, 2019). Eli Lilly also accounts for the lowest capex because, between 2014 and 2018, Eli Lilly maintained relatively flat operating expenses while growing revenue, resulting in consistent improvement in operating expense as a percent of revenue (Eli Lilly Annual Report, 2019).

On the contrary, although Sanofi has the second-highest joint venture ownership, Sanofi registers the lowest performance in terms of ROA, ROE and ROI. The net income attributable to equity holders of Sanofi was at a record low from 2013 to 2016, but started to improve from 2017 (Sanofi Annual Report, 2019). This may be responsible for the low ROA, ROE and ROI experienced in Sanofi.

GSK has the highest joint venture ownership, the highest ROE, but a low ROA and ROI. For example, in 2012, GSK initiated an effort to realise annual savings of about £1 billion by 2016 through a combined reduction of size and cost of its R&D and manufacturing operations (Grogan, 2013). Such saving may exert a positive influence on ROE and improved performance (Schuhmacher et al., 2016), and often translates into increase in ROI.

Novartis and Pfizer follow suit as the third and fourth levels of joint venture ownership, but this does not reflect significantly in their performance in terms of ROA, ROE and ROI.

Novartis experienced a major significant drop in the group net income in 2015 and 2016 (Novartis Annual Report, 2020) while maintaining a significant level of performance from the joint venture. However, the outcome is possible because net income exerts a direct proportional influence on ROA, ROE and ROI (CFI, 2020).

However, Pfizer suffered continuous significant decline in generated revenue between t 2014 and 2019, for example, a 2% decline in 2015, 1% decline in 2017 and 4% decline in 2019 (Pfizer Annual Reports, 2019). This decline in generated revenue during this period may have significantly affected the performance in terms of ROA, ROE and ROI.

The findings from the dataset contradict blanket findings that a joint venture alliance often triggers MNPCs to improve performance, the productive capacity of the existing market product, as well as attaining competitive advantages and increase profits (Zamir et al., 2014). Other challenges, such as the loss or expiration of intellectual property (IP) rights and the expiration of co-promotion and licensing rights can have a significant adverse effect on revenue generation or net income of MNPCs. Branded products may have multiple patents that expire at varying dates, thereby strengthening overall patent protection.

However, once patent protection had expired or had been lost before the expiration date as a result of a legal challenge, MNPCs lose on these products, and generic pharmaceutical manufacturers generally produce similar products and sell them for a lower price. Also, the date at which generic competition commences may be different from the date that the patent or regulatory exclusivity expires. The generic pharmaceutical competitors may be authorised by the regulatory body, the South African Health Products Regulatory Authority (SAHPRA), to commence the production of biosimilar alternatives to the patented product. The resulting price competition could significantly decrease the revenues generated by the affected patented products.

5.2.3 Firm-specific analysis

The firm-specific analysis shows an interesting initial trend in the dataset. It seems the level of the joint venture in the ownership structure of the pharmaceutical firms does not necessarily translate into better or enhanced company performance. The data seems to depict that the impact of the joint venture on company performance is firm-specific, and it is not to be expected that the joint venture enhances company performance. It is obvious, therefore, that there must be some intervening factors, some of which have been explained above.

5.2.4 Cross-correlation analysis

Table 5.3: Cross-correlation analysis

	ROA	*ROE*	*ROI*	*CAPEX*	*JV*	*MKTSHARE*	*RD*
ROA	1						
ROE	0.49***	1					
ROI	0.65***	0.31**	1				
CAPEX	-0.30**	-0.30**	-0.47***	1			
JV	-0.25**	0.29**	-0.38***	0.35**	1		
MKTSHARE	-0.07	-0.01	-0.28**	0.52***	0.05	1	
RD	-08.11	-0.46***	-0.21	0.75***	-0.29**	0.53***	1

Note: ***/**/* denote 1%/5%/10% level of significance.

Table 5.3 shows the correlation coefficient between the variables. The correlation coefficient shows the direction and strength of the relationship between the variables and the *a priori* expectations that it forms for the empirical estimation of the dataset. As initially depicted by the scatter graphs, the joint venture is negatively correlated with ROA (-0.25) and ROI (-0.38) both statistically significant at 5% and 1%, respectively. On the contrary, a joint venture is positively correlated with ROE (0.29), and statistically significant at 5% level. This gives an *a priori* expectation that the relationship between joint venture, ROA and equity will be negative, while the

relationship between joint venture and ROE will be positive in the empirical analysis of the dataset.

5.2.5 Unit root tests

Table 5.4: Unit root tests of variables

In levels:

Variable	*ROA*	*ROE*	*ROI*	*CAPEX*	*JV*	*MKTSHARE*	*RD*
Levin, Lin & Chu	-1.44*	-3.91***	-1.69**	-2.20**	-1.70**	-1.34**	-2.61***
ADF-Fisher Test	0.71***	-1.00	-0.94	7.77	3.97	5.47	4.56
Phillip Perron - Fisher Test	-0.82**	-0.77	-0.78	5.18	3.72	15.22	2.88

Note: ***/**/* denote 1%/5%/10% level of significance. ADF-Fisher Chi-Squared Test (1979). Phillip Perron Fisher Test (1988). Levin et al. (2002). Null hypothesis: Unit roots.

In differences:

Variable	*ROA*	*ROE*	*ROI*	*CAPEX*	*JV*	*MKTSHARE*	*RD*
Levin, Lin & Chu	-	-	-	-	-	-	-
ADF-Fisher Test	-	-1.77*	-2.41**	34.03***	16.96**	35.91***	35.78***
Phillip Perron Fisher Test	-	-2.59**	-2.23**	58.88***	40.17***	79.54***	55.56***

Note: ***/**/* denote 1%/5%/10% level of significance. ADF Fisher Chi-Squared Test (1979). Phillip Perron Fisher Test (1988). Levin et al. (2002). Null hypothesis: Unit roots.

Table 5.4 shows the results of unit root tests on the variables in this study. The results of the tests show mixed orders of integration. In the Levin et al. (2002) test, which assumes common unit root processes, all the variables are stationary in levels when

individual intercepts and trends are controlled. However, in the ADF Fisher (1979) test, and the Phillip Perron-Fisher (1988) test, all the variables are I (1) except ROA which is I (0) in levels. The mixed order of integration results makes it imperative that the estimation approach is done from multiple perspectives that accommodate a mixed order of integration.

5.3 Pedroni residual cointegration test

According to Pedroni (1999, 2004), the cointegration test is used to establish whether the variables are cointegrated or not.

The Pedroni residual cointegration test (Pedroni, 1999, 2004) was used to establish whether the performance measurement variables, that is, ROA, ROE and ROI, were cointegrated with the independent variables (JV) or not. These performance measurement variables are classified into three models, and PMG estimation was applied. In each model, two estimations are made: a sample wide estimation and a second estimation with firm-specific short-run dynamics and speed of adjustment. The firm-specific estimations help to determine firm-level differences in the long-run and short-run dynamics among the MNPCs.

The sample wide estimations relate to the entire sample of firms, whiles the firm-specific estimations are to see if there are any difference in firm-specific characteristics. The firm-specific results show that there are differences in firm behaviour. The sample wide estimations are usually criticised as hiding firm-specific nuances or details.

As such, the results obtained are interpreted to explain the joint venture performance objectives relative to the profitability ratios variable ROA, ROE and ROI, in respect of specific MNPCs (Eli Lilly, GlaxoSmithKline, Novartis, Pfizer and Sanofi) under study.

These tests are done for all three models measuring firm performance from three different perspectives: ROA, ROE and ROI. The results of the tests are shown in Tables 5.5–5.7.

Table 5.5: Return on assets model: Pedroni residual cointegration results

Alternative hypothesis: common AR coefficients (within dimension)				
	Statistic	*Probability*	*Weighted stat*	*Probability*
Panel v-stat	1.04	0.15	0.43	0.33
Panel rho-stat	-0.27	0.39	0.06	0.52
Panel PP-stat	-4.59***	0.00	-2.95***	0.00
Panel ADF-stat	-3.76***	0.00	-2.53**	0.01
Alternative hypothesis: common AR coefficients (between dimension)				
	Statistic	Probability		
Group rho-stat	0.79	0.79		
Group PP-stat	-5.24***	0.00		
Group ADF-stat	-4.56***	0.00		

Note: ***/**/* denote 1%/5%/10% level of significance.

Results from Table 5.5 suggest that we fail to reject the null hypotheses of no cointegration if the probability value of the test statistic is not statistically significant. On the contrary, we fail to reject the alternative hypotheses of cointegration if the probability value is statistically significant.

The results of the Pedroni residual cointegration test are shown in Table 5.5. In six of the 11 indicators, we reject the null hypotheses of no cointegration, and fail to reject the alternative hypotheses that the variables in the ROA model are cointegrated. This is depicted by their statistically significant probability values (p-values).

Table 5.6: Return on equity model: Pedroni residual cointegration results

Alternative hypothesis: common AR coefficients (within dimension)				
	Statistic	Probability	*Weighted stat*	*Probability*
Panel v-stat	-0.88	0.81	-0,70	0.76
Panel rho-stat	0.40	0.65	0.35	0.64
Panel PP-stat	-4.72***	0.00	-3.08***	0.00
Panel ADF-stat	-3.32***	0.00	-2.58***	0.00
Alternative hypothesis: common AR coefficients (between dimension)				
	Statistic	*Probability*	*Weighted stat.*	*Probability*
Group rho-stat	1.58	0.94		
Group PP-stat	-5.28***	0.00		
Group ADF-stat	-3.40***	0.00		

Note: ***/**/* denotes 1%/5%/10% level of significance.

The results of the Pedroni residual cointegration test for the ROE model are as shown in Table 5.6. In six of the 11 indicators, we reject the null hypotheses of no cointegration, and fail to reject the alternative hypotheses that the variables in the ROE model are cointegrated. This is depicted by their statistically significant p-values. The same estimation approach is applied for the return on investment (ROI) model.

Table 5.7: Return on investment model: Pedroni residual cointegration results

Alternative hypothesis: common AR coefficients (within dimension)				
	Statistic	Probability	*Weighted stat*	*Probability*
Panel v-stat	-1.12	0.87	-0.74	0.77
Panel rho-stat	-0.20	0.42	-0.19	0.42
Panel PP-stat	-13.05***	0.00	-5.09***	0.00
Panel ADF-stat	- 4.55***	0.00	-3.51***	0.00
Alternative hypothesis: common AR coefficients (between dimension)				
	Statistic	Probability	Weighted stat.	*Probability*
Group rho-stat	1.05	0.85		
Group PP-stat	-11.64***	0.00		
Group ADF-stat	- 4.79***	0.00		

Note: ***/**/* denote 1%/5%/10% level of significance.

The results of the Pedroni residual cointegration test for the ROI model are as shown in Table 5.7. In six out of the 11 indicators, we reject the null hypotheses of no cointegration, and fail to reject the alternative hypothesis of cointegration among the variables in the ROI model. This is depicted by their statistically significant p-values. Hence, we proceed to estimate the panel ARDL using the PMG estimator by Pesaran et al. (1997, 1999), as explained earlier.

5.4 Pooled mean group estimation results

Three models are estimated in this study from three different perspectives to firm performance, namely ROA (section 5.4.1), ROE (section 5.4.2) and ROI (section 5.4.3). In each model, two estimations are made: a sample-wide estimation and a second estimation with country-specific short-run dynamics and speed of adjustment.

5.4.1 Return on assets

In this model, firm performance is measured by ROA. The strategic impact of the joint venture on firm performance is assumed to be a function of R&D; as a measure of knowledge-seeking motives, capital expenditure (as a measure of efficiency-seeking motives through investments in technological infrastructure) and growth in market share (mktshare: as a measure of the market-seeking motives).

The first step is to establish the optimal lag order for estimating the model for each variable in each cross-section. The most frequently occurring lag order selection becomes the optimal lag length for the model (Pesaran et al., 1997, 1999).

Table 5.8: Lag order selection criteria

Firm	Lag order selection
Eli Lilly	ARDL (1 1 1 0)
GlaxoSmithKlein	ARDL (1 1 1 1)
Norvatis	ARDL (1 1 1 0)
Pfizer	ARDL (1 0 0 0)
Sanofi	ARDL (1 0 1 0)

From Table 5.8, the most frequently occurring lag order selection criteria is ARDL (1 1 1 0); hence that will be the lag order selection criteria for this model's estimation. The estimation results are as shown in Table 5.8a (sample-wide results) and Table 5.8b (country-specific short-run dynamics).

