https://dspace.org/

E-learning as an innovative platform for medical doctors in South Africa

Pillay, Terence

2021
https://hdl.handle.net/10539/32667

Downloaded from a DSpace repository. https://dspace.org/

E-learning as an innovative platform for medical doctors in South Africa

Student: Terence Pillay

Supervisor: Laurence Beder

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management specialising in Strategic Marketing

Johannesburg, 2020

ABSTRACT

E-learning could be an innovative continued medical education platform for medical doctors in South Africa, especially now with the COVID-19 pandemic and its effects on physical contact between pharmaceutical companies' representatives and doctors. This study aimed to determine and develop a more effective way to reach and provide accurate, credible education for all doctors using an e-learning platform as an alternative to representative visits.

This research involved a quantitative study, deploying a survey to a sample of 456 doctors in South Africa via an online platform.

The results arising from the analyses to prove the three hypotheses were statistically significant, and all were accepted. In summary doctors in South Africa valued their relationships with medical representatives, but simultaneously questioned the credibility of the education received from the representatives. Many doctors accessed the internet for their own education as one of their channels of education.

In view of the research findings, an innovative e-learning platform is proposed to deliver continued medical education to all doctors and to allow for best practices sharing across the medical fraternity in South Africa.

DECLARATION

I, Terence Pillay, declare that this research report is my own work except as indicated in the references and acknowledgments. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Strategic Marketing at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree in this or any other university.

T. Pillay

_____

Terence Pillay

Signed at Ascot, Berkshire, United Kingdom

On the 29th day of August 2020

DEDICATION

This report is dedicated to Lena Pillay who never stopped motivating and reminding me of the journey I started and why I had to finish it. She allowed me to be me. Thank you for lending yourself to me and for being the spine as I wrote this chapter of our life.

ACKNOWLEDGEMENTS

My heartfelt and sincere appreciation goes to the following key instrumental people who made this research report a success:

- Mr Laurence Beder, my supervisor. Your words of motivation, patience and coaching that we will get through, helped me to breathe a little more and press on;
- My mum and dad for an indescribable gift. ‘Go for it, Dream Big!’ will always resonate with me;
- Noah Liam Pillay and Gianna Cara Pillay who afforded me the time to focus on what needs to get done, ‘Oh the places we will go’; and
- Zak Ahmed Baig for saying ‘YES’.

TABLE OF CONTENTS

ABSTRACT I

DECLARATION II

DEDICATION III

ACKNOWLEDGEMENTS IV

TABLE OF CONTENTS V

LIST OF TABLES VIII

LIST OF FIGURES X

CHAPTER 1: INTRODUCTION 1

1.1 PURPOSE OF THE STUDY 1

1.2 THEORETICAL BACKGROUND TO THE STUDY 1

1.2.1 DIFFUSION OF INNOVATIONS MODEL 1

1.2.2 TECHNOLOGY READINESS INDEX 2

1.3 CONTEXT OF THE STUDY 2

1.4 PROBLEM STATEMENT 6

1.4.1 SUB-PROBLEM 1 6

1.4.2 SUB-PROBLEM 2 6

1.5 SIGNIFICANCE OF THE STUDY 7

1.6 DEFINITION OF TERMS 8

1.7 CONTRIBUTION OF THE STUDY 9

CHAPTER 2: LITERATURE REVIEW 10

2.1 INTRODUCTION 10

2.2 DIFFUSION OF INNOVATIONS MODEL 10

2.3 TECHNOLOGY READINESS INDEX 14

2.4 DETAILING TO HEALTHCARE PROFESSIONALS 22

2.5 BARRIERS TO INNOVATIONS 27

2.5.1 RELATIVE ADVANTAGE 29

2.5.2 COMPATIBILITY 29

2.5.3 COMPLEXITY 30

2.5.4 TRIAL-ABILITY 30

2.5.6 OBSERVABILITY 30

2.6 DETAILING REPRESENTATIVES ADDING VALUE TO CME OF DOCTORS 32

2.7 ACADEMIC DETAILING TO IMPROVE CLINICAL DECISION-MAKING 39
2.8 E-LEARNING AS A SOURCE OF DETAILING AND EDUCATING DOCTORS 45
2.9 E-LEARNING AS A SELF-DIRECTED EDUCATIONAL TOOL FOR DOCTORS 53
2.10 EFFECTS OF THE COVID-19 PANDEMIC 56
2.11 CONCEPTUAL MODEL OF ANALYSIS 61
2.11.1 HYPOTHESIS 1 62
2.11.2 HYPOTHESIS 2 62
2.11.3 HYPOTHESIS 3 62
2.12 CONCLUSION OF LITERATURE REVIEW 62

CHAPTER 3: RESEARCH METHODOLOGY 66

3.1 INTRODUCTION 66
3.2 RESEARCH METHODOLOGY 66
3.3 RESEARCH APPROACH / PARADIGM 66
3.4 RESEARCH DESIGN 69
3.5 POPULATION AND SAMPLE 70
3.5.1 POPULATION 70
3.5.2 SAMPLE AND SAMPLING METHOD 70
3.6 THE RESEARCH INSTRUMENT 70
3.7 PROCEDURE FOR DATA COLLECTION 72
3.8 DATA ANALYSIS 72
3.9 VALIDITY AND RELIABILITY 73
3.9.1 EXTERNAL VALIDITY 74
3.9.2 INTERNAL VALIDITY 74
3.9.3 RELIABILITY 75
3.10 LIMITATIONS OF THE STUDY 76

CHAPTER 4: PRESENTATION OF RESULTS 77

4.1 INTRODUCTION 77
4.2 DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS 77
4.2.1 GENDER 77
4.2.2 HOME LANGUAGE 78
4.2.3 PROVINCE OF PRACTICE 79
4.2.4 PRACTICE SECTOR 80
4.3 DESCRIPTIVE STATISTICS 81
4.3.1 ATTITUDE TOWARDS DETAILING REPRESENTATIVES 81
4.3.2 SOURCE OF INFORMATION FOR DOCTORS 83
4.3.3 E-LEARNING BEHAVIOUR OF DOCTORS 84
4.4 FACTOR ANALYSIS 85
4.5 RELIABILITY ANALYSIS 87
4.6 TESTING FOR DIFFERENCES BETWEEN GROUPS 88
4.6.1 DOCTORS' GENDER 88
4.6.2 DOCTORS' PRACTICE SECTOR 90
4.7 CORRELATION ANALYSIS 90

4.8 MULTIPLE REGRESSION 94
4.8.1 PREDICTION LEVEL OF EDUCATION 94

CHAPTER 5: DISCUSSION OF RESULTS 95

5.1 INTRODUCTION 95
5.2 DEMOGRAPHIC PROFILE OF RESPONDENTS 95
5.3 HYPOTHESIS TESTING 95
5.3.1 HYPOTHESIS 1 96
5.3.2 HYPOTHESIS 2 97
5.3.3 HYPOTHESIS 3 98
5.4 CONCLUSION 100

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS 102

6.1 INTRODUCTION 102
6.2 CONCLUSIONS OF THE STUDY 102
6.2.1 E-LEARNING PLATFORMS DELIVER ACCESSIBLE, CREDIBLE EDUCATIONAL CONTENT TO ALL DOCTORS 102
6.2.2 FACE-TO-FACE DETAILING CONTRIBUTES TO CREDIBLE VALUABLE EDUCATION TO DETAILED DOCTORS IN THEIR CLINICAL DECISION-MAKING PROCESS 103
6.2.3 THE POSITIVE RELATIONSHIP BETWEEN FACE-TO-FACE DETAILING AND E-LEARNING PLATFORMS CONTRIBUTE TO THE EDUCATION OF DOCTORS 104
6.3 IMPLICATIONS OF THE STUDY 105
6.3.1 THEORETICAL IMPLICATIONS 105
6.3.2 MANAGERIAL IMPLICATIONS 106
6.3.3 COVID-19 IMPLICATIONS 106
6.4 RECOMMENDATIONS FOR FUTURE E-LEARNING 107
6.4 SUGGESTIONS FOR FUTURE RESEARCH 108

REFERENCES 109

APPENDIX A – RESEARCH INSTRUMENT 118

APPENDIX B – RESEARCH COVER LETTER 122

APPENDIX C – FACTOR ANALYSIS AND RELIABILITY 124

APPENDIX D – CORRELATION ANALYSIS AND MULTIPLE REGRESSION ANALYSIS 126

LIST OF TABLES

Table 1: Gender distribution 77

Table 2: Home language 78

Table 3: Province of practice 80

Table 4: Practice sector 80

Table 5: Agreement scale: Attitude towards detailing representatives 82

Table 6: Mean and standard deviation: Attitude towards detailing representatives 82

Table 7: Agreement scale: Source of information 83

Table 8: Mean and standard deviation: Source of information 84

Table 9: Agreement scale: E-learning behaviour 84

Table 10: Mean and standard deviation: E-learning behaviour 85

Table 11: KMO and Bartlett test results 86

Table 12: Factor analysis results 87

Table 13: Cronbach's alpha values 88

Table 14: Gender t-test results 90

Table 15: Sector t-test results 90

Table 16: Correlation analysis: Attitude towards detailing representatives 92

Table 17: Correlation analysis: E-learning behaviour 93

Table 18: Correlation analysis: Source of information 93

Table 19: Multiple regression analysis: Education 94

Table 20: Multiple regression coefficient analysis 94

Table 21: Correlation analysis for source of information 96

Table 22: Attitude towards doctor detailing representatives 97

Table 23: Multiple regressions coefficient analysis 99

LIST OF FIGURES

Figure 1: Triangle and pyramid models of services marketing 18

Figure 2: HHK's multi-faceted paths 32

Figure 3: Prescribing behaviour change before and after academic detailing 41

Figure 4: Study periods and academic detailing 43

Figure 5: Effect of academic detailing on antibiotics prescriptions 45

Figure 6: Selected e-detailing approaches 48

Figure 7: Benefits and challenges of e-detailing in Europe 49

Figure 8: Spectrum of communication options 50

Figure 9: Key messages in the product life cycle 51

Figure 10: Motivations for physicians searching on internet 55

Figure 11: Factors important to physicians in accessing online CMEs 56

Figure 12: Conceptual model of analysis 62

Figure 13: Gender distribution 78

Figure 14: Home language 79

Figure 15: Practice sector 81

CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

The purpose of this research was to establish whether e-learning could be an innovative continued medical education platform for medical doctors in South Africa. The e-learning platform was examined to establish its effect on doctors' medical education. In view of the COVID-19 pandemic in 2020, this research also investigated its impact thus far on doctors' e-learning.

1.2 Theoretical background to the study

This study has theoretical roots in two primary domains (Singh, 2014).

1.2.1 Diffusion of innovations model

This model by Rogers (2003) explains how an innovation spreads via communication channels to members in a social system, which resonates with the medical profession. The origins of this model are attributed to the behavioural sciences. The diffusion of innovations model looks at four elements, which are innovation, communication channels, time, and social systems. Rogers (2003) defined an innovation as an idea, practice, or project that an individual is exposed to for the first time. The innovation could have existed for a long time, but the first time experience for the user makes it an innovation for that person.

Diffusion is how the adoption of the innovation takes place. Communication channels are segmented into localite and cosmopolite channels that communicate between an individual of a social system and outside resources. Time is a critical factor in the innovation – diffusion process, as it puts the innovation in a category and shows its rate of adoption. Rogers (2003) defined the social system as set of interrelated units trying to solve a common problem and accomplish a goal. This is what doctors in the medical professional do daily,

working cross-functionally with different faculties to solve a common medical problem.