Table 5.8a: Sample-wide estimations

Dep variable ROA	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Jv	1.17	2.16	0.59
Ln Capex	3.30	5.59	0.53
Ln Mktshare	1.07**	0.38	0.01
Short run			
ECT	-0.86	0.20	0.00
DLnJv	1.03	1.09	0.34
DLnCapex	0.72	0.77	0.35
DLnmktshare	0.80**	3.09	0.01

Note: ***/**/* denotes 1%/5%/10% level of significance. Research and development as a proxy for knowledge-seeking motives of the joint venture were dropped due to multicollinearity. See Table 4.4.

From Table 5.8a, the results of sample-wide estimation show that, in the long run, joint venture and efficiency-seeking motives as measured by capital expenditure are not relevant to firm-level performance as measured by ROA. This is depicted by their statistically insignificant coefficients. However, market-seeking motives as measured by market share is relevant to firm-level performance both in the long run and the short run. This is denoted by the positive coefficient of the market share variable, which is statistically significant at 5% level in both the long run and the short run. Hence, the market-seeking motive is the main driver of firm-level performance when performance is measured by ROA in joint venture arrangements forged by the five pharmaceutical companies in this study. As required, the speed of adjustment parameter (ECT) is negatively signed (-0.86) and statistically significant at 100% confidence interval. This shows a return to equilibrium should there be a deviation from this long-run relationship. However, there are differences in the short-run dynamics of the individual firms in the panel.

Firm-specific short-run dynamics are depicted in Table 5.8b. Consistent with the initial analysis in descriptive statistics, the joint venture is not statistically significant to the performance of Eli Lilly. Eli Lilly had the lowest percentage ownership in terms of the joint venture but the highest levels of firm performance in terms of ROA, ROI and the second-highest ROE. In the case of GSK, joint venture and market-seeking motives are relevant to firm-level performance. This is denoted by the statistically significant and positive coefficients of the two variables in the GSK results. As required, the speed of adjustment back to equilibrium (-0.51) is negative and statistically significant at 10%. This indicates a 51% recovery per year back to equilibrium should there be a deviation from the long-run relationship.

Table 5.8b: Firm-specific short-run dynamics

Eli Lilly	*Coefficients*	*Standard Error*	*P – value*
ECT	-0.29	0.52	0.58
DLnJv	0.66	3.2	0.84
DLnCapex	-1.26	2.06	0.54
DLnmktshare	1.64	1.82	0.37
GlaxoSmithKlein			
ECT	-0.51*	0.28	0.07
DLnJv	0.47***	0.16	0.00
DLnCapex	0.28	0.18	0.12
DLnmktshare	0.14**	0.07	0.03
Novartis			
ECT	-1.34***	0.24	0.00
DLnJv	0.53***	0.15	0.00
DLnCapex	1.06	0.65	0.10
DLnmktsh are	0.43	0.88	0.63
Pfizer			
ECT	-1.07***	0.27	0.00
DLnJv	1.26	3.56	0.72
DLnCapex	-1.57**	0.52	0.03
DLnmktshare	0.42**	0.15	0.01
Sanofi			
ECT	-1.10	0.41	0.01
DLnJv	-3.7	5.2	0.48
DLnCapex	1.0	0.95	0.27
DLnmktshare	0.60	2.2	0.79

Note: ***/**/* denotes 1%/5%/10% level of significance.

Still on Table 5.8b, and in respect of Novartis, the joint venture is significant to the company's performance in the short run. This is denoted by the positive coefficient of 0.53, which is statistically significant at 1% level. The rest of the variables are not statistically significant. As required, the error correction term (ECT) is negative (-1.34) and statistically significant, indicating a return to equilibrium should there be a deviation from the long-run relationship. For Pfizer, the efficiency motive as measured by capital expenditure (capex) and market-seeking motive as measured by market share (mktshare) are the main drivers of the company's performance. However, the coefficient of capex is negative, indicating that measures to enhance efficiency in Pfizer adversely affect their performance in the pharmaceutical industry.

The explanation for this statistical outcome is the diminishing drug pipeline in Pfizer and, according to a report by Gregory (2018), Pfizer has many products that perform profitably, especially products with no direct competitors in the pharmaceutical market. This means that Pfizer benefits exclusively from patented drugs and dominates the related target market segments. For example, Viagra is among the top-selling Pfizer products; while some patents expired in 2012, the Viagra patent only expires in 2020. This creates challenges to the business competency of Pfizer, as other pharmaceutical companies may produce drugs with the same active ingredient at competitive prices. The effect of the drug patent expiration ultimately changed the level of revenue generation by Pfizer, and consequently diminished the performance of Pfizer. As required, the ECT is negative and statistically significant, indicating a return to equilibrium should there be a deviation. Error Correction Term (ECT) in Table 5.8b (Sanofi) is negative (-1.10) and is statistically significant at 99% confidence interval.

5.4.2 Return on equity

In this model, firm performance is measured by ROE. The independent variables remain the same. Table 5.10 depicts the results of the lag order selection.

Table 5.9: Lag order selection criteria

Firm	*Lag order selection*
Eli Lilly	ARDL (1 0 1 0)
GlaxoSmithKlein	ARDL (1 1 1 0)
Novartis	ARDL (1 1 1 1)
Pfizer	ARDL (1 1 1 1)
Sanofi	ARDL (1 1 0 1)

From Table 5.9, the most frequently occurring lag order selection criteria is ARDL (1 1 1 1); hence that will be the lag order selection criteria for this model's estimation. The estimation results are as shown in Table 5.9a (sample-wide results) and Table 5.9b (company-specific short-run dynamics).

The results of the sample wide estimation in Table 5.10a show that when firm performance is measured by ROE, in the long run, joint venture and market share are the main drivers of firm performance. This is indicated by the positive coefficient of joint venture (1.36) and market share (0.50), which are statistically significant at 1% level. However, capital expenditure does not enhance firm performance as measured by ROE. This can be seen by the negative coefficient of capex (-0.01), which is statistically significant at the 1% level. As expected, the speed of adjustment coefficient is negative (-0.42), and statistically significant at the 5% level. This shows evidence that should there be a deviation from the long-run relationship between firm performance as measured by ROE, there will be a speed of return of 42% per year back to the equilibrium long-run relationship. This represents a moderate speed of recovery by the pharmaceutical industry from any unexpected shock that may derail the influence of the joint venture on firm performance. The rest of the variables are not statistically significant in the short run.

Table 5.9a: Sample-wide estimations

Dep variable ROE	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Jv	1.36***	0.07	0.00
Ln Capex	-0.01***	-0.01	0.00
Ln Mktshare	0.50***	0.10	0.00
Short run			
ECT	-0.42**	0.21	0.05
DLnJv	-0.49	0.41	0.25
DLnCapex	-0.01	0.01	0.12
DLnmktshare	1.19	3.01	0.39

Note: ***/**/* denotes 1%/5%/10% level of significance.

The firm-level short-run dynamics shows firm-level differences. In Eli Lilly, the prevailing capital expenditure does not enhance firm-level performance in the short

run. This can be explained by the level of mean capital expenditure as compared to the other pharmaceutical firms, as depicted by the descriptive statistics. In GSK, joint venture, and the quest to increase market share, are the key drivers of the company's performance in the short run, while prevailing capital expenditure does thus sufficient for the performance. In Novartis, joint venture is the main driver of firm-level performance; the rest of the independent variables are not statistically significant. In Pfizer, increasing market share is the main driver of firm-level performance. In Sanofi, none of the variables are statistically significant in the short run when firm performance is measured by ROE.

Table 5.9b: Firm-specific short-run dynamics

Eli Lilly	*Coefficients*	*Standard Error*	*P – value*
ECT	-0.53	0.36	0.14
DLnJv	-0.30	5.06	0.95
DLnCapex	-0.64	0.36	0.07
DLnmktshare	-0.16	0.26	0.55
GlaxoSmithKlein			
ECT	-0.83***	0.09	0.00
DLnJv	3.51***	0.31	0.00
DLnCapex	-3.02	0.39	0.00
DLnmktshare	0.98***	0.13	0.00
Novartis			
ECT	-1.26***	0.21	0.00
DLnJv	0.72***	0.19	0.00
DLnCapex	0.87	0.85	0.31
DLnmktshare	0.74	1.11	0.50
Pfizer			
ECT	-1.33***	0.35	0.00
DLnJv	3.41	9.35	0.72
DLnCapex	-0.24	0.13	0.07
DLnmktshare	0.73**	0.36	0.04
Sanofi			
ECT	-0.76	0.30	0.11
DLnJv	-0.30	0.81	0.71
DLnCapex	0.15	0.15	0.30
DLnmktshare	-1.85	2.68	0.49

Note: ***/**/* denotes 1%/5%/10% level of significance.

5.4.3 Return on investments

In this model, firm performance is measured by ROI. The independent variables remain the same. Table 5.10 depicts the results of the lag order selection.

Table 5.10: Lag order selection criteria

Firm	*Lag order selection*
Eli Lilly	ARDL (1 1 1 0)
GlaxoSmithKlein	ARDL (1 0 1 1)
Norvatis	ARDL (1 0 1 1)
Pfizer	ARDL (1 0 1 1)
Sanofi	ARDL (1 0 0 0)

The most frequently occurring lag selection order is ARDL (1 0 1 1); hence that will be the lag order selection criteria for this model's estimation.

The estimation results are as shown in Table 5.10a (sample-wide results) and Table 5.10b (company-specific short-run dynamics).

The results of the sample-wide estimation as contained in Table 5.10a show that when firm performance is measured by ROI, in the long run, the joint venture has a positive influence on the performance of the five pharmaceutical firms in this panel. In the short run, none of the variables are statistically significant except the speed of adjustment parameter.

Table 5.10a: Sample-wide estimations

Dep variable ROI	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Jv	0.05**	0.02	0.03
Ln Capex	0.55	0.79	0.49
Ln Mktshare	0.04	0.16	0.82
Short run			
ECT	-0.72**	0.25	0.01
DLnJv	-1.04	1.01	0.31
DLnCapex	-0.01	0.01	0.18
DLnmktshare	1.23	0.84	0.16

Note: ***/**/* denotes 1%/5%/10% level of significance.

According to Table 5.10a, the speed of adjustment parameter is negative as expected (-0.72) and statistically significant at the 1% level, indicating a return back to equilibrium at a quick rate should there be a deviation from the long-run impact of the joint venture on firm performance, as measured by ROI.

Table 5.10b: Firm-specific short-run dynamics

Eli Lilly	*Coefficients*	*Standard Error*	*P – value*
ECT	-1.08***	0.35	0.00
DLnJv	0.49	0.59	0.41
DLnCapex	-0.53	0.34	0.88
DLnmktshare	0.44	3.20	0.89
Cons	0.30	0.18	0.11
GlaxoSmithKlein			
ECT	-0.92***	0.29	0.00
DLnJv	0.21**	0.10	0.03
DLnCapex	-0.85	0.10	0.93
DLnmktshare	0.34	0.34	0.32
Cons	1.79	1.53	0.24
Novartis			
ECT	-1.51	0.32	0.00
DLnJv	1.94	0.77	0.01
DLnCapex	-0.36	0.32	0.27
DLnmktshare	0.36	0.62	0.56
Cons	0.30	0.24	0.22
Pfizer			
ECT	-1.34***	0.36	0.00
DLnJv	0.62	1.24	0.62
DLnCapex	-1.60	1.93	0.41
DLnmktshare	0.87	0.58	0.13
Cons	2.32	2.48	0.35
Sanofi			
ECT	-0.51	0.32	0.11
DLnJv	-0.94	0.21	0.97
DLnCapex	2.14	3.82	0.57
DLnmktshare	-1.37	0.56	0.02
Cons	0.86	0.89	0.33

Note: ***/**/* denotes 1%/5%/10% level of significance.

At the individual firm level, as shown in Table 5.10b, there are firm-specific differences. Consistent with earlier results, joint venture has a positive influence on firm performance in GSK and Novartis in the short run. In all cases except in Sanofi, the speed of adjustment is negative and statistically significant at different levels.

5.5 Results summary – sample-wide estimation and firm-specific short-run dynamics

This section summarises the sample-wide results and the firm-specific short-run dynamics in Tables 5.11a and 5.11b.

Table 5.11a: Summary of sample-wide results

Firm performance	*Drivers*	
	Long run	*Short-run*
Return on Assets	Market share	Market share
Return on Equity	The joint venture, market share, efficiency	None
Return on Investments	Joint venture	None

Table 5.11a summarises the sample-wide results and shows that joint venture (JV) has a positive influence in the long run on the performance of the five pharmaceutical companies in this panel, and occurring in two out of the three perspectives to firm performance, specifically ROE and ROI.

Market share is also a major driver of firm-level performance in the long run and the short run when performance was measured by ROA, and in the long run when performance was measured by ROE. This confirmed the market-seeking objectives of pharmaceutical companies in joint venture collaboration and this result is supported by the findings of Larimo and Nguyen (2015). Also, this study finds that market share influences the performance of companies, as documented earlier by Kabajeh, et al. (2012).

Efficiency-seeking motives influenced positively in the long run when firm performance was measured by ROE. This result is consistent with the findings of Larimo and Nguyen (2015), which reveals that efficiency-seeking motives may take longer to

achieve than other motives. The variable for knowledge-seeking motives was dropped due to multicollinearity with all the other variables in the model.

Table 5.11b summarises the firm-specific short-run dynamics as per the three different measures of firm performance. For Eli Lilly, none of the variables are relevant to the performance of the firm in the pharmaceutical industry in all three models, except capital expenditure in the ROE model. In the ROE model, Eli Lilly's capital expenditure as a measure of efficiency-seeking motives does not indicate positive performance. In the case of GSK, joint venture had a positive influence on its performance in all three models, and on its market share.

Table 5.11b: Summary of firm-specific short-run dynamics

Models	*Firm performance*	*Eli Lilly*	*GSK*	*Novartis*	*Pfizer*	*Sanofi*
Model 1	Return on assets	None	Joint venture, market share	Joint venture	Capex (-), market share	None
Model 2	Return on equity	Capex (-1)	Joint venture, Capex (-), market share	Joint venture	Capex (-1), market share	None
Model 3	Return on investment	None	Joint venture	Joint venture	None	Market share (-)

Similar to GSK, joint venture drives the performance of Novartis in all three models. In respect of Pfizer, market share was the key driver of its performance, while the extent of its capital expenditure negatively affects its performance in the pharmaceutical industry. Finally, for Sanofi, none of the variables are significant except in the ROI model, where market share is found to negatively affect its performance.

The result of the ROI model as documented in the preceding paragraph is consistent with the findings of Ebrahim-Khalil (2016), in which the competitive differentiated strategy adopted by Sanofi reduced its market share. Following this reduction,

performance shrank as a result of the reduction in market share, which consequently increased the operating cost and retail prices of final medicines in the market. These findings, in respect of Sanofi, supported the competitive differentiated strategy explained by Larimo and Nguyen (2015), that joint venture pharmaceutical companies produce unique products, which require additional cost to develop and add features to the products. Hence, the affected pharmaceutical companies may charge a premium price for their products. However, Sanofi produces unique products, such as established prescriptions (e.g. Plavix), cardiovasculars (e.g. Lasix), diabetes (e.g. Apidra Solostar) and vaccines (e.g. Fluzone Quadrivalent).

Generally, in joint venture arrangements by MNPCs, it has been observed that the consequent expiration and loss of IP rights decreases the revenue-generation capability of the companies. However, expired co-promotion activities and licensing rights of products have also contributed to the loss of revenue experienced by the MNPCs.

Furthermore, branded products may enjoy the benefit of multiple patents that expire at different periods, which often helps to strengthen the protection placed on a patent. However, once patent protection has expired or has been lost before the expiration date as a result of legal challenges, MNPCs will be forced to accept losses on these products; generic pharmaceutical manufacturers generally take this opportunity to produce similar products and sell them for a lower price.

Also, the date at which generic competition commences may be different from the date that the patent or regulatory exclusivity expires. However, when generic competition does commence, the resulting price competition can significantly decrease the revenues for the impacted products, although, often for a short period.

The results of the empirical estimation aligned with the *a prior* expectation that the influence of the joint venture collaboration on the performance of the pharmaceutical companies in this study could be firm-specific. According to results, while the joint venture had been beneficial to firms like GSK and Novartis, the same level of benefits cannot be said of Pfizer, Sanofi and Eli Lilly. The fundamental difference in outcome

is driven by the fact that joint ventures do not exist without shortcomings, among which are: frustrating experiences with alliance partners, ineffective planning and strategy undertakings, lack of prescribed exit strategy (Prescott & Salli, 2010), and network capacity. These often influence the performance of the MNPCs (Schuhmacher et al., 2013).

In a more specific term, the findings of this study confirm the earlier findings by Larimo and Nguyen (2015) that, in the studied market environment, market share (market-seeking motives) is easier to achieve, and that market-seeking joint venture collaborative companies will perform better than efficiency-seeking and knowledge-seeking joint venture companies in collaboration agreement.

The purpose of this study was to determine the influence of joint venture collaboration on the performance of MNPCs using ROA, ROE and ROI as measures of performance. Solving a problem statement requires the formulation of research objectives, as well as creating hypothesis. In this study, research hypothesis is used in conjunction with research questions.

The questions that this research strives to answer are listed below.

1. What is the influence of joint venture collaboration on the performance of MNPCs by considering ROA, ROE and ROI as measures of performance?
2. Is there a significant outcome of the joint venture collaboration relationship adopted by the sampled MNPCs and the performance?
3. Is there any company-specific difference in outcome of the performance of the joint venture MNPCs compared to the local non-joint venture pharmaceutical company in the short run and long run?

In this way, the research questions lead to the formulation of research objectives, which are clear, unambiguous and specific statements that identify or outline what the researcher intends to investigate and the outcome of this study (Saunders et al., 2016). To that effect, the objectives of this study are as outlined below:

1. To examine the influence of joint venture collaboration on the performance of MNPCs by considering ROA, ROE and ROI as measures of performance.
2. To investigate the outcome of the relationship between joint venture collaboration and the performance of sampled MNPCs.
3. To examine any company-specific differences in performance of the joint venture MNPCs and local non-joint venture pharmaceutical companies in both the short run and long run.

The hypothesis were discussed in section 7.3 and Table 7.3. The summary of firm-specific short-run dynamics (Table 5.11b) reveals that capex influences negatively on the performance of Eli Lilly, GSK and Pfizer in the short run.

However, the explanation for the above is found in the annual reports of the selected MNPCs. These reports reveal a different kind of joint venture arrangement and consequently influence on the performance. Pharmaceutical companies may partner through the formation of joint venture collaboration arrangements. It is expected that the alliance will increase the market share and performance (Larimo & Nguyen, 2015), while the same can be said in 2000, when GlaxoWellcome and SmithKline Beecham became GlaxoSmithKline. The GlaxoSmithKline alliance exists today.

Some MNPCs engage their business portfolio in a joint venture arrangement. In 2015, Novartis completed transactions to acquire the GSK oncology portfolio and created a joint venture alliance with GSK in their consumer healthcare portfolio. Additionally, a joint sale of the non-influenza vaccines business, as well as two pipeline compounds, were expected to expand Novartis's position in targeted prescription therapies and small molecules. These transactions propelled the positioning of Novartis as a preferred partner for combination agents. These events sharpened Novartis's ambition on growing segments of innovative pharmaceuticals, eye care, and generics, which led to improved core margins and increased overall financial strength that translated into performance (Novartis, 2019).

Other MNPCs created joint venture arrangements on a specific product line, known as a specialty product. For example, a single blockbuster drug, Lipitor®, catalysed the

strategic joint venture alliance of Pfizer-Warner Lambert, and Celebrex® created a strategic joint venture alliance under the auspice of Pfizer-Pharmacia. Consequently, Eli Lilly and Sanofi lost some percentage in revenue to patent expiration of some top-selling specialty medicines. For example, Zypreza® for Eli Lilly and Taxotere® for Sanofi (Gautam & Pan, 2016).

CHAPTER SIX
RESULTS ANALYSIS AND INTERPRETATION – NON-JOINT VENTURES

6.1 Introduction

This chapter details the results for non-joint ventures in South Africa as a control group using secondary data, as was done for the joint ventures in Chapter Five. These results were used as standard to compare the results obtained for the joint venture alliance MNPCs. The option to compare the joint venture MNPCs and non-joint venture local pharmaceutical company was explained in previous chapters that dealt with research methodology.

6.2 Initial diagnostics

6.2.1 Descriptive statistics

Table 6.1: Descriptive statistics

	ROA	*ROE*	*ROI*	*CAPEX*	*MKTSHARE*	*HCD*
Mean	11.27	30.06	-88.33	2558.10	24.95	6410.71
Maximum	41.90	223.20	4694	12969	51.40	30966.00
Minimum	0	0	-8402.80	0	0	0
Std. Dev.	8.64	37.39	1602.40	3444.32	17.60	7535.36
Obs.	40	40	40	40	40	40

Descriptive statistics of the non-joint venture firms are shown in Table 6.1. The mean ROA of the four non-joint venture pharmaceutical companies together is 11.27% across the sample period. This represents a higher ROA than in the case of the five joint venture MNPCs used in this study, with a mean ROA of 7.78%.

The four non-joint venture alliance companies registered a higher maximum ROA of 41.90, compared to 21.20 for the joint venture counterparts. The same trend can be

observed for ROE with the non-joint venture firms registering higher average and maximum ROE than the joint venture firms in this study.

The performance of the non-joint venture companies in respect of ROA and ROE can be attributed to their better understanding of the local market orientation, the customer orientation as well as competitor orientation. The market orientation related to embedded shared value and beliefs that place customers first in the business plan (Craig et al., 2014). Customer orientation deals with understanding the needs and wants of the majority of the local customers (Singh, 2009). Hence, the competitor orientation includes knowledge to understand and identify the strengths and weaknesses, as well as the capabilities and strategies, of the competitors in the pharmaceutical market sector (Craig et al., 2014).

However, in terms of ROI, the joint venture MNPCs have better average and maximum ROI, and also spend much more on capital expenditure than the non-joint venture counterparts. This is essentially because of the operational processes of the joint venture alliance MNPCs relating to financial resource pooling, risk sharing, cost saving, and learning (Walter et al., 2010). These operational processes were consistent with some of the reasons why firms enter joint venture collaboration agreements, in order to attain higher levels of efficiency, which often reflect in higher ROI.

The non-joint venture firms spent significantly on human capital development (HCD) and less significantly on R&D when compared with joint venture MNPCs counterparts. However, inter-firm knowledge-seeking objectives were less important to local non-joint venture pharmaceutical companies, because they were not involved in joint venture collaboration agreements. Therefore, HCD expenditure was adopted as a proxy to explain knowledge-seeking to improve the performance of the company. Nickolas et al. (2021) and Qamruzzaman et al. (2020) support this decision; the authors agree that a knowledgeable and skilled workforce acquires great potential to increase productivity, create economic growth and increase performance through HCD investment by the companies.

Similarly, the non-joint venture firms have a relatively higher average market share (12.33%) than their joint venture counterparts (4.40%). This is because the non-joint venture firms in this study had stronger market penetration into local and regional pharmaceutical markets (Clicks, 2020). The non-joint venture companies are subject to no or little entry barriers into the local and regional pharmaceutical markets, unlike the MNPCs counterparts engaging in joint venture collaboration agreements as a mode of entry into the local and regional markets of the host country. Liu (2017) believes that the collaborative entry mode could facilitate the growth processes (market share) of the joint venture alliance company in the host market.

Table 6.2: Mean of variables per firm

Firm	*ROA*	*ROE*	*ROI*	*CAPEX*	*MKTSHARE*	*HCD*
Adcock	11.86	17.49	444.23	1389.00	12.33	4017.99
Ascendis	6.93	33.81	8.86	403.18	5.17	4472.24
Clicks	13.44	46.31	-6.63	1348.33	48.02	3254.39
Life Healthcare	12.37	25.72	-819.79	8473.80	34.29	17403.13

Table 6.2 details the mean of the variables per firm. Among the four non-joint venture firms, Clicks registers the highest average ROA, highest average ROE and the highest relative market share. Clicks has over 620 in-store pharmacies across South Africa and targets customers in the middle-income and upper-income markets (Clicks Corporate Overview, 2021). However, Clicks spends the least on HCD among the four firms and depicts negative ROI. This state of HCD expenditure may be attributed to the establishment of the Clicks Club Card loyalty programme, which has 9.2 million active members (Clicks Corporate Overview, 2021).