1.2.2 Technology readiness index

The conceptual framework for classifying innovations comprises (a) continuous innovations, (b) dynamically continuous innovations, and (c) discontinuous innovations (Robertson, 1967). A continuous innovation has the least interruption to a pattern. This can be an alteration to a product and not the establishment of new product. A dynamically continuous innovation has more disruption than a continuous innovation, although generally not altering established patterns. It may involve the creation of a new product or the alteration of an existing product. A discontinuous innovation involves an establishment of a new product and the establishment of new behaviour patterns. The e-learning platform to educate doctors will be a discontinuous innovation as this will be a new educational platform to change behaviour patterns of doctors to embrace and be educated online. The technology readiness index was adopted in this research to look at the readiness of doctors to adopt the new e-learning platform (Parasuraman & Colby, 2015). This platform caters for the gaps in their medical education and affords doctors an opportunity to be educated at a convenient time and in a comfortable situation.

1.3 Context of the study

The formal educational requirement for doctors to qualify takes an average of six to eight years after completing their school education. To keep up-to-date on the latest clinical findings and education thereafter, they attend conferences, advisory boards, and focus group meetings. The invitations to these meetings are done through targeting and selection by pharmaceutical companies. Doctors are identified by the potential of their prescription habits and influence on the market share. Medical representatives are then trained and educated to call on these doctors and detail to them the latest clinical advancements in medicine and

product benefits. The aim of the representative is to get doctors to script the company's product more frequently (Soumerai & Avorn, 1990).

Doctors that are not visited by representatives must access other means of educational sources. Some doctors do not have the time to see medical representatives due to their busy schedules, however still need to fill the gap in their education and attain continued professional development points. The manner in which pharmaceutical companies establish relationships and call on doctors is called to question by many doctors who see this as an unethical practice and refuse to see representatives (Gonul, Carter, Petrova, & Srinivasan, 2001). Doctors need to be at forefront of the latest discoveries in medicine to prescribe their patients with the safest and most effective drugs thus ensuring an efficient treatment plan.

In the 1920s, many studies looked at the education of healthcare professionals and including modern science into medical faculties in universities. These teaching schools looked at equipping health professionals with knowledge that would double the life span of the 20th century (Frenk et al., 2010). This created a wave of medical teaching universities to be opened in United States (US) and Canada, which filtered into Europe with the vision of sharing advancements in medical science and discoveries equitably. In the twenty-first century, this has still not been achieved and there are major gaps in sharing of information and knowledge.

Medical science is advancing with clinical breakthroughs, and new diseases and health conditions emerging. The migration of people from one geographical location to the next brings with it complexities in healthcare treatment throughout the world. Worldwide healthcare systems are being overburdened with the shortage of staff. The professional education of healthcare workers has not kept pace with the changing environment. The divide in wealth among countries, and the migration of doctors from one region to another has increased the divide of transferring education, knowledge, skills, and new reforms in medicine evenly (Frenk et al., 2010).

Health is all about people and it involves one set of professionals providing a community and societal service to another set of unhealthy individuals. The relationship between doctor and patient is based on ethical standards, trust, and the educational competence of the medical professional. There is a multifaceted channel of events with the aim of delivering high quality care; the medical doctor needs ongoing education on the latest trends in medicine, so that the patient gets the best treatment. Uniform education for all medical doctors should deliver effective clinical practice to patients. This is not happening in the healthcare industry. Pharmaceutical companies are targeting doctors according to their scripting habits and using script data from data mining companies like IMS Health (Fugh-Berman & Ahari, 2007) to target doctors and drive the company's market share. Doctors are being targeted by pharmaceutical representatives according to the script share data, from which marketing and sales strategies are put into place with the aim of driving profit from sales. On average, a representative will see between six and eight doctors per day, spending between five and eight minutes detailing doctors. The line-up of the detail call is usually two products, with a third product as a leave behind reminder (Soumerai & Avorn, 1990).

The medical doctors at the top of the healthcare pyramid become the key opinion leaders on a specific therapeutic area and are given preferential treatment to attend conferences and invited to be keynote speakers. Medical advancements remain within the elite targeted doctors and key opinion leaders. Many doctors, who are not the highest prescribers in a category, are not included in the invitations to CME meetings (Fugh-Berman & Ahari, 2007). Many medical doctors are migrating to the cities to generate a higher income and thus become high script generators. Pharmaceutical companies use the Pareto principle and target doctors accordingly, thus decreasing their resources for reaching doctors in rural and country settings. Some representatives make a country visit once a month to target these doctors, and are fortunate doctors is in their practice on that day. This segmented targeting of doctors is creating a further gap in continued professional development of doctors not targeted by pharmaceutical companies.

As time proceeds, the lack of CME increases and the new and latest advancements in medical science does not reach doctors. This has been a major issue from as early as 1910, as mentioned in the Flexner report to the Carnegie Institute on medical education (Flexner, 2002). In the spirit of Abraham Flexner, the 2010 report had a similar idea of reform in medical education, that the report would generate some excitement on the reform of innovation in education for graduate and undergraduate medical professionals.

Three US reports have had powerful effects on the professional health education in North US and this has spread to the rest of the world: the Flexner report of 1910, the Welch-Rose report of 1915, and the Goldmark report of 1923 (Frenk et al., 2010). All these reports called for major instructional reforms to allow modern medical sciences into the core curriculum, to link education to research, and to base professional education in universities.

To cater for the gap in doctors' continued medical education (CME) and to gain their continued professional development points, the e-learning platform could bring about a reform in their medical education. This innovation would give access to education irrespective of them being seen by medical representatives or attending CME activities. This would remove the discrepancy by pharmaceutical companies of only educating detailed doctors, and allow doctors the opportunity to manage their time effectively and avoid unethical business practices, thus focussing on the science of medicine and the best treatment options for patients. In view of the COVID-19 pandemic in 2020, this research considered its effect on detailing representative visits, and made a recommendation on curbing the impact of COVID-19 on doctors' e-learning.

Before the 2010 Flexner report, there were numerous developments on the future of education of medical doctors and health professionals on a local and international level. This gave rise to four sets of reports stressing the importance of medical reforms in education driven by the Millennium Development Goals (MDGs). The main objectives of these reports called for more competency-based programs, the sharing of best practices, and finally IT led, empowered learning. These reports recommended an increased investment in education and training,

sharing of resources, and a global interdependent world of health professionals (Frenk et al., 2010).

In the education of doctors, the following constructs were critical in this research:

- E-learning;
- Innovation;
- Detailing;
- Technology readiness;
- Continued professional development;
- CME; and
- Key opinion leaders.

1.4 Problem statement

There is a need for CME of all doctors on clinical and product knowledge in the pharmaceutical industry (Soumerai & Avorn, 1990).

The main problem is to determine and develop a more effective way to reach and provide accurate, credible education for all doctors using an e-learning platform as an alternative to representative detailing visits.

1.4.1 Sub-problem 1

To determine whether there is a preference by medical doctors to utilise visiting doctor detailing representatives for their education or an e-learning platform.

1.4.2 Sub-problem 2

To determine if there is a positive correlation between the impact of e-learning behaviour on doctors education and clinical decision-making.

1.5 Significance of the study

The objectives of the study included the following:

- The main objective of the study was to emphasise the critical role that an innovation in e-learning contributes to the CME of medical doctors (Frenk et al., 2010). Medical institutions face the challenge of educating doctors for tomorrow due to less teaching time available at medical schools. It is also evident that there is a gradual movement from classroom face-to-face teaching to a more self-directed learning approach (Ruiz, Mintzer, & Leipzig, 2006). In view of this, e-learning provides an innovative solution to their CME.

- The second objective of this study was to propose an innovative e-learning platform that doctors throughout the world can log into in the comfort of their home and at their chosen time to continue their ongoing education.

This study looked at the evidence of the effectiveness of e-learning in getting a key clinical message across to doctors, and contributing to their education on scripting the safest and most effective drug for their patients.

The way learning is delivered to doctors is the major advantage of e-learning, with content being available in real time, as new clinical findings are discovered, content is standardised and approved by medical associations, content is easily distributed, and accountability for learning rests with doctors (Ruiz et al., 2006).

E-learning frees up time for doctors to concentrate on their patients and steer them clear of any unethical behaviour with pharmaceutical companies (Fugh-Berman, & Ahari, 2007).

The aims of the study were evaluated and researched through extensive literature review comparing the CME among medical doctors and concluded with the proposal of an innovative CME e-learning platform for doctors.

1.6 Definition of terms

An understanding of the following terms is essential in understanding the research:

- *Detailing*: Forms part of strategic medical marketing and involves educating medical doctors using trained medical representatives as part of the broader marketing mix used by pharmaceutical companies. The representatives do personal selling to doctors using detailing aids that are paper based, drop off samples, literature, and patient information (Lilien, Rao, & Kalish, 1981).

- *E-detailing*: Uses an electronic device such as a personal digital assistant, tablets, laptops, and podcasts (Bernewitz, 2001).

- *Detailed doctors*: Doctors visited by representatives to provide education on the efficacy of a product (Zipkin, & Steinman, 2005).

- *Non-detailed doctors*: Doctors not visited by a representative (Zipkin, & Steinman, 2005).

- *E-learning*: - As defined by the American Society of Training and Development, learning that takes place through a wide set of applications and processes such as web-based platform learning, computer-based learning, virtual classrooms, and digital collaboration (Derouin, Fritzsche, & Salas, 2005).

- *Key opinion leader*:– An academic, highly esteemed by colleagues in their profession, at the forefront of clinical research, and a thought leader in their profession who is called upon by pharmaceutical companies to deliver therapeutic area education and is a key influencer in getting a clinical message across (Soumerai & Avorn, 1990).

- *Innovation*: An idea, practice or project that is seen as new by the individual (Rogers, Medina, Rivera, & Wiley, 2005).

- *Diffusion*: A process in which an innovation spreads through certain communication channels over time (Rogers et al., 2005).

- *Communication channel*: An avenue or platform through which information is shared to gain a common understanding of an idea or concept, or education of the target group (Rogers et al., 2005).

- *Continued professional development*: An ongoing educational process by which medical doctors keep up-to-date on latest research, clinical findings, therapeutic area knowledge, and trends to deliver the best practice to their patients (Graham et al., 2006).

- *CME*: An ongoing set of planned activities that medical doctors engage in to keep their knowledge up-to-date on the latest medical science. This can take the form of journals, conferences, and round table discussions (Graham et al., 2006).

1.7 Contribution of the study

This study contributes to the efficacy of detailing and educating doctors on an innovative e-learning platform which enables pharmaceutical companies reaching all doctors in real time with the latest clinical findings and development of drugs so that patients' basic right to the best medical practice is realised.

Thought processes will be challenged, and policy changes will look at new innovative ways to allow doctors to gain their continued professional development points and have an interdependent world of exchanging best in class medical practices. This will allow for medical knowledge to be standardised, accredited, and acknowledged so there is consistency in the medical profession across markets. This research proposes an e-learning platform that will allow for the dissemination of medical knowledge to all doctors without any prejudices. Medical doctors will have access to CMEs in the comfort of their practices and homes without being side-lined by not being detailed to and not being invited by pharmaceutical companies to CME meetings.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 consists of the literature review that supports the depth, understanding, and building blocks of this study. Literature sources were reviewed, compared, and critically analysed to form a firm base to the study of e-learning as an innovative educational platform for medical doctors.

The subsections consist of the diffusion of innovations model, the technology readiness index, detailing to doctors, barriers that influence the adoption of innovations, e-learning, and finally a conceptual model is presented.