Life Healthcare comes second after Clicks in ROA, spends the most on HCD, and has the second largest market share. This is because Life Healthcare has about 66 facilities across the South Africa, second in number to Clicks facilities. The highest capital expenditure (capex) arose from installation of innovative technology and techniques in all facilities, and HCD expenditure on the employees to operate and manage the facilities (Life Healthcare, 2021).

Adcock comes third in average ROA across the sample period, but has the lowest ROE among the firms and the highest ROI. Adcock has a relatively lower market share compared to Clicks and Life Healthcare and spends the third highest on HCD among the four firms.

Adcock has three local manufacturing facilities in South Africa, which produce and distribute products into the market. This may be responsible for lower market share and low ROE. Its capital expansion projects and investment in the high-volume liquid facilities, coupled with increased capacity in tablet and capsule manufacture, especially antiretrovirals (ARVs) (Adcock, 2021b), may be an indicator for the highest ROI.

Ascendis has the lowest ROA, lowest market share and spends the least on capital expenditure. These shortcomings were related to the fact that Ascendis as a pharmaceutical company in South Africa has been facing business challenges. Recently, Mashego (2021) has reported that Ascendis Health was compelled by a court order to hold an annual general meeting and entered into recapitalisation agreements with lenders because of debt. The consequences are poor firm performance as revealed by the dataset in Table 6.2.

6.2.2 Cross-correlation analysis

Table 6.3: Cross-correlation analysis

	ROA	*ROE*	*ROI*	*CAPEX*	*MKTSHARE*	*HCD*
ROA	1					
ROE	0.83***	1				
ROI	0.16	0.83**	1			
CAPEX	0.01	-0.09	-0.44***	1		
MKTSHARE	0.35**	0.30*	-0.12	0.34**	1	
HCD	-0.12	-0.15	-0.50***	0.93***	0.22	1

Note: ***/**/* denote 1%/5%/10% level of significance.

Table 6.3 shows the correlation coefficient between the variables. The correlation coefficient shows the direction and strength of the relationship between the variables and the *a priori* expectations that it forms for the empirical estimation of the dataset.

ROA has a positive correlation with ROE and market share, but a negative correlation with ROI. This was because market dominance or increase in market share relates to increase in ROA and ROE. This was displayed by Clicks as reported in Table 6.2.

However, ROE has a strong positive relationship with ROI due to the fact that ROI often results in increase ROE. An example was when Adcock embarked on a capital expansion project and investment in a high-volume liquid facility as well as increased capacity in tablet and capsule manufacturing, which resulted in increasing ROE and ROI as seen in Table 6.2.

Capital expenditure has negative correlation with ROI, indicating the possibility of negative returns or diminishing marginal returns to capital expenditure for these non-joint venture firms. This was observed in Asendis Health, where capital expenditure from lenders could not positively precipitate the realisation of ROI.

This probably explains why the non-joint venture firms spend less on capital expenditure than their joint venture counterparts, as per the descriptive statistics in Table 6.1. ROI also has a negative correlation with HCD for these non-joint venture firms. This is because ideally HCD expenditure positively informs human capital investment to maximise ROI (Qamruzzaman et al., 2020). However, although these non-joint venture firms spend more on HCD, the quality or nature of the HCD may not adequately inform investment to the extent of translating into positive ROI. Human capital expenditure has a positive correlation with market share as expected.

6.2.3 Unit root tests

Table 6.4: Unit root tests of variables

In levels:

Variable	*ROA*	*ROE*	*ROI*	*CAPEX*	*MKTSHARE*	*HCD*
Levin, Lin & Chu	-2.16**	-2.02***	-4.03***	1.21	2.98	1.64
ADF-Fisher Test	11.99	9.80	19.91**	1.54	1.49	1.68
Phillip Perron - Fisher Test	20.61***	24.2***	33.73***	0.88	0.12	1.57

Note: ***/**/* denote 1%/5%/10% level of significance. ADF-Fisher Chi-Squared Test (1979). Phillip Perron Fisher Test (1988). Levin et al. (2002). Null hypothesis: Unit roots.

In differences:

Variable	*ROA*	*ROE*	*ROI*	*CAPEX*	*MKTSHARE*	*HCD*
Levin, Lin & Chu	-	-	-	-5.16***	-2.23**	-3.27***
ADF-Fisher Test	23.7***	20.27***	–	24.98**	11.95***	14.10*
Phillip Perron Fisher Test	-	–	-	22.02**	27.65***	27.58***

Note: ***/**/* denote 1%/5%/10% level of significance. ADF-Fisher Chi-Squared Test (1979). Phillip Perron Fisher Test (1988). Levin et al. (2002). Null hypothesis: Unit roots.

Table 6.4 shows the results of unit root tests on the variables in this study. The results of the tests show mixed orders of integration.

In the Levin etc. (2002) test, which assumes common unit root processes, all the variables are stationary in levels except capital expenditure, market share and HCD. However, in the ADF-Fisher (1979) test, all the variables are I (1) except ROI, which is I (0) in levels. In the Phillip-Perron-Fisher Test ROA, ROE and ROI are I(0), while capital expenditure, market share and HCD are I(1). The mixed order of integration of

the variables makes it imperative that the estimation approach is done from multiple perspectives that accommodate a mixed order of integration.

6.2.4 Pedroni residual cointegration test

The Pedroni residual cointegration test (Pedroni, 1999, 2004) was again used to establish whether there is a long-run relationship between the performance measurement variables, that is, ROA, ROE and ROI, and the independent variables. The results of the Pedroni cointegration tests are shown in Tables 6.5–6.7.

Table 6.5: Return on assets model: Pedroni residual cointegration results

Alternative hypotheses: common AR coefficients (within dimension)				
	Statistic	*Probability*	*Weighted stat*	*Probability*
Panel v-stat	-0.47	0.68	-0.43	0.33
Panel rho-stat	1.04	0.85	0.74	0.52
Panel PP-stat	-0.53	0.30	-2.05**	0.02
Panel ADF-stat	- 0.60	0.27	-1.90**	0.03
Alternative hypotheses: common AR coefficients (between dimension)				
	Statistic	*Probability*		
Group rho-stat	1.71	0.79		
Group PP-stat	-3.05***	0.00		
Group ADF-stat	-2.35***	0.01		

Note: ***/**/* denote 1%/5%/10% level of significance.

In the Pedroni cointegration test, we fail to reject the null hypotheses of no cointegration if the probability value of the test statistic is not statistically significant. On the contrary, we fail to reject the alternative hypotheses of cointegration if the probability value is statistically significant. In four of the 11 indicators, we reject the null hypotheses of no cointegration and fail to reject the alternative hypotheses that the variables in the ROA model are cointegrated. This is depicted by their statistically significant probability values (p-values).

The results of the cointegration tests for the ROE model are shown in Table 6.6.

Table 6.6: Return on equity model: Pedroni residual cointegration results

Alternative hypotheses: common AR coefficients (within dimension)				
	Statistic	*Probability*	*Weighted stat*	*Probability*
Panel v-stat	-0.23	0.59	-1.07	0.86
Panel rho-stat	0.21	0.58	0.71	0.76
Panel PP-stat	-1.41*	0.08	-2.21***	0.01
Panel ADF-stat	-1.47*	0.07	-2.07**	0.02
Alternative hypotheses: common AR coefficients (between dimension)				
	Statistic	*Probability*	*Weighted stat.*	*Probability*
Group rho-stat	1.83	0.97		
Group PP-stat	-2.07**	0.02		
Group ADF-stat	-2.10**	0.02		

Note: ***/**/* denotes 1%/5%/10% level of significance.

The results of the Pedroni residual cointegration test for the ROE model show that in six of the 11 indicators, we reject the null hypotheses of no cointegration and fail to reject the alternative hypotheses that the variables in the ROE model are cointegrated. This is depicted by their statistically significant p-values. The same estimation approach is applied for the ROI model. Table 6.7 details the results of the cointegration tests for the ROI model.

Table 6.7*:* Return on investment model: Pedroni residual cointegration results

Alternative hypotheses: common AR coefficients (within dimension)				
	Statistic	*Probability*	*Weighted stat*	*Probability*
Panel v-stat	1.30	0.09*	0.73	0.23
Panel rho-stat	1.68	0.95	1.76	0.96
Panel PP-stat	-2.36***	0.01	-1.22	0.11
Panel ADF-stat	-1.83**	0.03	-1.04	0.15
Alternative hypotheses: common AR coefficients (between dimension)				
	Statistic	*Probability*	*Weighted stat.*	*Probability*
Group rho-stat	2.30	0.99		
Group PP-stat	-2.51***	0.01		
Group ADF-stat	-1.86***	0.03		

Note: ***/**/* denote 1%/5%/10% level of significance.

Similarly, in five of the 11 indicators, we reject the null hypotheses of no cointegration and fail to reject the alternative hypotheses of cointegration among the variables in the ROI model. This is depicted by their statistically significant p-values.

Hence, we proceed to estimate the panel ARDL using the PMG estimator by Pesaran et al. (1997, 1999), as explained earlier.

6.3 Pooled mean group estimation results

As in the case of the joint venture estimation, three models are estimated from three different perspectives to firm performance, namely ROA (section 6.3.1), ROE (section 6.3.2) and ROI (section 6.3.3). In each model, two estimations are made: a sample-wide estimation and a second estimation with firm-specific short-run dynamics and speed of adjustment.

6.3.1 Return on assets

In this model, firm performance is measured by ROA. ROA is modelled as a function of HCD (as a measure of knowledge-seeking motives), capital expenditure (as a measure of efficiency-seeking motives through investments in technological infrastructure) and growth in revenue (as a measure of the market-seeking motives).

The optimal lag order for estimating the model is detailed in Table 6.8

Table 6.8: Lag order selection criteria

Firm	*Lag order selection*
Adcock	ARDL (1 1 1 1)
Ascendis	ARDL (1 1 1 1)
Clicks	ARDL (1 1 1 1)
Life Healthcare	ARDL (1 1 1 1)

According to Table 6.8, the most frequently occurring lag order is ARDL (1111). This will be the lag order for the ROA model estimation. The estimation results are detailed in Table 6.8a (sample-wide results) and Table 6.8b (country-specific short-run dynamics).

Table 6.8 a: Sample-wide estimations

Dep variable ROA	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Capex	-0.41***	0.15	0.00
Ln Mktshare	1.2***	0.61	0.01
Short run			
ECT	-0.48**	0.21	0.02
DLnCapex	-0.76**	0.96	0.04
DLnmktshare	0.57*	2.58	0.08

Note: ***/**/* denotes 1%/5%/10% level of significance. R&D as a proxy for knowledge-seeking motives was dropped automatically due to multicollinearity with capital expenditure, correlated at 0.93, statistically significant at the 1% level. See Table 6.8a.

The results of the sample-wide estimation for the ROA model show that in the absence of joint ventures, efficiency-seeking motives as measured by capital expenditure has

a negative long-run relationship with firm performance as measured by ROA. This negative relationship also holds in the short run, as depicted by the negative and statistically significant coefficients.

Market-seeking motives as measured by market share enhances firm-level performance both in the long run and the short run. This is denoted by the positive coefficient of the market share variable, which is statistically significant at the 1% level in both the long run and at the 10% level in the short run. Hence, similar to joint ventures, the market-seeking motive is the main driver of firm-level performance when performance is measured by ROA.

As required, the speed of adjustment parameter is negatively signed (-0.48) and statistically significant at the 5% level. This shows a return to equilibrium should there be a deviation from this long-run relationship. The absolute value of the short-run adjustment parameter shows a moderate speed of adjustment back to equilibrium should there be a deviation from the long-run relationship. However, at the firm level there are differences in the short-run dynamics of the individual firms in the panel.

Table 6.8 b: Firm-specific short-run dynamics

Adcock	*Coefficients*	*Standard Error*	*P – value*
ECT	-0.51***	0.13	0.00
DLnCapex	1.41***	0.78	0.00
DLnmktshare	-3.66***	0.52	0.00
Ascendis			
ECT	-0.38	0.85	0.66
DLnCapex	-1.50***	0.99	0.01
DLnmktshare	-3.18**	4.91	0.05
Clicks			
ECT	-1.03***	0.21	0.00
DLnCapex	1.23	3.23	0.70
DLnmktshare	1.75***	0.54	0.00
Life Healthcare			
ECT	-0.003	0.43	0.99
DLnCapex	-3.04**	2.28	0.02
DLnmktshare	0.74***	0.66	0.00

Note: ***/**/* denotes 1%/5%/10% level of significance.

Firm-specific short-run dynamics differ. For Adcock, efficiency-seeking motives enhanced firm performance, while market-seeking motives did not enhance firm performance in the short run. This is depicted by the positive coefficient of capital expenditure and negative coefficient of market share, both significant at the 1% level. The speed of adjustment parameter back to equilibrium is negative and statistically significant as expected; however its magnitude depicts a moderate rate of return back to equilibrium should there be a deviation from the long-run relationship between firm performance, efficiency-seeking and market-seeking motives. This related to the fact that Adcock was involved in capitalisation of projects and investment in the liquid products facility as well as increased capacity in the manufacture of solid dosage form (Adcock, 2021).

In the case of Ascendis, the speed of adjustment parameter is negative but not statistically significant, indicating that there is no return to the long-run relationship should there be a deviation. For Ascendis, both efficiency-seeking and market-seeking motives do not enhance firm performance as measured by ROA. The negative and statistically significant coefficients of both parameters denote this dynamic. This is because Ascendis was faced with bankruptcy when it no longer repaid the debts due to lenders and was compelled by court to hold an annual general meeting (Mashego, 2021).

Efficiency-seeking motives are not relevant to firm performance for Clicks, but market-seeking motives are, as depicted by the statistically insignificant coefficient of capital expenditure, and statistically significant coefficient of market share at the 1% level. This is because Clicks capitalised and dominated the market sector through the establishment of about 620 facilities and Clicks Clubcard loyalty with about 9.2 million active members (Clicks Corporate Overview, 2021).

The speed of adjustment parameter is negative and statistically significant at 1% as expected, with an absolute value of 1.03 indicating a very rapid return to equilibrium should there be a deviation from the long-run relationship. The same is true for Life Healthcare, whereby efficiency-seeking motives are not relevant to firm performance,

but market-seeking motives are. There is no return to equilibrium should there be a deviation from the long-run relationship.

6.3.2 Return on equity

In this model, firm performance is measured by ROE. The independent variables remain the same. Table 6.9 depicts the results of the lag order selection.

Table 6.9: Lag order selection criteria

Firm	*Lag order selection*
Adcock	ARDL (1 1 1 1)
Ascendis	ARDL (1 1 1 1)
Clicks	ARDL (1 1 0 1)
Life Healthcare	ARDL (1 1 1 1)

From Table 6.9, the most frequently occurring lag order is ARDL (1 1 1 1), hence that will be the lag order for this model's estimation. The estimation results are as shown in Table 6.9a (sample wide results) and Table 6.9b (company-specific short-run dynamics).

The results of the sample-wide estimation in Table 6.9a show that when firm performance is measured by ROE, in the long run, neither efficiency-seeking nor market-seeking motives drive firm performance. This is indicated by their statistically insignificant coefficients. In the short run, however, market-seeking motives drive firm performance, as measured by ROE. The positive coefficient statistically significant at 1% denote this. Efficiency-seeking motives did not enhance firm performance in the short run, as indicated by the negative and statistically significant coefficient of capital expenditure.

Table 6.9a: Sample-wide estimations

Dep variable ROE	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Capex	2.41	2.49	0.33
Ln Mktshare	8.18	6.45	0.20
Short run			
ECT	-0.95	1.74	0.59
DLnCapex	-0.49***	0.17	0.00
DLnmktshare	0.12***	0.74	0.01

Note: ***/**/* denotes 1%/5%/10% level of significance.

The results from the firm-level analysis show that when firm performance is measured by ROE, neither efficiency-seeking or market-seeking motives drive firm performance in Adcock. The same results recorded for Ascendis: neither efficiency- nor market-seeking motives drive firm performance. For Clicks, the same results are realised when firm performance is measured by ROA. Market-seeking motives and not efficiency-seeking motives drive firm performance. However, this time round, the speed of return to equilibrium is moderate (-0.57) and not quick (-1.03). when firm performance is measured by ROE. The results for Life Healthcare also mirror previous results, where market-seekings motive drive firm performance and not efficiency-seeking motives. There is no return to equilibrium should there be a deviation from the long-run relationship.

Table 6.9b: Firm-specific short-run dynamics

Adcock	*Coefficients*	*Standard Error*	*P – value*
ECT	-0.92***	0.16	0.00
DLnCapex	0.94	8.68	0.91
DLnmktshare	-0.41***	0.05	0.00
Ascendis			
ECT	2.58	4.58	0.57
DLnCapex	-0.80***	0.51	0.01
DLnmktshare	-0.21***	0.25	0.00
Clicks			
ECT	-0.57***	0.23	0.00
DLnCapex	-0.54***	0.49	0.00
DLnmktshare	0.71***	0.61	0.00
Life Healthcare			
ECT	0.25	0.60	0.68
DLnCapex	-0.65***	0.44	0.00
DLnmktshare	0.13***	0.13	0.00

Note: ***/**/* denotes 1%/5%/10% level of significance.

6.3.3 Return on investments

In this model, firm performance is measured by ROI. The independent variables remain the same. Table 6.10 depicts the results of the lag order selection.

Table 6. 10: Lag order selection criteria

Firm	*Lag order selection*
Adcock	ARDL (1 1 1 1)
Ascendis	ARDL (1 1 1 1)
Clicks	ARDL (1 0 0 0)
Life Healthcare	ARDL (1 1 0 1)

The most frequently occurring lag selection order is ARDL (1 1 1 1); hence that will be the lag order for estimating this model. The estimation results are as shown in Table 6.10a (sample-wide results) and Table 6.10b (country-specific short-run dynamics).

The results of the sample-wide estimation as contained in Table 6.10a show that when firm performance was measured by ROI, in the long run, both efficiency-seeking and market-seeking motives decrease firm performance as measured by ROI in the non-joint venture firms. This is depicted by the negative and statistically significant coefficients of capital expenditure and market share respectively. This trend also holds for the short run.

Table 6.10a: Sample-wide estimations

Dep variable ROI	*Coefficients*	*Standard Error*	*P – value*
Long run			
Ln Capex	-0.92***	0.14	0.00
Ln Mktshare	-0.15***	0.01	0.00
Short run			
ECT	-1.01	0.27	0.00
DLnCapex	-0.28***	0.27	0.00
DLnmktshare	-0.30***	0.32	0.00

Note: ***/**/* denotes 1%/5%/10% level of significance.

At firm level, Adcock and Ascendis register the same results; neither efficiency-seeking nor market-seeking motives drive firm performance. This is denoted by the negative and statistically significant coefficients or insignificant coefficients of capital expenditure and market share for both Adcock and Ascendis. Clicks and Life Healthcare also register similar results as in previous firm-specific estimations. Market-seeking motives drive firm performance and not efficiency-seeking motives. This is depicted by the positive and statistically significant coefficient of market share and negative and statistically significant coefficient of capital expenditure.

Table 6.10b: Firm-specific short-run dynamics

Adcock	*Coefficients*	*Standard Error*	*P – value*
ECT	-0.92***	0.16	0.00
DLnCapex	0.94	8.68	0.91
DLnmktshare	-0.41***	0.05	0.00
Ascendis			
ECT	2.58	4.58	0.57
DLnCapex	-0.80***	0.51	0.01
DLnmktshare	-0.21***	0.25	0.00
Clicks			
ECT	-0.57***	0.23	0.00
DLnCapex	-0.54***	0.49	0.00
DLnmktshare	0.71***	0.61	0.00
Life Healthcare			
ECT	0.25	0.60	0.68
DLnCapex	-0.65***	0.44	0.00
DLnmktshare	0.13***	0.13	0.00

Note: ***/**/* denotes 1%/5%/10% level of significance/

CHAPTER SEVEN
SUMMATION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter is a summary of the findings of this study, taking readers through the main topics of study, the explanation of the variables of the joint venture, the research questions, research objectives, the research proposition, research methodology adopted, data collection, the econometric diagnosis, and estimation techniques employed, to analyse the dataset, the results obtained and the implications, conclusion and recommendations.

7.2 Summation of findings

The problem statement raised in this study was to investigate whether joint venture collaboration influences the performance of the MNPCs using ROA, ROE and ROI as measures of performance. Therefore, this study was designed to investigate the influence of joint venture collaboration on the performance of MNPCs.

The required datasets for this study were obtained from the consolidated annual financial statements of the selected pharmaceutical companies from 2010 to 2019. These companies were leading pharmaceutical companies in South Africa. The investigated companies were Eli Lilly, GlaxoSmithKlein (GSK), Novartis, Pfizer, Sanofi, Adcock Ingram, Ascendis Health, Clicks Group and Life Healthcare.

Firm performance was measured from three different perspectives – ROA, ROE and ROI, which are the dependent variables. The independent variables were joint venture (percentage interest holding), R&D/HCD (knowledge-seeking motives), capital expenditure/capex (efficiency-seeking motives) and revenue/market share (market-seeking motives).

Panel cointegration estimation techniques were used in this study. The estimation approach entailed three key steps. Firstly, the characteristics of the dataset were established, namely descriptive statistics, scatter diagrams, cross-correlation analysis, and unit root tests. Secondly, the cointegration relationship between the variables was ascertained for all three models. Thirdly, the long-run equilibrium relationship and the short-run dynamics were established.

These trends were confirmed by the cross-correlation analysis as well. The unit root tests showed mixed results. In the ADF (1979) and Phillip Perron (1988) tests, the variables were I(1) except for ROA, while in the Levin et al. (2002) tests, the variables were I(0). Thus, a combination of panel data cointegration techniques that address mixed order of integration was used to estimate the data.

Based on the I (1) unit root test results, the cointegration test was done with Pedroni (1999, 2004) panel cointegration tests. In six of the 11 indicators in all three models, the variables were found to be cointegrated. The estimation of the long-run equilibrium relationship and the error correction model, speed of adjustment and short-run dynamics were done using the ARDL models by Pesaran et al. (1997, 1999).

The scatter graphs of joint ventures and the three measures of firm performance showed a negative relationship between joint venture and ROA and ROI, but a positive relationship between ROE and joint venture.

Similar estimation techniques (except scatter graphs) were carried out on the local non-joint venture pharmaceutical companies investigated.

Descriptive statistics of the non-joint venture firms are shown in Table 6.1. This revealed that the mean ROA of the four sampled non-venture companies was 11.27% across the investigated period. This value depicted a higher ROA than was indicated for the five joint venture MNPCs investigated, with mean ROA of 7.78%.

The four local non-joint venture companies depicted a higher maximum ROA of 41.90 than the joint venture MNPCs counterparts, which presented ROA of 21.20. In the same Table 6.1, the local non-joint venture pharmaceutical companies presented

higher average and maximum ROE than the joint venture MNPCs investigated in this study.

The non-joint venture companies indicated a significantly higher average market share of 12.33% than the joint venture collaboration MNPCs counterparts, with percentage market share 4.40%. The result may be attributed to the stronger market penetration into local and regional pharmaceutical markets by the local non-joint venture companies under investigation.

A massive capital expansion project and high investment in the high-volume liquid facility, in addition to increased capacity in tablet and capsule manufacturing by Adcock, supported the objective to significantly increase the performance (Adcock Ingram, 2021b). Also, increase in ROE and ROI, as observed in Table 6.2.

The business strategy in which Clicks established over 620 in-store pharmacies across South Africa and targets customers in the middle-income and upper-income markets through the Clicks Club Card loyalty programme administered to over 9.2 million active members (Clicks Corporate Overview, 2021). This strategy supported the explanation for the highest average ROA, highest average ROE and the highest relative market share, as depicted in Table 6.2.

7.2.1 Summary from sample-wide estimation and firm-specific short-run dynamics

With reference to Table 7.1, the joint venture has a positive influence on the performance in the long run, for the five MNPCs studied, in perspectives to firm performance ROE and ROI.