2.2 Diffusion of innovations model

The origins of the diffusion model can be traced back to the field of agriculture in the 1950s. The model later lent itself to other sectors such as public health. Diffusion is a process by which an innovation, an idea, or project seen as new, or for the first time, begins to spread through communication channels in a social system (Rogers, 2004). Recently, approximately 5 000 studies on innovation range from seed corn and modern maths, to antibiotic drugs and AIDS prevention, have been made. The pioneers of the diffusion model were first seen in the study of two farming communities in the hybrid seed corn study in the state of Iowa (Ryan & Gross, 1943). This was the establishment of the shift for diffusion research. Ryan came over from Harvard and joined Iowa State University's sociology department. He was very interested in the economics of agriculture, but then his vast reading of anthropological studies aroused his interest in understanding the non-economic factors that influenced the decisions that farmers made. He chose to study the diffusion and adoption of hybrid seed corn with the farmers there. He had a suspicion that sociological factors like the influence of the farmer's neighbour played an important role in decision-making for the farmer. This decision either made the farmer adopt the seed corn or refuse to adopt (Ryan & Gross, 1943).

For Iowa State, the hybrid seed corn produced was a revolution in the corn production category. The corn produced gave rise to a genetically stronger crop that could withstand harsh environmental conditions and thus contributed to a higher increased yield of 20 per cent. At the time, mechanical combine harvesters were being introduced and the sturdy crop with strong stalks was better suited for harvesting by these machines, another advantage to be adopted. The droughts of 1934 and 1936 were not a challenge for the hybrid crop as it withstood these conditions as well.

Such a revolutionary new hybrid crop would seem like good news among the farmers there and it was expected to diffuse at a fast rate among the farmers; instead, it was found that this diffusion process took 13 years (Ryan & Gross, 1943), with the first planting taking seven years. Of interest was the influence of neighbouring farmers in adopting the innovation. At the heart of the diffusion was the exchange of information on experiences and best practice sharing of the new idea. This gave rise to the term innovation.

The diffusion model lent itself to other disciplines of study, such as medicine, nursing, and marketing, and Rogers was teaching it at University; therefore, the model itself started the diffusion process.

The diffusion model has existed for over 60 years and the studies of diffusion have continued. The basic diffusion model of 1962 had some important additions to the model as outlined below:

- *Critical mass*: Defined as reaching the higher volume of individuals that become the advocates of the innovation such that further diffusion takes place and becomes self-sustaining;

- *Focus on networks*: As a means of further understanding of how a new idea spreads through interpersonal channels; and

- *Re-invention*: A process by which an invention changes by its adopters as it evolves during the diffusion process.

The model has been reassessed with new emerging empirical data (Fitzgerald, Ferlie, Wood & Hawkins, 2002). Their findings were a result of two studies conducted in the United Kingdom healthcare system, which showed that there was no single, linear, one-fit route of the diffusion process. They looked at newly found evidence-based medical scientific discoveries, passive adopters of the diffusion process and the influence that different scenarios or contexts have on the diffusion process. The discovery of new clinical findings in medicine is classified as privileged information, which most of the time helps to break long-standing habits and behaviours among doctors. This context is knowledge-based, and the education is either new or problem solving information; these key drivers allowed the diffusion process to start (Williamson, 1992).

Roger's (1995) work focusses on whether need precedes the newfound knowledge or the other way around. However, these models provide limited interpretation of the knowledge in situations of ambiguity (Fitzgerald et al., 2002). In the medical profession, there is a hierarchy of how knowledge is cascaded. Knowledge transfer takes place by means of a pyramid structure or top-down approach. Among medical professionals, the science is argued, reasoned with the fraternity and networks, and clinical best practices are shared, thus allowing a slow rate of diffusion of the new knowledge. From this study, three key themes emerged. First was to validate the credibility of the evidence; discovery of new knowledge in the medical profession first needs to be accepted before it will be used in practice. The second, for an innovation to be adopted it requires the decision of active adopters, not passive. In this theme, there is interaction between actors and innovations, and between groups. The third theme looks at the interlocking characteristics of communities. These three themes all affect the diffusion process.

The process of diffusion is not straightforward but very complex and full of uncertainty. Diffusion requires a network of interwoven relationships. In medical evidence, no direct or distinct connection with the discovery of the new science and the rate of diffusion existed. The high quality of evidence did not have an impact on the diffusion.

Diffusion in the healthcare system is not only affected by budget constraints but also political hierarchy in the system. As mentioned previously (Rogers, 1995), diffusion is not only complex and uncertain, it involves many interactions, which go beyond re-invention or translation, as in the actor-network theory (Latour, 1987). Users have their own interpretations and negotiate on what they thought to be credible evidence. This modification to suit their needs also assisted the diffusion process. In the healthcare sector, there is a very complex system of interactions between professors, physicians, doctors, nurses, and pharmacists. The knowledge transfer from one professional to the next can be very sticky and this affects the overall diffusion process. In this profession and the race for science and credibility, academics and politics go hand in hand, and this causes the complexity in knowledge transfer (Van de Ven, 1999)

The healthcare sector has many interlocking relationships that affect the rate of diffusion as the study by Fitzgerald et al. (2002) found. The history, culture, and quality of relationships affect the rate of diffusion and this too evolves over time. The learning and change capacity also vary as per local settings, adaptations, and negotiations, which mean that diffusions cannot roll out readily. The study alludes to the point that there is no uniform pattern in the diffusion of an innovation, the diffusion process in multifaceted and depends on a myriad of characteristics.

In the healthcare sector, the use of key opinion leaders is another critical pathway that affects the rate of diffusion of an innovation (Valente, 1999). Several criteria exist, by which key opinion leaders are chosen and selected, each with their own pro and cons. A key opinion leader is selected in five ways:

(1) Key opinion leaders will select themselves;

(2) Project teams and staff will select key opinion leaders;

(3) Members in a community will recruit participants that are not leaders, these participants in turn will recruit new participants (Broadhead, Heckathorn, Grund, Stern, & Anthony, 1995); this was seen much in the AIDS project, where participants were comfortable in this approach;

(4) Individuals within a community selected other key people to be opinion leaders (Kelly et al., 1991); or

(5) All community members are invited to nominate key opinion leaders (Lomas et al., 1991).

Each of these methods has its own drawbacks. When selecting a key opinion leader, the trustworthiness and credibility of that person has a direct impact on the rate of adoption and diffusion. These leaders come to meetings to push their own agendas and very rarely have the community's interests as their focal point. Being resolute on their agenda, they lack the expertise of knowing the needs of the adopters. The third approach is temporary in nature, and key ideas and behaviours are not communicated effectively; however, allowing community members to nominate leaders takes care of the main disadvantage. The fourth approach provides a pool of community leaders, the drawback being the method of selection and possible bias in the process.

The fifth approach is similar to a democratic presidential election. The trustworthiness and credibility of the opinion leader is ensured through this method, as the people nominate the leader. This allows for a mix of leaders each with different skill sets and knowledge that permits a better intervention and dissemination of the knowledge as and when required in the diffusion process. The selected opinion leader can then be educated and trained in the intervention or knowledge, and paired up with a community leader. This is vital as it affects the rate of diffusion and adoption of the innovation within the community (Valente, 1999).

2.3 Technology readiness index

The technology readiness index is a 36-item scale that was first published in 2000. Technology readiness as defined by Parasuraman and Colby (2015) is peoples' ability to accept and use new technologies for accomplishing goals both at work and in their personal lives. As the years have passed, technology has found its place in every service category. The rise of the internet has seen an

exponential growth over the years, and the growth of mobile technology has been prolific, and is on the increase year-on-year (Brahima, 2013). Social media is another channel that has accelerated at a staggering rate – Facebook had 1 million subscribers worldwide in 2004, 350 million in 2009, and over 1 billion in 2012. While the areas of speed, capacity, connectivity, functionality, and the ease of use of current technologies is a focus, innovations are near discovery. Technology-triggered transformation is likely to continue accelerating (Parasuraman & Colby, 2015).

With the rise of technology set to revolutionise services, managers need to be mindful of the complexity that arises from delivering innovative customer experiences and customers being receptive to those experiences. The customer needs to know how to interact and use the new technologies, and manage its content. If this is not done, it leads to frustration and poor user experience, which in turn affects the rate of adoption and the diffusion process negatively. Employees need to be minimally affected, which requires constant communication, education, and training in the areas of new technology, which in turn makes employees comfortable and confident about the new technology. If this is not addressed, then productivity and staff morale can decline. Understanding consumers' readiness for technology adoption is critical in understanding their reactions (Parasuraman & Colby, 2015).

The original technology readiness index had its roots in literature on adoption of new technologies and interactions between people and technology. Parasuraman (2000) mentions the work of Mick and Fournier (1998) who conducted research on people's use, response, and reactions and identified eight different opposite states, for example freedom/enslavement, assimilation/isolation, and efficiency/inefficiency. Their findings meant that technology had both positive and negative feelings (Mick & Fournier, 1998). Many previous studies in the areas of interactive media, tele-shopping, and self-service technologies (SST), strengthened Parasuraman and Colby's (2015) argument that relative dominance of positive and negative feelings about technology would be different across people and cause corresponding variations in people's ability to embrace and employ new technologies. Similarly, other

studies (Davis, Baggozzi, & Warshaw, 1989) found specific consumer beliefs and motivations that might fast track or stop new technology adoption.

Technology readiness was developing, and at the same time the internet boom was increasing, leading researchers to put strategies in place to increase consumer trust in the e-commerce environment. This research looked at the advantages and disadvantages of new technology-based systems and the meaning for the consumer in accepting these technologies. Since the first publication of technology readiness, much advancement has taken place in this technology space. More internet users, the speed of the internet, the switching form normal cell phones to smartphones, the social media boom, mobile commerce, and cloud computing. With this history behind technology readiness and the experience gained over 12 years until Parasuraman's (2000) research, the authors of the technology readiness index agreed that there was a need to streamline and update the index.

A clear differentiation between the new technology readiness index and the old one needs to be made. The former was named TRI 2.0 and the latter TRI 1.0. TRI 1.0 consists of 36 belief statements, each fully anchored on the five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Of the 36 statements, 10 measure optimism, seven measure innovativeness, 10 measure discomfort, and nine measure insecurity. TRI 1.0 provides dimension-specific as well as overall measures of technology readiness (Parasuraman & Colby, 2015).

With the years, technology has increased and improved exponentially. The internet has progressed in terms of speed, connectivity, and access, which has had a direct effect on the attitudes and behaviours of consumers towards technology. With these changes, the language has also changed. TRI 1.0 has words like 'machine', 'computer', and 'computer programme', which are fast becoming outdated. In 1999, when TRI 1.0 was developed, many of today's devices were in their infancy and some not even ideated. These were smartphones, wireless internet, social media, and home video conferencing. In addition, the 36-item index was too long. All these advancements and improvements motivated the need to relook TRI 1.0 and thus develop TRI 2.0.

TRI 2.0 is made up of 16 belief statements, of the 16 items, 11 are from TRI 1.0, while five have been newly added. The technology readiness statements use the same five-point scale used in TRI 1.0. One third of the items in TRI 2.0 have been reworded in keeping with the times and new technology (Parasuraman & Colby, 2015).

Many companies have increased the use and adoption of technologies in the selling and marketing of their products and services to customers. Similarly, the use of technology among customers is also rapidly increasing (Parasuraman, 2000). Parasuraman (2000) noted little scholarly research on people's readiness to use such systems. Traditionally in business there was a clear difference between goods companies and service companies, but this argument was challenged and contested by Rust (1998, as cited in Parasuraman, 2000), who stated that all companies provide a service. Research to establish the readiness of people to adopt the use of technology as a service offering was sparse. Parasuraman (2000) proposed a conceptual framework that looks at the traditional domain of marketing and what needs changing. In Parasuraman's (2000) research, a 'pyramid model' of services marketing was put forward. This model is an extension of the triangle marketing model by Kotler (1994). These models are depicted in Figure 1.

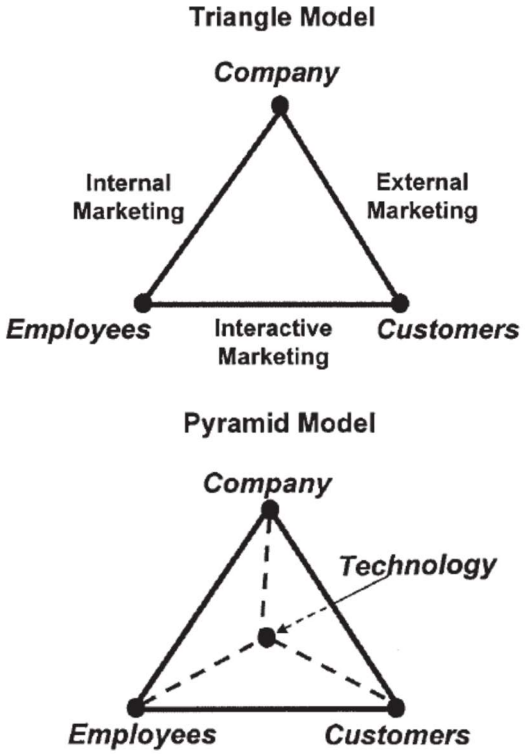


Figure 1: Triangle and pyramid models of services marketing

(Parasuraman, 2000, p. 308)

The traditional 4-Ps of marketing, namely product, placement, price, and promotion or distribution forms the basis of the triangle model. The effective marketing of services looks to include two more forms of marketing: internal and interactive. Internal marketing has been used in many research papers and literary works and is accredited to the work of Berry (1981), which states that the employee of an organisation is the first customer, who needs the knowledge, education, and training internally to allow them to deliver superior service experience to customers. The impression created by the first interaction of the customer with an employee of a company through the delivery of a service is interactive marketing.

According to Parasuraman (2000), internal and interactive marketing was consistent with other research by Booms and Bitner (1981) who recommended having three additional Ps: people, process, and physical environment, added to the traditional 4-Ps. However, these two types of marketing still do not cater for technology. With technology on the increase on both the goods and services

sides of business, as well as consumers' use of technology, the triangle model does not capture all the complexities of services marketing. To cater for these complexities, the pyramid model adds the dimension of technology and shows three distinct relationships that need to be managed to ensure effective marketing services. These three relationships are company-technology, technology-employee, and technology-customer. Parasuraman's (2000) first objective in this study was to set out the development of the technology readiness model and the multi-item scale to assess users' acceptance and readiness of this model. The second objective was to investigate the scale's psychometric properties, future applications, and use of this model.

Looking at the comparison of the automobile, which took 55 years to reach 25 per cent ownership, with the cell phone that took 13 years to achieve the same ownership (Berry, 1999); although there was an increase in technology, the users of this technology were frustrated and left disillusioned with the technology (Alsop, 1999). Some of the reasons for this were first the early adopters were much more technology wise than the laggards. Second, the use and experience of technology, and third the complexity of use of the product.

These reasons were the motivation to understand what factors will predict whether a user will embrace technology or not; are people ready to use technology and do demographics affect the use of technology (Parasuraman, 2000). This gave rise to the development of the technology readiness index with the main aim of assessing people's technology readiness.

Many studies have been conducted on the technology readiness, which differentiates users as either being positive towards new technology or negative. Users with positive attributes adopt and embrace new technologies more easily, while users with negative attributes shy away from using new technology. There were different technology contradictions that looked at a more general overview of technology readiness of people as outlined in work by Mick and Fournier (1998) and Davis et al. (1989), which looked at specific consumer motivation and beliefs behind the adoption and readiness to embrace technology. The above-mentioned studies, together with some qualitative work formed the foundation of

this research to understand the development of technology readiness and its future applications.

Parasuraman's (2000) development of the technology readiness index was a collaborative effort with an organisation that tasked him with the objective of trying to understand the attitudes and behaviours of technology readiness for a client they were commissioned to work with. This study took many years and adopted both qualitative and quantitative evidence. The qualitative research took the form of focus groups, which had well set out themes around being positive and negative. Flexibility, convenience, enjoyment, and efficiency were the positive factors and security concerns, users lacking of control, technology being impersonal, and the risk of the technology becoming obsolete made up the negative factors (Parasuraman, 2000).

Another study, the Salae Mae study (Parasuraman, 2000), researched customer's openness to various technology-based services using 44-item survey and a five-point Likert scale. The sample size was 3 000 people, and results rendered 1 200 useable responses. The ratings received underwent a series of statistical analysis leading to a shortened scale of 28 items differentiated into four categories:

(1) *Optimism*: A positive view of technology and the belief that it adds value by offering people increased control, efficiency, and flexibility in their lives;

(2) *Innovativeness*: The tendency to be the first adopter and mover on technology, as well as a thought leader in this area;

(3) *Discomfort*: Lack of control over the technology and having a sense of being overwhelmed by the technology; and

(4) *Insecurity*: When trust in technology is lost and respondents display scepticism about the use and belief of what the technology can do.

Optimism and innovativeness are the positive factors in technology readiness, whereas discomfort and insecurity are negative factors, stalling and sometimes stopping the use of technology. These subscales of the technology readiness

scale appeared to be good predictors of technology-based behaviour. The technology readiness index is a sound psychometric multi-item scale that companies can use to gain a thorough understanding of their customers readiness to interact with new technology, especially computer or internet-based technology (Parasuraman, 2000). In addition, it can be used by companies to assess the readiness of its employees to either embrace or reject new technology.

In the framework of researching technology readiness, another study looked at the readiness of physicians using smartphones in clinical practice. Historically physicians walked around with pagers, which had a direct impact on the hospital budget; they were expensive. The introduction of the smartphone revolutionised this and replaced the pager, bringing with it a decrease in diagnosing errors and prescriptions. As the internet and hospital information technology increased the advantage was an overall cost reduction (Putzer & Park, 2012).

The study examined the innovation characteristics of compatibility, job relevance, internal environment, observability, personal experience and the external environment. All these characteristics have an impact on physicians' attitude towards the use of smartphones. On compatibility, if physicians found that smartphones are connected to the hospitals' other information technology related offerings then their attitude is positive toward the adoption of smartphones. Hence, hospital infrastructure needs to consider the support structure in terms of bandwidth, network monitoring, and synchronizing capabilities with desktops in the hospital. The legal implications entail the capturing of doctors' personal information. Practicality and job relevance in the use of a smartphone was another important factor, if physicians found that the device brought about better patient care, a positive attitude towards the use of the device was evident (Putzer & Park, 2012).

Physicians' personal experience and interactions with the innovative characteristic was important in this study although previous findings by Putzer and Park (2012) found mixed results between physicians and nurses. The explanation was that in their study's sample more than 50 per cent of physicians

were older, much more experienced in clinical practice, and needed more exposure to become accustomed to the devices.

The internal environment proved a significant predictor of adoption and use of the smartphone; it involved the support physicians received from the hospital structure with regard to networks, budgets set aside for smartphones, and technology support, which proved to be critical in physicians' attitudes to adoption of the technology. The relevance of the use of smartphones in making better clinical decisions for the patient has now been widely supported by hospital policies and procedures, and technical support is now in place. Smartphones have since increased in functionality and capabilities, which has given rise to the increase of technology and is here to stay (Putzer & Park, 2012).

2.4 Detailing to healthcare professionals

With all the glitz and glamour that technology brings, the main objective of every healthcare system is the delivery of services by one set of professionals to those in need of services to maintain and improve overall health. This transactional exchange of services is founded on a set of skills, knowledge, values, expertise, relationships, and trust that patients invest in doctors to get the best and most effective treatment. Through time and interactions, this trust is earned through a special set of skills, ethical duties, commitment, and social accountability, which forms the core of professional work (Frenk et al., 2010). Obtaining and developing this mix of characteristics requires lengthy periods of study, education, and investment from the medical student and society. The professional medical education that a doctor undertakes is one of the key attributes in delivering high quality, safe, and effective services to communities.

With the advancement and the pace of technology, education in the medical profession has not kept pace. Into the twenty-first century and more recently there still exist major holes in the professional education of doctors and pharmacists. The discovery of new science, best clinical practices, fresh challenges, and demographic transitions has not kept pace with the professional education of healthcare professionals (Frenk et al., 2010).

In reports calling for reformation in medical education, it is noted that before the celebrations of 100 years of the Flexner report, there was a heightened awareness of and focussed attention on, nationally and internationally, the future of education of health professionals. The four sets of major reports, as mentioned in section 1.2 of this research report, calls for the focus on education of the global workforce, nursing education, public health education, and medical education. In fact, these reports call for a reform in education that emphasise patient and population centeredness, competency-based curriculum, inter-professional, and team-based education. These areas will form a strong base for formulation of reform initiatives for the twenty-first century. All reports proposed an investment in education and training, sharing of resources and partnerships within and across countries (Frenk et al., 2010).

A lot of research has been done by Manchanda and Honka (2005) in the area of the effects of the role of direct physician marketing in the pharmaceutical industry. Face-to-face doctor detailing does have its positive and negative attributes as it drives education driven, changes scripting behaviour patterns, and builds relationships. The proposal put forward is that the experience of face-to-face detailing needs to be effective and used in the best possible way, practice ethical marketing, and allow for a mixed model of incorporating e-learning to reach doctors not reached by pharmaceutical representatives in face-to-face detailing (Manchanda & Honka, 2005).

Education of doctors driven by detailing can take the form of face-to-face detailing or in a group, like lunch and breakfast appointments. Research looked at the benefits of these two types of detailing, the motivation was that it was noticed that there was an increase in prescriptions of anticholinergics to the elderly, which led to higher side effects and contributed to a decreased life span. The aim of this detail exercise was to drive CME to both pharmacists and doctors, and to bring about a reduction in the prescriptions of these drugs and thus the knock on effect of reducing the dispensing of these drugs (Van Eijk, Avorn, Porsius, & de Boer, 2001). The findings of this study were conclusive in that both individual and group detailing brought about a change in behaviour and drove fewer prescriptions of anticholinergic drugs among the elderly.

The differences highlighted in group detailing is that there was more conformity, which was attributed to peer pressure; with individual, face-to-face detailing it was noted that healthcare professionals were much freer to talk about their prescribing habits. In this study, both individual, face-to-face detailing and group detailing changed prescribing behaviour. This prescribing behaviour can be attributed by the frequency of the visiting detailing representatives; more visits meant the delivery of the same key messages, which drove top-of-mind behaviour and prescribing habits.

For physicians, choosing an individual drug is one of the most important clinical decisions in a medical practice. The prescribing decision is influenced by many factors such as patients providing information to doctors on what they are experiencing, commercial drive by pharmaceutical companies, colleague influence, medical journal articles, and government regulations (Soumerai, McLaughlin, & Avorn, 1989). In this research, it was found that the older population, above 65 years of age, were taking more prescription drugs. Prescribing behaviour in such age group is critical due to the adverse events of drugs in this population and prescribing behaviour can influence their quality of life and life span. Strangely enough there is an over prescription of drugs in this age group. This study looked at non-regulatory methods and its effect on changing prescribing behaviour patterns to reduce over-prescription of drugs.

One of these methods looked at face-to-face educational detailing to change behaviour patterns. Several health education studies that show evidence of one-on-one education can effectively change behaviour patterns; such an example is changing behaviours in smokers (Leventhal & Cleary, 1980). Soumerai et al. (1989) also made mention of this method being effective in his previous studies. As mentioned, pharmaceutical companies train their medical representatives to detail doctors with the purpose of changing prescribing behaviours. One of the key reasons for prescribing errors in a clinical setting is over zealous medical representatives and relationship-based selling. The results from this study (Soumerai et al., 1989) showed that one-on-one education of physicians by a visiting pharmacist or counsellor brought about a change in prescribing

behaviour. The pharmacist or counsellor in this study was the medical representative.