Market share was a major driver of firm-level performance in the long run and the short run when performance is measured by ROA, and only in the long run when performance is measured by ROE. This finding confirms the market-seeking motives of pharmaceutical companies in joint venture collaboration and is supported by the findings of Larimo and Nguyen (2015). Also, this study finds that market share

influences the performance of companies, as documented earlier by Kabajeh et al. (2012).

Table 7.1: Summary of sample-wide results

Firm performance	*Drivers- joint ventures*		*Drivers – non-joint ventures*	
	Long run	*Short run*	*Long run*	*Short run*
Return on Assets	Market share	Market share	Market share Capex (-)	Market share Capex (-)
Return on Equity	The joint venture, market share, Capex	None	None	Market share Capex (-)
Return on Investments	Joint venture	None	Market share (-) Capex (-)	Market share (-) Capex (-)

Efficiency-seeking motives had a positive influence in the long run when company performance was measured by ROE. This result is consistent with the findings of Larimo and Nguyen (2015). The study revealed that efficiency-seeking motives may take longer to be achieved than other motives. The variable for knowledge-seeking motive was dropped due to multicollinearity with the capital expenditure variable in the model, due to a high positive correlation coefficient of 0.93, statistically significant at the 1% level

For the non-joint venture firms, market-seeking motives seem to be the main driver of firm performance in both the long and short run when firm performance was measured by ROA. In the long run, neither market-seeking nor efficiency-seeking motives were relevant to firm performance when measured by ROE. However, in the short run market-seeking motives were the main driver of firm performance while efficiency-seeking motives decreased firm performance. These findings explained the market domination by Clicks and Life Healthcare.

None of these motives were relevant when firm performance was measured by ROI in the case of the four non-joint venture firms. Capital expenditure and market share decrease firm performance as measured by ROI in both the long run and short run, as observed with Ascendis Health and as explained above.

Table 7.2 reveals that in joint venture MNPCs, Eli Lilly was negatively influenced by low capital expenditure in the ROE model (see Table 4.4). The negative relationship between capital expenditure (capex) and firm performance is an indication that efficiency-seeking motive decreased Eli Lilly's performance. In the case of GSK, the joint venture had a significant positive influence on its performance in all three models, and on its market share. In the ROE model, the level of performance of GSK was negatively influenced by capital expenditure.

Table 7.2: Summary of firm-specific short-run dynamics

Models	*Firm performance*	*Joint Venture Pharma*					*Non-Joint Venture Pharma*			
		Eli Lilly	*GSK*	*Novartis*	*Pfizer*	*Sanofi*	*Adcock*	*Ascendis*	*Clicks*	*Life Healthcare*
Model 1	Return on assets	None	Joint venture, market share	Joint venture	Capex (-), market share	None	Capex Market share (-)	Capex (-) Market share (-)	Market share	Capex (-) Market share
Model 2	Return on equity	Capex (-)	Joint venture, Capex (-), market share	Joint venture	Capex (-), market share	None	Market share (-)	Capex (-) Market share (-)	Capex (-) Market share	Capex (-) Market share
Model 3	Return on investment	None	Joint venture	Joint venture	None	Market share(-)	Market share (-)	Capex (-) Market share (-)	Capex (-) Market share	Capex (-) Market share

Similar to GSK, joint ventures drive the performance of Novartis in all three models. Concerning Pfizer, market share was the key driver of its performance (see Table 4.4). Finally, for Sanofi, none of the variables were significant, except in the ROI model, where market share is found to negatively influence its performance (see Table 4.5).

The result of the ROI model as documented in the preceding paragraph is consistent with the findings of Ebrahim-Khalil (2016), in which the competitive differentiated strategy adopted by Sanofi went wrong and ended up reducing its market share. Sanofi's performance shrank as a result of the reduction in market share, which consequently increased the operating costs and retail prices of the final medicines in the market.

These findings, in respect of Sanofi, were supported by the competitive differentiated strategy explained by Larimo and Nguyen (2015). In that joint venture, pharmaceutical companies produce unique products, which require additional cost to develop and add features to the products. Hence, the affected pharmaceutical companies may charge a premium price for their products. It was reported in Sanofi (2019) that Sanofi produces unique products, such as established prescriptions (e.g. Plavix), cardiovasculars (e.g. Lasix), diabetes (e.g. Apidra Solostar) and vaccines (e.g. Fluzone Quadrivalent). These products target few but specific market niche.

Consequently, the loss of revenue by MNPCs from expired patented medicines may shift the MNPCs from thriving to surviving, and expose them to diminished ROA, ROI and ROE, culminating in diminished company performance (Khanna, 2012).

Also, the date at which generic competition commences may differ from the date that the patent or regulatory exclusivity expires. However, when generic competition does commence, the resulting price competition can significantly decrease the revenues for the affected products. Eli Lilly and Sanofi lost some percentage in revenue to patent expiration of some top-selling specialty medicines, such as Zypreza® for Eli Lilly and Taxotere® for Sanofi (Gautam & Pan, 2016).

Joint venture collaboration agreements by MNPCs help to cushion the decreased revenue-generating consequences, where the pooled resource of the alliance partners are drawn on to ameliorate the decrease in performance effects. The financial performance has been used to assess the success or failure of companies (Strouhal et al., 2018).

In a more specific term, the findings of this study confirm the earlier findings by Larimo and Nguyen (2015) that, in the studied market environment, market share (market-seeking motive) is easier to achieve, and that a market-seeking joint venture firm will perform better than an efficiency- and knowledge-seeking joint venture agreement.

The firm-specific results for non-joint venture firms show that for Adcock the efficiency motive was the main driver of firm performance as measured by ROA. In the case of Ascendis, both the efficiency-seeking motive and market-seeking motive decreases firm performance in all perspectives to firm performance. For Clicks and Life Healthcare, the market-seeking motive is the main driver of firm performance.

7.3 Aligning the objectives of the study with the research hypothesis

The problem statement of this study is to investigate the influence of strategic joint ventures on the performance of MNPCs in South Africa, as measured by ROA, ROE and ROI. However, solving problem statements requires identifying of the research objectives to formulate the research hypothesis. However, the objectives of this study are as outlined below:

1. To examine the influence of joint venture collaboration on the performance of MNPCs by considering ROA, ROE and ROI as measures of performance.
2. To investigate the significant outcome of the relationship between joint venture collaboration and the performance of sampled MNPCs.
3. To examine any company-specific differences in performance of the joint venture MNPCs and local non-joint venture pharmaceutical companies in both the short run and long run.

However, the discussion of the objectives of the study consequently leads to hypothetical propositions.

Table 7.4: Summary of research hypothesis

Hypothesis 1	
Null hypothesis *(H_0)*	Joint venture collaboration does not influence the performance of MNPCs.
Alternative hypothesis *(H_α)*	Joint venture collaboration does influence the performance of MNPCs.
Conclusion	*Null hypothesis (H_0) is rejected but we fail to reject the alternative hypothesis (H_α)*. The performance of MNPCs is influenced by joint venture collaboration.
Hypothesis 2	
Null hypothesis *(H_0)*	There is no significant outcome in joint venture collaboration relationship with MNPCs and the performance
Alternative hypothesis *(H_α)*	There is significant outcome in joint venture collaboration relationship with MNPCs and the performance.
Conclusion	*Null hypothesis (H_0) is rejected but we fail to reject the alternative hypothesis (H_α)*. We found strong relationship between JV collaboration by MNPCs and their overall performance - both in the short and the long run, especially in favour of market seeking motives, rather than in efficiency seeking ones.
Hypothesis 3	
Null hypothesis *(H_0)*	There is no company-specific difference in outcome of the performance of joint venture MNPCs compared to the local non-joint venture pharmaceutical company in the short run and long run
Alternative hypothesis *(H_α)*	There exits company-specific difference in outcome of the performance of joint venture MNPCs compared to the local

	non-joint venture pharmaceutical company in the short run and long run
Conclusion	*Null hypothesis (H_0) is rejected but we fail to reject the alternative hypothesis (H_α)*. We found divergence in the performance of MNPCs and those with purely domestic footprint - both in the short and the long run. JV arrangements were found to significantly influence the performance of MNPCs, but converse was found for purely domestic pharmaceutical companies.

The findings as regards the first research hypothesis was supported by the scatter graphs of joint ventures, and the three measures of firm performance showed a positive relationship between ROA and joint venture. Therefore, *the first objective of this study was achieved*. This is consistent with earlier studies by Kabajeh et al. (2012), who claim that pooled analysis of ROA, ROE and ROI ratios together revealed a strong and positive relationship with performance (market share price) in the study of Jordanian insurance public companies.

Furthermore, hypothesis 1 conformed with the findings of this study that joint ventures exert a positive influence on the performance of the MNPCs and is supported by the findings of Zamir et al. (2014), which confirm that joint venture alliances often trigger MNPCs to improve performance, the productive capacity of existing market products as well as attaining competitive advantage and increased profits.

Hypothesis 2 expressed the existence of significant outcomes in joint venture collaboration relationships with MNPCs and the performance. These outcomes were supported by the results analysis of the study. According to the evaluated firm-specific short-run dynamics as per the three different measures of firm performance (see section 5.4). It was indicated that, for GSK and Novartis, the joint venture has a positive influence on the performance of both MNPCs, irrespective of how firm performance is measured. However, the contrary relationship was observed in the case of Pfizer, Sanofi and Eli Lilly. The market-seeking motive as measured by market share has been a key driver of firm-level performance in GSK, Pfizer, Sanofi and Eli Lilly. The

efficiency-seeking motive had an adverse effect on firm performance for Eli Lilly and Pfizer, while the market-seeking objective has adversely affected the performance of Sanofi. Therefore, *the second objective of this study was achieved*.

Hypothesis 3 concluded that there exists company-specific differences in outcome of the performance of joint venture MNPCs compared to the local non-joint venture pharmaceutical companies in the short run and long run. At the individual firm level, there were company-specific differences that are consistent with earlier results (Table 5.9b). The joint venture has a positive influence on firm performance of GSK and Novartis in the short run, but has no equivalent influence on Eli Lilly, Pfizer and Sanofi over the period of study.

In some cases, MNPCs create a joint venture with another pharmaceutical company on a specific business portfolio, while the joint venture often achieves an increased performance based on such business portfolio. For example, in 2015, GSK and Novartis created a consumer healthcare joint venture collaboration in which GSK had a 36.5% stake. This joint venture increased the performance of the partners before the joint venture was dissolved in 2018 (Novartis, 2019). Analytically, this may be responsible for the positive influence of joint venture arrangements on performance outcome in GSK and Novartis in the short run.

The results of the sample-wide estimation as contained in Table 5.10a show that when firm performance was measured by ROI, the joint venture has a positive influence on the performance of the MNPCs in the long run. In the short run, none of the variables are statistically significant. The measure of performance by ROA, ROE and ROI reveal that the joint venture exerts a low but positive influence on the performance in the short run and exerts a significant positive influence on the performance of the MNPCs in the long run.

This outcome was consistent with the findings of Kabajeh et al. (2012), who examined joint venture relationship between ROA, ROE and ROI ratios, both in system and isolated estimations with JIPCs profit performance in the form of market share price. The results reveal a positive but low relationship between each ROA ratio separately, and ROI ratio separately with JIPCs profit performance.

The sample-wide results (Table 5.10a) show that the joint venture has a positive influence in the long run on the performance of Eli Lilly, GSK, Novartis, Pfizer and Sanofi, although actions undertaken by different MNPCs often surface in the explanation for the positive influence of joint venture arrangements on their performance in the long run as measured by ROA, ROE and ROI. For instance, Eli Lilly applied the virtual R&D model and claimed a reduction in capital requirements and financial risks, a reduction in overhead costs, a higher research project flexibility, coupled with limited infrastructure expenses. This action led to a reduction in both time expended and cost in pharmaceutical R&D (Owens, 2015) and resulted in a better joint venture performance.

In non-joint venture pharmaceutical companies, no joint venture collaboration agreements are in place. In the results of the sample-wide estimation for the ROA model, market share was the driver of the company performance. Market-seeking motives as measured by market share enhances firm-level performance both in the long run and the short run (Table 6.8a). Clicks enjoyed better performance in the long run and short run by capitalising and dominating the local pharmaceutical market through the establishment of about 620 facilities and the Clicks Club Card loyalty, with about 9.2 million active members in South Africa (Clicks Corporate Overview, 2021). Market-seeking motives drive the firm performance in the short run, when measured by ROE (Table 6.9a). These discussions reveal company-specific differences and indicate that *the third objective of this study was achieved*.