There are several studies showing that detailing supports behaviour change, brings about better clinical outcomes for the patient, and reduces prescribing errors. Another study showed a different benefit of detailing: culture. In the US, many medical doctors failed to understand the minority cultures when treating patients. This lack of knowledge in understanding the different cultures created huge differences in healthcare treatment when it came to the minority versus their white counterparts (Horner et al., 2004). The literature review showed many studies examining reasons for, and consequences of, observed racial, ethnic, gender, and socioeconomic differences in the management of many conditions across different therapeutic areas of cardiovascular disease, central nervous system disorders, cancer, and pain management.

Upon these findings, the medical fraternity put together a task force to address these differences and generate a plan to rectify this situation. This task force was a representation of different healthcare professional bodies and medical academic institutions. The healthcare professionals did not understand the health system and came with their own mindsets on racial, ethnic, and social class. Their lack of awareness on these attributes meant they did not understand their patients, which led to incorrect diagnoses and treatment plans. These professionals lacked cultural competence.

The working group was to establish a set of recommendations that would be effective in driving behaviour change in these health professionals. One of those recommendations was educational outreach, which took the form of detailing on cultural competence, and was found to be effective in changing behaviour. Another study (Horner et al., 2004) made mention that this type of detailing should be part of the classroom setting for healthcare professionals. Training of cultural competence and supporting a diverse workforce is an area that needs attention and can take several forms:

- Providing healthcare professionals and staff with continued education on cultural competence;

- Availing practical resources to doctors to be cross-culturally sensitive;
- Putting incentives in place for staff by means of textbooks, journals, and access to internet; and
- Providing transportation and interpreters where needed.

Cultural competence training at medical schools in the US and the United Kingdom vary, but overall the numbers focussing on this is low. Research has shown that detailing is effective in changing behaviour, and this behaviour can be changed to reduce disparities in the healthcare system of diagnosing and treating patients from different cultural backgrounds.

By comparison, detailing in South Africa is limited, and further research is needed to look at how product e-detailing is transforming traditional pharmaceutical marketing. Prior to 1997, direct marketing to consumers was very limited, Pharmaceutical companies, as mentioned earlier, continued driving education with doctors via detailing (Trucco & Amirkhanova, 2006). Research in US pharmaceutical companies showed that the cost of detailing took a huge share of the marketing budget, between 45 and 70 per cent. In Europe this figure is even more significant as the direct consumer advertising spend is low (Bates, Bailey & Rajyaguru, 2002). The main objective of detailing is to gain market share of the products they detail and thus drive up company profits, and in the interim build strong relationships. Over the years, a major shift has occurred to challenge detailing efforts due to trends and radical changes in the industry to drive ethical marketing. These changes are as follows:

- Introduction of new policies and procedures locally and globally;
- Generic products and clone products as original drugs lose their patency;
- Increased demand of doctors time as more detailing representatives flood the market; and
- Rising costs of research and development.

Traditionally if there were inefficiencies in the sales force, this was addressed by increasing the number of medical representative, thus increasing the reach to new doctors and increasing the frequency of calls to A-listed doctors. The sales representative force globally increased by an average of 21 per cent from 1999 to 2001. This increase has been strongest in the US, with 42 per cent, and the least in Japan, with 1.2 per cent. However, this cannot be a long-term solution, as the return on investment (ROI) of the representatives will start to outweigh the profits generated. In addition, having numerous representatives in an area means that they compete for the doctors' time, a 15 minute call could reduce to five minutes as doctors need to make time to see other representatives. Some doctors go to the extent of refusing to see any representatives because of the influx of so many of them in the field.

It has been noted that in countries like the US, the number of medical graduates annually has been a steady flat number, but the medical representative force has been doubling. The marketing exercise of targeting and segmenting has seen the detailing efforts focused on the high potential, high prescribing doctors. It means these doctors are being flooded by representatives demanding their time; all competitor pharmaceutical companies are doing the same, all competing for the doctors' time. The detailing cycle planning includes two priority detailing products, some companies will have a third as a reminder product. With the pressure and line up of these products on the representatives detailing cycle, the effectiveness of detailing is not beneficial on message delivery and recall. The combination of all these factors have led to an ever-decreasing ROI for the pharmaceutical companies, that leaves a major gap in educating doctors if pharmaceutical companies want to see profits from sales increasing (Trucco & Amirkhanova, 2006).

2.5 Barriers to innovations

The medical profession is one sector that thrives on research and clinical trials, it boasts a sector rich in medical science discoveries. Having stated this, major gaps in knowledge remain when it comes to putting this knowledge into clinical

daily practice (Berwick, 2003). This gap is described in the Institute of Medicine Report; there is a divide between what science has delivered and the healthcare provided.

In the US, this is a huge problem, as alluded to earlier in this research, due to the lack of knowledge, dispensing errors and treatment regimens have been affected. It is one thing discovering an innovation; however, the actual rate of dissemination of this innovation can take much longer, as seen in Rogers' (2010) work in Iowa State, with the seed corn innovation.

The rate of diffusion and dissemination of innovations is often a long process; Berwick (2003) researched the barriers to innovation and what makes dissemination successful. As in Rogers' (2010) study on diffusion of innovations, it took the farming community 13 years to adopt the seed innovation.

In the diffusion of innovations studies by Rogers (2010) and Van der Ven's (1999) work on innovation research, and many others, they focussed on three basic clusters of influence that enables a diffusion to disseminate. They looked at (1) perceptions of innovation; (2) characteristics of the people who adopt the innovation, or fail to do so; and (3) contextual factors, especially involving communication channels, incentives, leadership, and management.

For an innovation to have a successful adoption in a system, Rogers (2003) and Berwick (2003) highlighted five characteristic perceptions of innovations:

(1) Relative advantage of the innovation;

(2) Compatibility;

(3) Complexity;

(4) Trial ability; and

(5) Observability.

2.5.1 Relative advantage

Any innovation needs to give the user an advantage of being more effective and efficient; in addition, the cost of the innovation as well as what it would take to maintain. Social motivation is another factor of relative advantage. While the early innovators, early adopters, and early majority are status motivated, the late adopter and laggards do not perceive status as important. To increase the rate of adoption and make the innovation relative, direct and indirect payment incentives can be in place to motivate the adoption of the innovation (Rogers, 2003).

Education plays a critical role in the adoption of an innovation, the more knowledge shared on the innovation the more likely it is to be adopted, Rogers (1995) calls this 'reduction in uncertainty'.

2.5.2 Compatibility

Everyone has a system of beliefs, attitudes, and values. Rogers (2003) stated that compatibility occurs when the innovation is consistent with existing values, past experiences, and the needs of potential adopters. If individuals do not have experience in technology or the use of it, this will affect their ability to adopt an innovation in this sector and thus few will use the innovation (McKenzie, 2001). In a literature review by Hoerup (2001), innovations influence teachers' opinions, beliefs, values, and views about teaching. Another key factor is the naming of the innovation, as users associate themselves with brands and names.

Values, beliefs, history, and current needs of the individual affect the rate of diffusion of an innovation. At times in the medical profession, it is noted that only a minority of doctors will use scientific guidelines and algorithms in treating their patients (Casillino et al., 2003). This is largely due to the surgeon or physician's stubbornness towards the use of the innovation, or a mismatch of the innovation serving the current needs of the practice and thus the healthcare professional does not see the need to adopt the innovation (Berwick, 2003).

2.5.3 Complexity

According to Rogers (2010), complexity is the degree to which the user perceives the adoption as being difficult to understand and use. Simplicity and ease of use is paramount in an innovation. With so many technological advancements, grappling with understanding how to use innovations should be minimal. If the innovation does not meet such criteria, then the rate of adoptions is much slower. Successful adoption depends on the ease of use of both the software and hardware of the innovation.

Most of the time the developer of the innovation is not a good salesman and is more interested in its elegance, seeing the innovation as being something that can be replicated once it is adopted and adapted to meet the local needs (Berwick, 2003).

2.5.4 Trial-ability

Trial-ability, according to Rogers (2003), is the testing of or experimenting with the innovation for a limited period; a trial run. Some companies use what is referred to a test market, and during this period troubleshooting takes place and adjustments made so that the rate of adoption can be quick and ease of use ensured. Feedback is given on what is working, what is not, and how the innovation can be improved. This is also is an example of best practices sharing, and if other individuals and markets see the value the innovation brings, then they are more likely to adopt the innovation.

2.5.6 Observability

When the innovation becomes visible to others and they see it in use, this is observability, as defined by Rogers (2003). Users and observers need to see the benefit of the innovation as a solution to a problem; this is vital to the rate of diffusion.

The adoption of a new idea or innovation is not an easy process, for an adoption to be successful; these barriers to innovation (section 2.5) need to be taken into

account to ensure the rate of adoption is impactful and the diffusion process speedy (Rogers, 2003). The change in attitudes, behaviour, and adoption diffuses faster when these factors are applied to the innovation (Berwick, 2003).

The Canadian health heart kit (HHK) research is a study that applied these factors to an innovation that was built on the constructs of Roger's (2010) theory of diffusion and the theory of planned behaviour. According to the theory of planned behaviour, an individual's aim to perform the set behaviour is vital to performing the behaviour, as is the motivation as a key driver behind the behaviour (Ajzen, 1991). In Berwick's (2003) study, he makes mention that Eccles et al. (2006) suggested that there is a predictable connection between healthcare professional's objective to engage in behaviour and their succeeding behaviour.

The two main aims of the Canadian HHK research were to find out (1) if there were specific factors of the HHK as well as circumstances and situational factors that contributed to the aim and actual use of the kit; and (2) if any situational or other circumstantial factors are associated with individual or environmental barriers that prevent the uptake and adoption of the kit among physicians who do not intend to use it (Scott, Plotnikoff, Karunamuni, Bize, & Rodgers, 2008).

The decision to adopt an innovation is not a linear path, but highly multifaceted, a dynamic and active process that involves interactions between individuals, situational factors, different circumstances, and considerations of the attributes of the innovation itself.

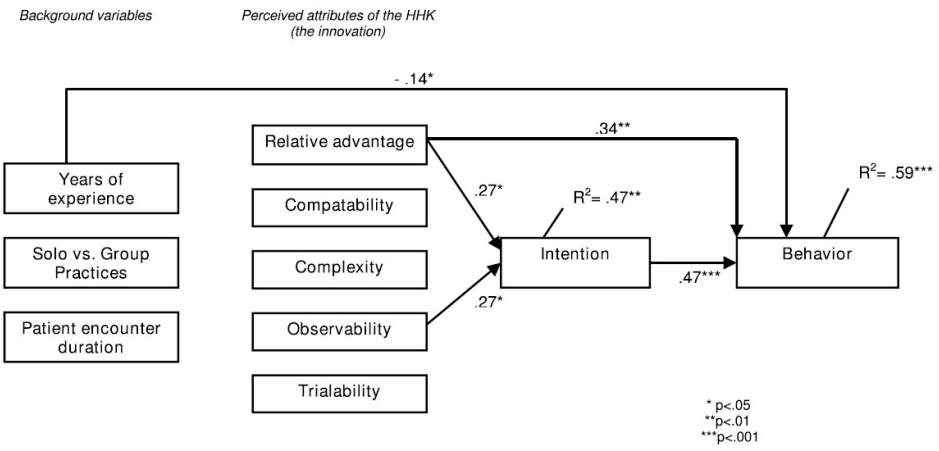


Figure 2: HHK's multi-faceted paths

(Scott et al., 2008, p. 6)

As mentioned in section 2.5, the two key attributes of the study (Scott et al., 2008) was relative advantage and observability. An innovation that has a clear advantage over another will be adopted should the need arise. The advantage can be conceptualised in terms of economic profit, social prestige, or ease of use. Observability of the benefits of using the HHK was another attribute that ranked high in this study on the intentions to use the kit. The outcomes show that the adoption process is not linear and straightforward but that contextual factors, attributes of the innovation, and situational factors play a critical role in the adoption process and the innovation diffusion, as depicted in Figure 2.

2.6 Detailing representatives adding value to CME of doctors

Pharmaceutical companies invest a lot of time, money, and resources in equipping representatives to get a clinical message out to doctors. This detailing process involves the promotion of drugs and is effective in the early life cycle stage of drug marketing, with incremental returns on investment. Research and development of a next originator or ethical drug takes years to discover and manufacture. The representative thus continues detailing a product over a very long period after the early life cycle of the drug, the efficacy of the detailing process is questioned as to whether the process continues to add value or new education to doctors (Manchanda & Honka, 2005).

This process of face-to-face detailing increasing becomes a relationship-based selling tactic used by pharmaceutical companies with the main aim of driving repeated messaging and re-enforcement (Fugh-Berman & Ahari, 2007). Pharmaceutical companies segment, target, and profile doctors according to the amount of scripts they write and the potential of their scripts (Soumerai & Avorn, 1990).

The Flexner report, discussed in sections 1.2 and 2.4, is a report on medical education, 100 years from 1910, a series of requests and proposals have gained

local and international attention on the reform of medical education (Flexner, 2002). This heightened awareness has been included as part of the MDGs. The MDG report, in addition to three others detailed in section 1.2, all stress the importance of education and training in the medical fraternity. The joint request of these reports calls for an incremental increase in investment in medical education, best practices sharing, along with sharing of resources and partnerships within and across borders (Frenk et al., 2010).

Health is all about people, the professional development of doctors encompasses life-long learning either formally or informally. Effective healthcare requires continuous learning (Bennett et al., 2000). As noted in section 2.4, not all doctors are visited by pharmaceutical representatives. The face-to-face detailing process provides an avenue for doctors to be susceptible to the influence of pharmaceutical companies; the gift bearing involved, the relationships built, and the tactfully and carefully selected messages (Fugh-Berman & Ahari, 2007). Pharmaceutical companies target doctors that add to the net revenue and profits; therefore, the education gap between detailed doctors and non-detailed doctors is widening, and is not in line with the MDGs and other reports.

Research has shown that detailing by representatives adds to the CME of doctors and is a key factor that changes behaviour. All in the name of science, the medical profession has been plagued for many years with misdiagnoses and incorrect prescriptions adding to and increasing the death rates (Choudhry, Fletcher & Soumerai, 2005). One way to address this critical gap in education that exists is by doctor detailing.

This was proved in a hospital setting where vasodilators were incorrectly prescribed (Soumerai & Avorn, 1990). Pharmacists were trained in selling skills and pharmacotherapy to visit physicians to educate them in bringing about change in their behaviour pattern and prescribing habits of vasodilators. The pharmacists in this case where the detailing representatives. On the first detailing visit, there was no difference in behaviour, when key educational messages were repeated on the second visit; behaviour change was noted (Soumerai & Avorn, 1990). Other studies have concluded positive changes in prescribing behaviour

thus decreasing prescribing errors when face-to-face doctor detailing was employed (Soumerai & Avorn, 1984). Educating doctors and changing their prescribing behaviours meant huge cost savings due to prevention of prescribing errors and misdiagnosis of medical conditions.

In view of the fact that representatives change the behaviour patterns of prescribing doctors there is very little quantitative evidence on the impact they have, the evidence (Hemminki, 1977) that does exist is broad sales presentations on survey results. Soumerai and Avorn (1990) set out to research and understand if the representatives could change prescribing behaviour of physicians by detailing and educating them, which adds to their continued professional development. The medical detailing can be likened to a non-government organisation, as the pyramid of influence is similar and detailing looks at spreading of education. The objective of the research was to find out if the representatives were adding value to doctors' prescribing behaviour. The prescription of antibiotics has always been a contentious issue due to the over-prescription of these drugs. Previous research looked at the over-prescription of antibiotics and a behavioural change strategy to stop this problematic activity, and instead lead patients to self-care and over the counter medications like aspirin (Soumerai & Avorn, 1986).

The analysis of the impact of detailing was based on different techniques and principles used to bring about behaviour change. Adult-based education, diffusion of innovation, and communication were the techniques used. The motivation behind doctors' prescribing of a product is important to understand the impact that face-to-face detailing would have. It is misleading to believe that the delivery on CME to doctors alone will bring about a shift in prescribing behaviour and effective treatment for the patient. The discovery of new clinical science has, in some cases, brought about a change in prescribing behaviour; research has also shown that the personality, attitudes, behaviour styles, competitive landscape, competitor activities, peer influence, and CME strategies form part of the detailing mix (Soumerai, McLaughlin, & Avorn, 1990). The representative is extensively trained and educated to use this information in their detailing calls to doctors.

In detailing to medical professionals, the source of information is critical, as this is associated with the credibility of the message. The research centre of the trial, the journal in which the trial was published, the key researcher in the trial, all these factors are what makes the message credible. Pharmaceutical representatives are trained to deliver these messages, so they come across as being credible. Symposiums are also sponsored by pharmaceutical companies and the attending doctors are met with representatives delivering the key messages when they interact with doctors at the exhibition booths at medical symposiums (Bowman, 1986).

Detailing representatives are also highly incentivised to achieve sales targets; however, this leads to overzealous representatives delivering messages to achieve a sales target. In the delivery of this type of message, the credibility of the message is brought into question. During Soumerai and Avorn's (1990) research, doctors have not fully confessed that they have been swayed by representatives and the relationships they have. Ethical medical practice should be based on the science and thus lead to effective clinical decisions for best outcomes for both patient and treating doctor (Soumerai & Avorn, 1990).

The time to see a representative can be easily substituted and channelled to spend more time on seeing a patient. Doctors dedicate time in their busy schedules to seeing representatives and when asked why they do this, most did not even have an answer to this question. It felt to them like it was part of their job. Some found representatives to waste their time, but still found time to see them. A study that looked into the reasons that physicians refuse to see representatives stated that these appointments were taking too much time in a day, and that the trinkets and gifts they brought creates bias and this sways the doctors' prescription habits (Brody, 2005).

However, having stated this, this practice of seeing representatives has not changed since 1961, and every year pharmaceutical companies continue to employ representatives to call on high potential, high prescribing doctors. Brody's (2005) study showed that doctors felt compelled to see representatives due to the gifts received and that prescribing became personal. A more robust way to

verify the educational content delivered by the representative would have been to receive the information and then spend time reviewing the clinical evidence to verify the content given by the representative. The decision then lies with the doctor to prescribe the correct medication and dedicate their time to the patient and treatment diagnosis and regimen. If doctors spend time with representatives, and are swayed with gifts and trinkets, then the ethics and integrity of the profession is questioned. Representatives are business people that are being loyal to their employers in delivering key clinical messages, the integrity of doctors is solely in the power of the doctors' hands and the representative is not responsible for the integrity of doctors.

Detailing to doctors involves a multifaceted approach and, in another study, Soumerai et al. (1990) researched the quality assurance of prescriptions and investigated seven pillars that assisted the representative in the detailing process. These pillars are: (1) the use of printed educational materials in the form of leave behinds; (2) the list of medications that patients were prescribed; (3) group gatherings in the form of breakfast, lunch, and round tables; (4) qualitative feedback of prescribing habits of physicians; (5) reminders by the representatives at times of prescribing; (6) detailing that involved face-to-face interaction; and (7) continued ongoing pharmacy services.

The use of printed educational materials alone matches the findings in previous literature that education in the form of pamphlets, fact sheets, unbranded advertorials, and leave behind materials does change the attitudes of doctors; however, it does not change prescribing behaviour (Soumerai et al., 1990).

Sending a list of the patients' drugs without any proper instructions, reports, and findings did not change the prescribing behaviour of doctors in any way (Hershey, Porter, Breslau & Cohen, 1986). There is little research on group learning changing prescribing habits. Group education is a common practice in the medical profession; universally many doctors work in corporate groups. It was found that when senior physicians led the discussions, and were seen as key opinion leaders (Inui, Yourtee, & Williamson, 1976), they were able to influence

and bring about a change in prescription behaviour in terms of antibiotics and hypertension (Klein, Charache, & Johannes, 1981).

In terms of feedback on prescribing patterns, the past habits of doctors were compared to their present habits and with that of their peers. It was found that this did influence behaviour and change prescribing habits; however, not many findings are conclusive in this category. One study was well controlled and showed a generic prescribing of 46 per cent over the controls (Gehlbach et al., 1984), which proved that with adequate feedback prescribing behaviours can be changed.

Many interventions looked at reminders to doctors at the time of prescribing, even though education was taking place, this did not pose a problem, but it was something that doctors overlooked. The most recent study failed to show the effectiveness of either reminder or feedback on physicians' compliance with other drug protocols (Tierney, Hui & McDonald, 1986).

As mentioned in section 2.4, the one-on-one detailing by representatives to doctors does contribute to their education and changes prescribing behaviours. This has been seen in antibiotic prescriptions, scripting of vasodilators, cardiovascular drugs, and even smoking cessation (Soumerai & Avorn, 1990). Detailing does contribute to the medical education of doctors and their professional development.

In the detailing to doctors and adding to their continued professional development, one specific area that doctors were questioned on was conflict of interest and their handling of this issue (Chimonas, Brennan, & Rothman, 2007). Many surveys were carried out and many inconsistencies remain; some doctors believe that seeing representatives and receiving gifts is part of their educational development (Keim, Sanders, Witzke, Dyne, & Fulginiti, 1993), while others believe that this shows bias towards the representatives and company behind the products. Several surveys carried out showed that doctors were not aware of the negative effectives of the detailing and their relationships with representatives. They justified their relationships as part of their job and necessary to their professional development.

The methodology followed focus groups among physicians, which was an excellent format to understand how physicians managed the inner conflict of manufacturers trying to sell a product, while they were trying to maintain their integrity and have patient care at the forefront (Chimonas et al., 2007). Since, the pharmaceutical industry, medical bodies, and governments have put in place legislation to make sure that unethical practices do not take place between pharmaceutical companies and doctors.

The trend in the 1970s and 1980s saw a huge investment from pharmaceutical companies sponsoring CME of doctors and thus adding to their continued professional development, be this in the form of detailing by representatives, round table dinners, or national and international symposiums. Over the years, the pharmaceutical industry has come under heavy legal and regulatory scrutiny and seen policies and regulations put in place. This was instituted by the Accreditation Council for Continuing Medical Education (ACCME), which accredits all CME providers, and put in place policies and procedures to identify, disclose, and resolve conflicts of interest (Steinman, Landefeld & Baron, 2012).

With the decline of industry support of CMEs, physicians are concerned about their CME and thus their continued professional development. The shift has already been seen with medical schools moving CMEs to their facilities and lecture rooms. This means that there is no cost for conference venues, accommodation, and transport. This money can be channelled into other avenues that can help medical teaching hospitals. This shift is also taking place from traditional physical attendance to online interactions; however, physicians feel they will miss the opportunity of listening to key opinion leaders on various subjects and thus the knowledge deficit will widen.

Reducing funding for accredited CMEs also poses a problem for pharmaceutical companies having their own CMEs in restaurants and other venues, which mean that education is not accredited and standardised, adding to confusion and lack of clarity on education. Industry support for accredited CME is unlikely to disappear totally from the profession, time will tell as tighter restrictions from a regulatory and economic perspectives is seen more frequently. This shift calls for

the medical profession to make a cross-functional collaborative effort with physicians, accredited CME providers, and pharmaceutical companies to work together for the main purpose of better education and patient outcomes (Steinman et al., 2012).