7.4 Conclusions

In practice, MNPCs engage in joint venture collaboration agreements to advance various motives, such as a market-seeking motive to increase market share, a knowledge-seeking motive to improve research and drug development, and an efficiency-seeking motive to acquire transfer of technology. The same cannot be said of the non-joint venture pharmaceutical companies investigated, where joint venture collaboration agreements were absent.

The non-joint venture companies operated the business as stand-alones, advancing the market-seeking, efficiency-seeking and knowledge-seeking efforts on design that fit the purpose and in response to the competitors and consumers.

The financial implications of engaging in joint venture collaborations by MNPCs was observed to go beyond the congenial appetite to grow the bottom-line, to include the cost-reduction of medicines and other pharmaceuticals to the consumers. Joint venture collaborations were a mode of entry into local markets with the purpose to dominate the market through competitive advantage.

The majority of MNPCs utilised joint venture collaboration as a strategy to augment local skills and expertise through R&D, and innovative collaboration with the local supply chain. However, the period under investigation revealed that most joint venture MNPCs have been experiencing the effect of off-patent period-end, drug pipeline contraction, the rising cost of research and drug development. In addition, the cost of production was observed to have created a shift in dynamics in the global pharmaceutical markets (Cohen et al., 2016).

These notable changes have resulted in a consequent response from MNPCs to consolidate manufacturing and marketing activities through the formation of joint venture collaboration agreements. However, the adverse effects the shifting dynamics placed upon MNPCs must be managed partly to maintain growth, increase scale, enhance inflow of revenue, increase market share and advance competitive advantage.

Consequently, it was observed that MNPCs have made joint venture collaborations a significantly important business practice (David, 2010), in an effort to satisfy the quest for equitable, cheaper and cost-effective pharmaceutical products in South Africa. The measurement and evaluation of the performance of joint venture collaboration MNPCs was restricted to the assessment of ROA, ROE and ROI as a departure from other studies.

The objectives of this study are as outlined below:

1. To examine the influence of joint venture collaboration on the performance of MNPCs by considering ROA, ROE and ROI as measures of performance.
2. To investigate the significant outcome of the relationship between joint venture collaboration and the performance of sampled MNPCs.

3. To examine any company-specific differences in performance of the joint venture MNPCs and local non-joint venture pharmaceutical companies in both the short run and long run.

The study was able to achieve its objectives. The study confirms that the formation of joint venture collaborations exert a significant but positive influence on the performance of MNPCs; as such, the first stated objective is achieved. The extent of performance by joint venture MNPCs observed is greater than the performance found with non-joint venture local pharmaceutical companies. This was not surprising because of the effect of data limitations, explained in section 1.7.

The findings of the study reveal that there is a significant relationship between the joint venture MNPCs and the performance measured. For example, in the joint venture collaboration between GSK and Novartis, the joint venture collaboration exerted a positive influence on the performance of both MNPCs, irrespective of how firm performance is measured. Hence, the second stated objective is achieved.

The findings of the study further reveal that joint venture collaboration is the driver of the performance in the long run and short run for all the MNPCs investigated, whereas market share and capital expenditure are the drivers of performance in the long run and short run for non-joint venture local pharmaceuticals investigated. Therefore, the third stated objective is achieved.

The empirical statistics and econometric diagnosis employed to ensure stability and ascertain the reliability of the findings were useful statistical tools for the study. The Pedroni residual cointegration test was used to gauge the relationship between the independent variables (JV, market share, R&D and capex) and dependent variables (ROA, ROE and ROI). This was a necessary test whether the dependent variables were cointegrated with the independent variables or not; but they were found to cointegrate.

The pooled mean group (PMG) technique was employed to estimate ROA, ROE and ROI models under ARDL cointegration tests. Both sample-wide and company-specific short-run dynamics were estimated, with an extended gauge of the speed of adjustment separately for each model.

The practical implications of the study reveal that managers of pharmaceutical companies in South Africa should consider the formation of joint venture collaborations between companies as a means to advance market share, innovations, and efficiency in performance. Joint venture collaborations exert a significant positive influence on the performance of MNPCs in South Africa.

The outcome of this study creates a possible business model option for South African pharmaceutical companies to tap into, using the techniques exhibited by the joint venture collaboration MNPCs to optimise the company performance.

7.5 Relevance and contribution of the study

The research study was conducted with datasets from secondary sources, most importantly from consolidated annual financial statements of the pharmaceutical companies under study over a period of 10 years (2010–19).

The documented literature was observed to focus widely on the structural formation of joint venture collaborations in various market segments locally and globally. Few literatures reported on the effects of joint venture collaboration on firm performance as measured by profitability ratios such as ROA, ROE and ROI, especially from the perspective of the pharmaceutical market segment in South Africa, thus creating a research gap.

Most research studies were recorded to have discussed extensively the administrative formation of joint venture collaborative arrangements (Nam, 2011; Andra & Broll, 2012; Mo, 2012; Nemeth & Nippa, 2013), but paid little or no attention to the influence of joint venture collaboration on firm performance.

To fill this gap, this study investigated the influence of joint venture collaborations on the performance of MNPCs specifically in South Africa. The joint venture firms were compared with non-joint venture firms to determine what drives firm performance in the long run as well as the short run.

Furthermore, this study revealed the research methodology approach, statistical diagnostic tools, and the econometric estimation tools suitable for the type of research study.

The findings from this study could be a useful source of knowledge with which managers of business, especially pharmaceutical companies, may ensure the performance of their firms and ultimately survival and growth in the long run. Also, to have the right strategic focus in the short run, using what drives firm performance in the short run. This research study, therefore, adds to the body of literature or knowledge in academia and business.

7.6 Recommendations from the study

The main recommendation from the study is that joint venture alliances could serve as a long-term survival strategy, since they have a positive long-term influence on firm performance. However, in the short run different dynamics play out. Market seeking motives or growth in market share emerges as the key strategy for enhanced firm performance in the short run. Efficiency seeking motives through increases in capital expenditure should be looked at very cautiously since it might not yield the returns expected on firm performance. This is the case for both joint venture and non-joint venture firms in the pharmaceutical industry. The findings of the study also reveal that there are firm-specific differences in outcomes, meaning emulating competitor strategies may not necessarily be optimal. Firms need to design competitive strategies unique to their peculiar circumstances and not just follow competitor innovation. This could lead to disastrous endings. The data limitations encountered in this study imply that firms should strive to keep accurate data, especially for R&D expenditure, which was missing for non-joint venture firms, as well as all other firm variables to enable comprehensive research that could help with evidence based business decisions to guide performance. A researcher intending to conduct a similar study design needs to ensure that the source of data is readily available and sufficient datasets are obtainable prior to embarking on the study investigation.

This study used consolidated annual financial statements due to challenges in data accessibility. It is recommended that prospect researchers on the subject are required to collect the annual financial statements contributed by the pharmaceutical division of the company.

To express a more accurate generalisation of phenomena, this report recommends that prospective researchers in the field increase the period of investigation beyond the 10 years investigated in this study. Also, the sample size should be increased.

The scope of the study is limited to the variables intended to be investigated. The profitability ratios as dependent variables were limited to ROA, ROE and ROI. The independent variables were limited to joint venture (percentage ownership interest holding), R&D, revenue (market share) and capex. The prospective researchers may widen the scope of study beyond the scope reported in this study.

7.7 Recommendations for future study

Some challenges were confronted during this study. Therefore, it is useful to present these challenges as a recommendation for further research. Certain discrepancies were observed during the interpretation of the results, although these were traced to differences in internal accounting and reporting standards of some local non-joint venture pharmaceutical companies under study.

These discrepancies are discussed extensively in sections 1.7 and 4.3.2. above. The discrepancies related to Ascendis Health, Clicks and Life Healthcare not reporting data relating to R&D. As a result, HCD expenditure was adopted as a proxy to explain the knowledge-seeking objective on local non-joint venture pharmaceutical companies under investigation.

It is recommended that future researchers on the subject consider a careful selection of the study variables.

In conclusion, this study adopted a quantitative methodology as a research design to investigate the influence of joint venture collaborations on the performance of MNPCs as documented. This researcher recommends the use of a mixed methodology (a combination of a quantitative and qualitative approach). This is because oral conversation and the opinions of decision-makers in the pharmaceutical companies may add more useful information or value to the study.

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ANNEXURE A

UNISA university of south africa

UNISA ETHICS REVIEW COMMITTEE

12 June 2020

NHREC Registration # : (if applicable)
ERC Reference # 2019_CEMS_BM_096
Name : Bolaji Mufutau Ayoku
Student #35957093
Staff #N/A

Dear Mr Bolaji Mufutau Ayoku

Decision: Ethics Approval from 12 June 2020 to 12 June 2025

Researcher(s): Name: Mr Bolaji Mufutau Ayoku
E-mail address: bolajiayoku16@gmail.com
Telephone # 071 348 2535

Supervisor(s): Name: Prof RA Aregbeshola
E-mail address # aregbra@unisa.ac.za
Telephone # (012) 429-8505

Working title of research:

Strategic influence of joint venture on the performance of multinational pharmaceutical companies in South Africa

Qualification: PhD degree

Thank you for the application for research ethics clearance by the Unisa Ethics Review Committee for the above-mentioned research. Ethics approval is granted for 5 years.

*The **low risk application** was reviewed by a Sub-committee of URERC on 08 June 2020 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment. The decision will be tabled at the next Committee meeting on 22 July 2020 that this application was approved on 08 June 2020.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa

Open Rubric

2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's Act, no 38 of 2005, and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
8. No field work activities may continue after the expiry date 12 June 2025. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number 2020_CEMS_BM_096 *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

D. Visser

Chairperson: Prof Thea Visser
Department of Business Management
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Executive Dean: Prof Thomas Mogale
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ANNEXURE B

Adcock Ingram Holdings (financial year end: 30 June)

ZAR (million) Financial year	*2010 (06)*	*2011 (12)*	*2012 (12)*	*2013 (12)*	*2014 (09)*	*2015 (12)*	*2016 (06)*	*2017 (06)*	*2018 (06)*	*2019 (06)*
Net Income (PAT)	643.22	792,952	719,076	601,230	962,156	198.80	379.38	519.98	644.07	697.03
Total Assets (TA)	4,757.34	4,453.560	4,599.240	5,445.63	3,615.28	5,528,360	5,949,500	5,936,050	6,540,250	7,164,690
$roa = \left[\frac{pat}{ta}\right].100$	13.5%	17.8%	15.6%	11.0%	26.6%	3.6%	6.4%	8.8%	9.8%	9.7%
Total Equity	3,073.34	3,223.380	3,560.690	3,780.860	2,857.479	3,116.920	3,254.590	3,495.000	3,914.910	4,298.190
$roe = \left[\frac{pat}{te}\right].100$	20.9%	24.6%	20.2%	15.9%	33.7%	6.4%	11.6%	14.9%	16.4%	16.2%
Cost of Investment	151.21	16,890	26,872	12,613	6,506	10,670	9,179	5,979	4,340	3,864
$roi = [\Delta CoI /CoI].100$	0.0%	0.0%	37.1%	-113.0%	-93.9%	39.0%	-16.2%	-53.5%	-37.8%	-12.3%

Revenue	4,440.65	4,453.56	4,559.24	5,445.63	3,615.28	5,528.36	5,949,50	5,936.05	6,540.25	7,164.69
$\boldsymbol{Capex} = Fxa - dpr$	755.88	1,066.88	1,460.85	1,614.65	1,447.08	1,355.09	1,285.77	1,304.70	1,362.86	1,385.13
R&D	65.28	70.72	81.60	104.94	81.09	119.28	0	0	0	0
HCD	3.448.5	0	0	0	0	0	0	0	0	0

Source: Adapted from consolidated annual financial statements (IRESS / McGregor).

Ascendis Health (financial year end: 30 June)

ZAR (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)					140,169	209,987	190,081	378,296	495,564	4,754,692
Total Assets (TA)					2,556,573	3,647,707	5,721,719	14,486,617	15,877,071	11,331,003
$roa = \left[\frac{pat}{ta}\right].100$					5.4%	5.7%	3.3%	2.6%	3.1%	41.9%

Total Equity (TE)					1,212,720	1,824,238	2,455,042	5,296,342	6,794,109	2,130,622
$roe = \left[\frac{pat}{te}\right].100$					11.5 %	11.5%	7.7%	7.1%	7.3%	223.2%
Cost of Investment					48,133	0	386	8,078	24,279	51,732
$roi = [\Delta CoI / CoI].100$					0.0%	0.0%	100.0%	95.2%	66.7%	53.1%
Revenue					1,617.946	2,816.717	3,918.432	6,435.027	7,954.985	8,055.767
$\boldsymbol{Capex} = Fxa - dpr$					76.444	126.111	335.086	897.397	1,008.589	434.160
R&D					1.837	2.281	2.489	4.299	13.293	14.355

HCD										

Source: Adapted from consolidated annual financial statements (IRESS / McGregor).

Clicks (financial year end: 30 August)

ZAR (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (pat)	563.81	650.965	688.38	751.568	864.845	954.575	1,093.872	1,277.642	1,475.210	1,702.914
Total Assets (ta)	4,110.13	4,254.783	4,776.412	5,449.408	6,192.257	7,555.938	8,376.896	9,721.115	11,564.077	13,054.675
$roa = \left[\frac{pat}{ta}\right].10$	13.7%	15.3%	14.4%	13.8%	14.0%	12.6%	13.1%	13.1%	12.8%	13.0%

Total Equity (te)	1,141.32	965.187	1,348.904	1,376.838	1,566.973	2,012.807	2,452.241	3,300.350	4,427.868	4,912.810
$roe = \left[\frac{pat}{te}\right].10$	49.3%	67.4%	51.0%	54.6%	55.2%	47.4%	44.6%	38.7%	33.3%	34.7%
Cost of Investment	23.40	5.73 23.407	12.49	12.105	35.16	29.67	45.94	52.11	117.52	105.59
$roi = [\Delta CoI /CoI].100$	0.0%	0.0%	54.1%	-3.2%	65.6%	-18.5%	35.4%	11.8%	55.7%	-11.3%
Revenue	13,276.27	14,102.919	15,436.947	17,543.301	19,149.524	22,070.092	24,170.879	26,809.101	29,239.688	31,352.109

$\boldsymbol{Capex} = Fxa - dpr$	768.57	806.799	843.300	866.636	933.238	1,003.115	1,107.200	1,274.278	1,554.163	1,723.663
HCD	1,438.05	0	0	0	0	0	0	0	0	0

Source: Adapted from consolidated annual financial statements (IRESS / McGregor).

Life Healthcare (financial year end: 30 September)

ZAR (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)	835.21	1493	1743	2004	3098	2228	1970	1119	1914	2871
Total Assets (TA)	7872.00	8468	9256	9969	11813	15935	17497	36639	39142	37566

$roa = \left[\frac{pat}{ta}\right].100$	10.6%	17.6%	18.8%	20.1%	26.2%	14.0%	11.3%	3.1%	4.9%	7.6%
Total Equity (TE)	3515.17	4384	4878	5606	5900	6448	6798	15551	16202	17491
$roe = \left[\frac{pat}{te}\right].100$	23.7%	34.1%	35.7%	35.7%	52.5%	34.6%	29.0%	7.2%	11.8%	16.4%
Cost of Investment	0	0	1098	1178	828	2311	2548	2976	35	53
$roi = [\Delta CoI /CoI].100$	0.0%	0	100%	6.8%	-42.3%	64.2%	9.3%	14.4%	-8402.8%	34.0%
Revenue	8336.15	9812	10937	11834	13046	14647	16567	20967	23488	25672

$\boldsymbol{Capex} = Fxa - dpr$	2994	3753	4010	4517	5901	7101	7752	11131	12243	12969
HCD	6081.61	0	0	0	0	0	0	0	0	0

Source: Adapted from consolidated annual financial statements (IRESS / McGregor).

Eli Lilly (financial year end: 31 December)

US$ (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)		4,347.7	4,088.6	4,684.8	2,390.5	2,408.4	2737.6	(204.1)	3,232.0	8,318.4
Total Assets (TA)		33,659.8	34,398.9	35,248.7	37,178.2	35,568.9	38,805.9	44,981.0	43,908.4	39,286.1
$roa = \left[\frac{pat}{ta}\right].100$	17.7%	13.0%	11.9%	13.3%	6.4%	6.8%	7.1%	-0.5%	7.4%	21.2%

Total Equity (TE)		13,535.6	14,773.9	17,640.7	15,388.1	14,509.3	14,080.5	11,667.9	10,909.1	2,699.1
$roe = \left[\frac{pat}{te}\right].100$	46.1%	32.1%	27.7%	26.6%	15.5%	16.6%	19.4%	-1.7%	29.6%	308.2%
Cost of Investment (CoI)		4,029.8	6,313.3	7,624.9	4,568.9	3,646.6	5,207.5	5,678.8	2,005.4	1,962.4
$roi = [\Delta CoI /CoI].100$	25.4%	55.8%	36.2%	17.2%	-66.9%	-25.3%	30.0%	8.3%	-183.1%	-2.2%
Revenue	23,076.0	24,286.5	22,603.4	23,113.1	19,615.6	19,958.7	21,222.1	22,871.3	21,493.3	22,319.5
$\boldsymbol{Capex} = Fxa - dpr$	436.6	672.0	905.4	1,012.1	1,162.6	1,066.2	1,037.0	8,826.5	7,996.1	7,872.9
R&D	4884.2	5,020.8	5,278.1	5,531.3	4,733.6	4,796.4	5,243.9	5,281.8	5,051.2	5,595.0

JV		4.5							19.8	80.2

Source: Adapted from consolidated annual financial statements.

GlaxoSmithKline (financial year end 31 December)

UK £ (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)		5,458	4,744	5628	2,831	8,372	1,062	2,169	4,046	5,368
Total Assets (TA)		41,080	41,475	42,086	40,651	53,446	59,081	56381	58066	79,692
$roa = \left[\frac{pat}{ta}\right].100$	1.2%	13.3%	11.4%	13.4%	7.0%	15.7%	1.8%	3.8%	7.0%	6.7%
Total Equity (TE)		8,827	6,747	7,812	4,936	8,878	4,963	3,489	3,672	18,357

$roe = \left[\frac{pat}{te}\right].100$	19.0%	61.8%	70.3%	72.0%	57.4%	94.3%	21.4%	62.2%	110.2%	29.2%
Cost of Investment (CoI)		1,150	1,366	1,525	1,454	1,462	1,248	1,101	1,558	2,151
$roi = [\Delta CoI /CoI].100$	1.2%	55.8%	15.8%	10.4%	-4.9%	0.5%	-25.2%	-13.4%	29.3%	27.6%
Revenue	28,392.0	27,387	26,431	26,505	23,006	23,923	27,889	30,186	30,821	33,754
$\boldsymbol{Capex} = Fxa - dpr$	7,592.0	8,748	8,776	8,872	9,052	9,668	10,808	10,860	11,058	10,348
R&D	4457.0	4,009	3,968	3,923	3,450	16.0	3,628	4,476	3,893	4,568
JV			50.0%			63.5%	55.0%		68.0%	

Source: Adapted from consolidated annual financial statements.

Novartis (financial year end 31 December)

US$ (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)		9,245	9,618	9,292	10,280	17,794	6,698	7,703	12,614	11,737
Total Assets (TA)		117,496	124,216	126,254	125,387	131,556	130,124	133,079	145,563	118,370
$roa = \left[\frac{pat}{ta}\right].100$	8.1%	7.9%	7.7%	7.4%	8.2%	13.5%	5.1%	5.8%	8.7%	9.9%
Total Equity		65,940	69,219	74,472	70,844	77,122	74,891	74,227	78,692	55,551
$roe = \left[\frac{pat}{te}\right].100$	14.3%	14.0%	13.9%	12.5%	14.5%	23.1%	8.9%	10.4%	16.0%	21.1%

Cost of Investment		8,622	8,840	9,225	8,432	15,314	14,304	15,370	8,352	8,644
$roi = [\Delta CoI / CoI].100$	4.2%		2.5%	4.2%	-9.4%	44.9%	-7.0%	6.9%	-84.0%	3.4%
Revenue	50,624.0	59,375	57,561	52,716	52,419	49,440	49,436	50,135	46,099	48,677
$\boldsymbol{Capex} = Fxa - dpr$	14,488.0	15,627	16,939	18,197	15,983	15,982	15,641	16,464	15,696	12,069
R&D	9070.0	9,583	9,332	9,071	9,086	8,935	9,039	8,972	8,489	9,402
JV						36.5%				

Source: Adapted from consolidated annual financial statements.

Pfizer Inc. (financial year end 31 December)

US$ (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)		10,009	14,570	22,003	9,135	6,960	7,215	21,308	11,153	16,273
Total Assets (TA)		188,002	185,798	172,101	169,274	167,381	171,615	171,797	159,422	167,489
$roa = \left[\frac{pat}{ta}\right].100$	4.2%	5.3%	7.8%	12.8%	5.4%	4.2%	4.2%	12.4%	7.0%	9.7%
Total Equity		82,621	81,678	76,620	71,622	64,998	59,840	71,656	63,758	63,447
$roe = \left[\frac{pat}{te}\right].100$	9.4%	12.1%	17.8%	28.7%	12.8%	10.7%	12.1%	29.7%	17.5%	25.6%

Cost of Investment		23,270	22,319	30,225	32,779	19,649	15,255	18,650	17,694	8,525
$roi = [\Delta CoI / CoI].100$	0.0%	-12.9%	-4.3%	26.2%	7.8%	-66.8%	-28.8%	18.2%	-5.4%	-107.6%
Revenue	67,809.0	65,259	58,986	51,584	49,605	48,851	52,824	52,546	53,647	51,750
$\boldsymbol{Capex} = Fxa - dpr$	14,778.0	15,921	14,461	12,397	11,762	13,766	13,318	13,865	13,385	13,967
R&D	9,413.0	9,074	7,870	6,678	8,393	7,690	7,872	7,683	8,006	8,650
JV			13.5%						32.0%	

Source: Adapted from consolidated annual financial statements.

Sanofi (financial year end 31 December)

€ (million)	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Net Income (PAT)		5,934	5,136	3,874	4,509	4,388	4,800	8,537	4,410	2,837
Total Assets (TA)		100,668	100,407	96,055	97,392	102,321	104,679	99,813	111,408	112,736
$roa = \left[\frac{pat}{ta}\right].100$	6.7%	5.9%	5.1%	4.0%	4.6%	4.3%	4.6%	8.6%	4.0%	2.5%
Total Equity		56,373	57,472	57,033	56,268	58,210	57,722	58,239	59,035	59,108
$roe = \left[\frac{pat}{te}\right].100$	10.7%	10.5%	8.9%	6.8%	8.0%	7.5%	8.3%	14.7%	7.5%	4.8%
Cost of Investment		807	487	448	2,384	2,676	2,892	2,847	3,402	3,591

$roi = [\Delta CoI / CoI].100$	0.2%	14.5%	-65.7%	-8.7%	81.2%	10.9%	7.5%	-1.6%	16.3%	5.3%
Revenue	32,367.0	35,058	35,957	31,391	31,999	34,861	34,696	36,221	35,677	37,631
$\boldsymbol{Capex} = Fxa - dpr$	9,398.0	10,750	10,578	10,182	10,396	9,943	10,019	9,579	9,651	9,717
R&D	4,547.0	4,811	4,922	4,605	4,667	5,082	5,172	5,472	5,894	5,529
JV		51.0%					50.0%			

Source: Adapted from consolidated annual financial statements.

$$roa = \left[\frac{pat}{ta}\right].100$$

Where, roa = return on asset,

pat = profit after tax (net income),

ta = total assets

$$roe = \left[\frac{pat}{te}\right].100$$

Where, roe = return on asset,

pat = profit after tax (net income),

te = total equity.

$$roi = [\,\Delta CoI/CoI].100$$

Where roi = return on investment,

$\Delta\, CoI = \ CoI\text{-}\ CoI\text{^}$

$CoI\text{^}$ = previous cost of investment,

CoI = current cost of investment.

$$Capex = Fxa - dpr$$

Where $Capex$ = Capital expenditure,

Fxa = fixed asset,

dpr = depreciation (straight-line).