2.7 Academic detailing to improve clinical decision-making

Healthcare is not affordable for many, and with the cost of drugs increasing, it is important that these drugs be prescribed as rationally as possible; this is not happening. The drugs doctors' choose to prescribe for the patient, and the cost of the drug often falls short of the desired clinical outcome due to adverse reactions to the drug. Several theories and principles of communication and behaviour change can be found that underlie the success of pharmaceutical companies in influencing prescribing practices (Soumerai & Avorn, 1990).

Pharmaceutical representatives have been operating for more than 100 years. In the US, Soumerai and Avorn's (1990) research on representatives showed numbers of approximately 28 000. Pharmaceutical companies have a high annual investment in detailing representatives. Several studies indicate that representatives are the first point of contact for information dissemination to doctors. Detailers do shape much of the prescribing behaviour, but there is a lack of scientific literature on how they might adapt their detailing to reduce prescribing behaviour.

Medical representatives often employ incentive strategies to all personnel in the medical profession, nurses, receptionists, theatre sisters, and doctors. The objective behind this tactic is to gain entry and time with selected, targeted doctors to deliver a clinical, medical marketing message. One of the key credentials to recruit a medical representative is for them to have a scientific, health sciences, educational background so that they can converse with doctors and be successful at undergoing a rigorous training programme on clinical science, sales, and marketing. The motivation behind their task is further enhanced by huge incentives, like overseas trips, if they exceed their sales targets through doctors they detail. This is a hazard as you get over-zealous

representatives trying to push a message through with the sole purpose of generating additional income, instead of having doctors and patients in mind for the best, cost effective treatment (Soumerai & Avorn, 1990). From this angle, many physicians have questioned the credibility of the messages from the representatives on product efficacy. In some instances, these incentives have led representatives to deliver the wrong messages on the drugs being detailed.

The way educational information is diffused by pharmaceutical companies is at times misleading to doctors. In 2012, giants such as GSK (Thomas & Schmidt, 2012) and Eli Lilly were issued with fines in the billions. Repeatedly, there has been evidence of companies breaking the law despite the fine line between delivering a credible scientific message and persuading doctors to prescribe their product. This has led to an examination of how pharmaceutical companies educate doctors, so that they do not forfeit their CME, and thus have the latest clinical findings at their disposal for effective and improved patient outcomes (Fischer & Avorn, 2012). A possible solution to this problem of CME for doctors is academic detailing.

Academic detailing does not have the business and profit aspect as an objective but focusses on the delivery of evidence-based education to doctors. Currently there are many such academic detailing programmes, funded by the government, taking place in Pennsylvania, the District of Columbia, Massachusetts, Saskatchewan, Canada, and Australia among other places. There is no known research on this type of government-funded academic detailing taking place in South Africa. Many studies have proven that detailing is welcomed by doctors, as it reduces costs by minimising incorrect prescriptions and improves patient and clinical outcomes (Avorn et al., 1992).

The ideal would be for governments to use their academic resources at universities to provide the research and to fund this academic detailing. In this way, there will be no bias. In countries like Canada and Australia, this is the model being used to cater for academic detailing. However, it comes with its own set of risks, as some governments let the politics and the money obscure the credibility of the source of the information.

Another study conducted in an Australian hospital looked at academic detailing to improve clinical decision-making. In this setting, it was noted that the dosing adjustment of drugs was not taking place in patients with poor kidney function, this affected the clearance time of the drug by the kidneys, which contributed to adverse effects (Roberts et al., 2010).

The duration of the detailing process was 15 minutes, delivered by a trained person, and performed within two weeks of a physician joining the hospital. A total of 44 doctors and 12 clinical pharmacists were detailed during a two-week period. The academic detailing was done by the same person throughout the study. The drugs that affected glomerular filtration in the kidney were the focus of the study, namely allopurinol, angiotensin, convert enzyme inhibitor (ACE-I), digoxin, enoxaparin, gentamycin, lithium, metformin, spironolactone, and vancomycin. Two major drugs that had the most severe side effects and toxicity if incorrectly dosed and prescribed was enoxaparin and gentamycin. Detailing was then employed as a focus to measure the effects before detailing and after detailing and document the influence on prescribing behaviour and clinical decision-making.

The introduction of academic detailing had a significant impact on the prescribing behaviour patterns of physicians, as seen in Figure 3.

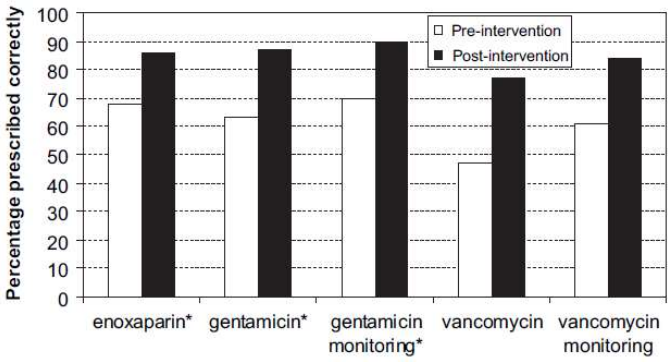
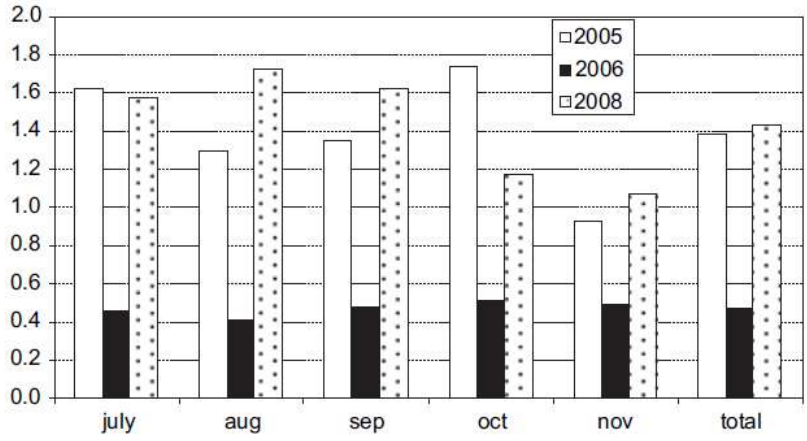


Figure 3: Prescribing behaviour change before and after academic detailing

(Roberts et al., 2010, p. 310)

The study took place in 2005, in 2006, there was no evidence of academic detailing taking place, and this shows the glomerular filtration rate (GFR+) had decreased significantly. In the world of clinical trials, this meant that 2006 became the control year by default. This serves as evidence of the strong effect of academic detailing. In 2008, academic detailing was introduced by the pharmacy staff; it was noted that the impact on the glomerular filtration rate returned to the 2005 levels. This is depicted in Figure 4.



Note: 2005 – with academic detailing, 2006 – no academic detailing, 2007 – data incomplete; 2008 – return of academic detailing

Figure 4: Study periods and academic detailing

(Roberts et al., 2010, p. 311)

The academic detailing certainly created awareness and education among the prescribers to change behaviour patterns and thus contributed to the clinical decision-making. It was also evident in this study that academic detailing should be used in conjunction with other innovative computerised patient management systems to improve overall patient outcomes (Roberts et al., 2010).

From the time of the discovery of antibiotics, the prescriptions of antibiotics for every flu-like symptom have increased. Patients are aware of the benefits and efficacy of many antibiotics and many times, they influence doctors' prescriptions by asking for an antibiotic during their visit. There has been a constant increase of prescriptions of antibiotics, which has led to antibiotic resistance increasing over the past decades. This poses a threat to patients' treatment and increases pressure to find the next generation of antibiotics.

The misuse of antibiotics is costly. In one hospital setting, it was found that one third of the patients were prescribed an antibiotic when there was no need for such treatment. Several other reports showed that antibiotics had been over-prescribed and were not needed for treating patients' underlying conditions (Avorn et al., 1988).

Antibiotics are classed into broad-spectrum and narrow-spectrum; the broader spectrum targets numerous viruses. Often doctors will prescribe a broad-spectrum antibiotic, to cover all bases and target many viruses, when in fact a narrow-spectrum antibiotic would have done the job. This becomes problematic as it leads to antibiotic resistance in the patient; should a patient be exposed to a different strain of virus, these patients will become resistant to the antibiotics prescribed. This practice is seen with many doctors and this misuse of antibiotics is a compounding problem. At one teaching hospital, it was found that in a two-month period, over 70 per cent of the prescriptions for the drug vancomycin hydrochloride, were inappropriate (Lipsky, Baker, McDonald, & Suzuki, 1999).

To address the problem at another teaching hospital a program was put into place to target the interns that were responsible for the over-prescription of two broad-spectrum antibiotics called levofloxacin and ceftazidime. The programme or intervention that was adopted to address this issue was to deploy academic detailing (Solomon et al., 2001). These delegates underwent training and role-playing detailing sessions to deliver key messages to change the prescribing behaviour habits of the interns. Academic detailing included educating them on the pros and cons on antibiotic prescribing and what antibiotic resistance will mean for the profession. The effect of academic detailing on reducing over and inappropriate prescription behaviour is shown in Figure 5.

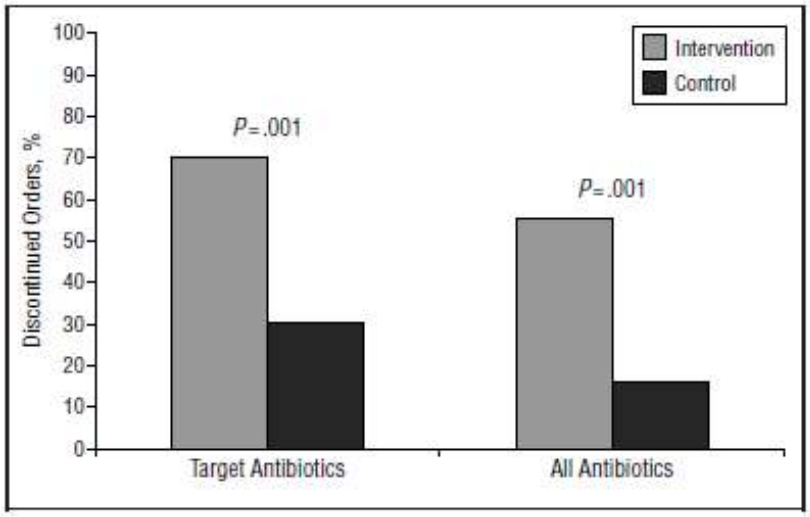


Figure 5: Effect of academic detailing on antibiotics prescriptions

(Solomon et al., 2001, p. 1900)

The results of the programme of introducing academic detailing as depicted, showed a decrease of misappropriate use of antibiotics by 41 per cent in the group that was detailed, versus the control. This shows that academic detailing contributes to the clinical decision making of doctors. Academic detailing using trained educators, be they physicians or pharmacists, as in this study, bring about positive effects of changing behaviour and scripting patterns leading to effective treatment regimens (Avorn & Soumerai, 1983).

2.8 E-learning as a source of detailing and educating doctors

E-learning is fast becoming the mainstream of medical education. The heart of e-learning is concerned with the use of technology. Some e-learning involves focussing on the content while some on the processes. Traditionally medical education revolved around teaching hospitals and universities, and some students attended rural and remote teaching sites. In recent years, a number of programs have been carried out in this distributed model, and e-learning is an important component as a means to unite and coordinate this distributed approach (Ellaway & Masters, 2008).

In the pharmaceutical industry, academic detailing has been taking place by medical representatives visiting doctors and promoting and educating doctors face-to-face. The average time spent detailing ranges from four to seven minutes; however not all doctors are targeted as pharmaceutical companies choose from the top percentile of high potential, high-prescribing doctors (Soumerai & Avorn, 1990). The move from face-to-face academic detailing to educating doctors online is referred to as e-detailing. E-detailing is communicating and educating a doctor on an online channel using technology (Trucco & Amirkhanova, 2006). In this category two types of e-detailing emerged, one is self e-detailing and the other is live e-detailing. These have been the most successful technologies applied in comparison to many others. Self e-detailing means that a physician will access a site, most often the pharmaceutical company site and will navigate through the site for education purposes. They browse the site in their own time and spend on average 10 to 15 minutes or more looking at trials, product features, and the company profile. Some sites have a call to action after the navigation and browsing experience. Live e-detailing involves representatives calling physicians and mimicking a face-to-face detailing session. This is done virtually, and representatives educate doctors on product features, new trials, mechanism of action videos, and have a dialogue with the doctors. The technology to enable such interaction can take place through many online and virtual platforms such as Microsoft Teams and Zoom.

According to a survey done in 2003, as noted in Trucco and Amirkhanova (2006), 78 per cent of medical doctors stated that they felt that the information detailed to them by representatives was biased and almost half of them said the timing of the calls was inconvenient. Physicians are equally frustrated with old detailing methods and the internet offers an alternative solution to address any lack of knowledge.

Pharmaceutical companies took heed of this trend and conducted case studies of their own to see the effects of e-learning as a source of detailing to doctors. There were many pharmaceutical companies that entered into this study, the following three allowed their names to be divulged, Aventis, Lily, and Novartis. The results of the e-learning/detailing across these pharmaceutical companies

were very significant and showed a huge ROI. One company showed a cost reduction, afforded by e-detailing, of 40 per cent. On interviewing doctors, they mentioned that when they saw a representative visiting them at their practice, to them this was selling. However, going online and browsing according to their prompts and needs, doctors felt that the information was more credible and more in-depth than what the representative delivered in face-to-face detailing. Doctors, who refused to see representatives, went online to cater for their gaps in knowledge and education (Trucco & Amirkhanova, 2006).

The number of studies over the years around the globe on e-detailing is very limited. One study focuses on the benefits and challenges of e-detailing in Europe, which the view of transferring best practices from the USA (Heutschi, Legner, Schiesser, Barak, & Österle, 2003). In the US, the representative force has increased tremendously and has brought about challenges; in Europe the challenges of conventional detailing are not very different and consist of limited opportunities for personal calls, large intervals between sales calls, short call durations, high costs of maintaining the detailing representative, inadequate availability of on the spot information, lack of differentiation from competitors, standardisation of communication, and tendency to classify doctors visited incorrectly (Heutschi et al., 2003). E-detailing as e-learning provides a different channel for pharmaceutical marketers to drive CME for doctors. Detailing has developed over the years and is distinguishable by the type of interaction used to communicate. This is shown in Figure 6.

	Human-human interaction	Rule-based human-machine interaction	Static human-machine interaction
Internet PC	• Video detailing • Telephone co-browsing • Chat, forum	• Interactive web programs	• Mass e-mail • Static electronic content
Mobile devices	• Chat	• Interactive programs for mobile devices	• Mobile device messaging e-mail, MMS, SMS)
Interactive digital TV	• Chat	• Interactive broadcasts	• Mass e-mail
Telephone		• Interactive voice response	
Personal visit	• Electronic detailing aid	• Interactive programs on laptop/mobile device	• Static electronic content on laptop/mobile device

Figure 6: Selected e-detailing approaches

(Heutschi et al., 2003, p. 266)

The benefits that e-detailing brings is shown in Figure 7, along with the challenges; European pharmaceutical companies still find it a challenge to make full use of these benefits. This is critical to understand, as Europe is a first world country in comparison to South Africa.

Corporate headquarters	**Company A** Europe	**Company B** Europe	**Company C** USA	**Company D** USA	**Company E** Europe
Interviewee position	Head of global e-detailing	Head of marketing	Head of business intelligence and new customers	Business unit director	Head of e-business
Experiences with e-detailing in Europe	Pilot projects conducted (video detailing, virtual detailing)	Pilot projects planned (telephone co-browsing)	No pilot projects planned	No pilot projects planned	Pilot projects conducted (video detailing, virtual detailing)
Interview results					
Main challenges in e-detailing	• Short interaction time • High costs • Limited reach	• Low contact frequency • Low effectiveness of detailing sessions	• Low contact frequency	• Access to physicians	• Declining contact frequency • Short interaction time • Declining impact per visit
Main potentials of e-detailing	• Extended reach • More time spent on a single detailing session • Independence of office hours • Increased information richness • Increased measurability of customer behaviour • Synergy effects for conventional detailing	• Increased contact frequency • Improved effectiveness of (e-) detailing sessions • Better knowledge about customer • Better customer acceptance	• Increased time to market for new product information	• Increased information richness, especially support of sales reps during detailing session with simulations, etc.	• Increased interaction frequency • Better customer satisfaction • Increased product visibility during market launch
Main challenges of e-detailing	• Legal and regulatory environment • Availability of vendors	• Loss of personal relationship • Lack of infrastructure/ skills at physician's offices	• Loss of personal relationship • Lack of interest from physicians • Unclear return on investment	• Acceptance of new communication channels • Internal scepticism, change processes • Legal restrictions • Lack of infrastructure/skills at physician's offices	• Unclear return on investment of video detailing • Difficulty in realising economies of scale due to heterogeneous market in Europe • Availability of vendors • Lack of infrastructure/skills at physician's offices • Legal restrictions

Figure 7: Benefits and challenges of e-detailing in Europe

(Heutschi et al., 2003, p. 269)

The evidence shows that e-detailing will complement the normal face-to-face detailing as relationships do play an important role (Fugh-Berman & Ahari, 2007). The main element for pharmaceutical companies is not whether one form of detailing is superior, but to reach doctors via different channels thus delivering constant, consistent, CME. Companies should strive to attract, retain, and educate doctors with the latest clinical information (Heutschi et al., 2003). In reaching doctors, pharmaceutical companies should combine their push and pull strategies when establishing e-detailing channels. Therefore, a mix of pull and push methods will be beneficial.

The ongoing question in the pharmaceutical industry over the last decades is the ROI on the medical representative versus online platforms to drive CME for doctors. One critical component for pharmaceutical companies is controlling the flow of information (Bernewitz, 2001). There are many platforms and digital concepts from which pharmaceutical companies can choose; applications on personal digital assistants (PDAs), online detail aids, digital detailing, online communities, chat rooms, and websites. This can be a costly exercise for a company and sometimes even unsuccessful. For these companies to be effective they need to look at two dimensions of communication:

(1) The extent to which the company wants to control the flow of information; do they want to push a key message, engage physicians in dialogue, or wait for physicians to reach out?

(2) The degree of personal interaction, in other words the 'human touch'.

After this is established then only can the company map out their indications, as shown in Figure 8.

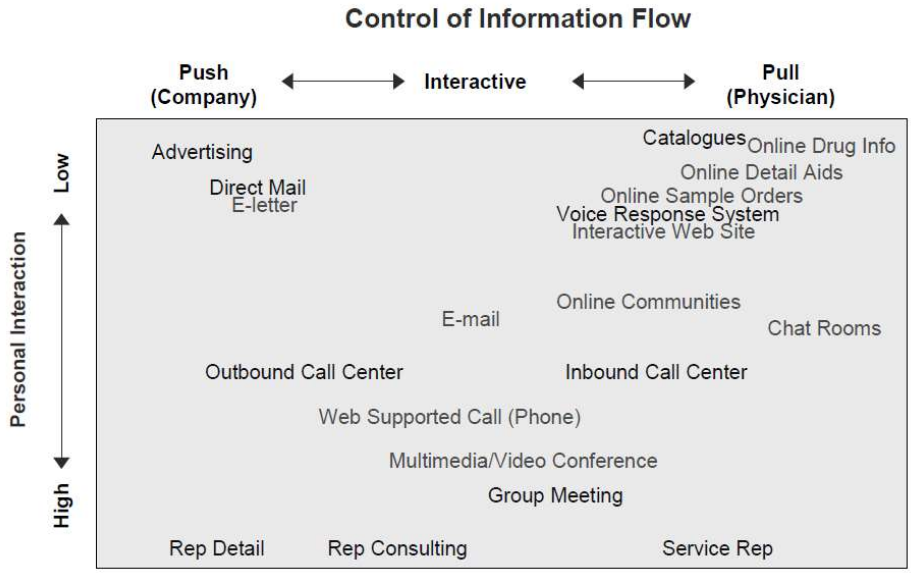


Figure 8: Spectrum of communication options

(Bernewtiz, 2001, p. 4)

The product life cycle plays an important role as to when to deploy the detailing message. With so many promotional options, the best promotional strategy to adopt in the product life cycle must be considered. Many companies look at deploying e-detailing at the latter stages of a product life cycle. However, according to Bernewitz (2001), this should not be the case. E-detailing and technology supported promotion works best where the content of the interaction is information rich, where a lot of information needs to be shared with graphs and data, animations, mechanism of action videos, and key opinion leader (KOL) videos. The best position for this e-detailing is when the company has launched a product and is looking at anchoring key messages and supporting these messages with science and information. Figure 9 gives a clear indication of the positioning of the key messages after the launch of the product as it correlates with physicians' fact-based decisions.

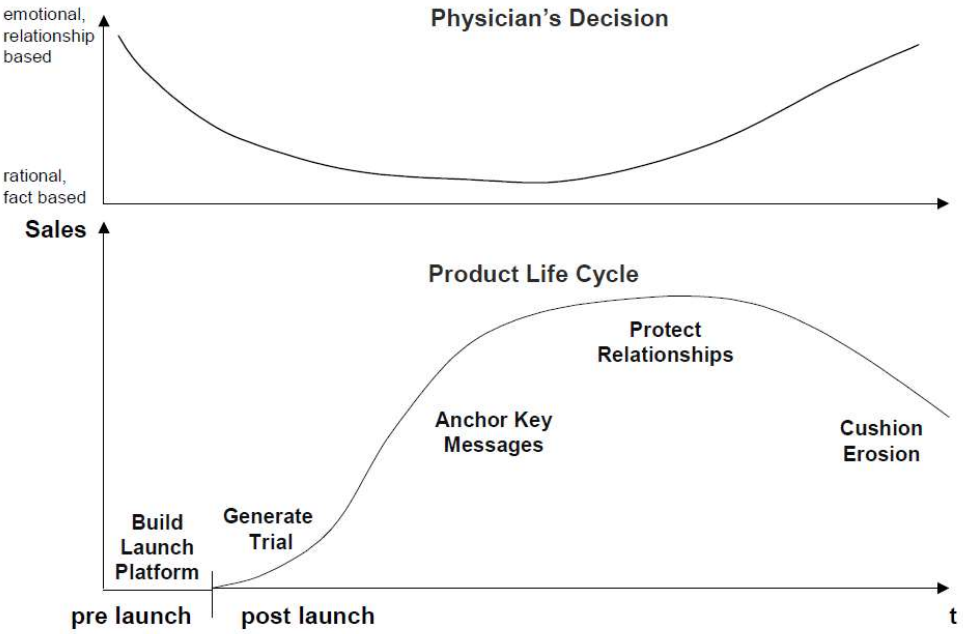


Figure 9: Key messages in the product life cycle

(Bernewitz, 2001, p. 7)

E-detailing breaks down the geographical barriers and affords doctors and opportunity to log into an online platform from any location, at their convenience, and spend more time educating themselves on information required. In

comparison to a representative face-to-face visit, e-detailing has broader reach and coverage; hence, CME is available to all doctors, not just those covered by representatives.

Some of the challenges that arise for companies is that the rate of adoption and the reach. As with the seed corn innovation in Iowa State (Rogers, 2010), it took time to diffuse; this needs to be factored in to e-detailing plans. In terms of reach, companies need to be mindful of the internet bandwidth, network coverage, support, and IT infrastructure. It means thinking and accounting for a completely new infrastructure. Training of the representatives is crucial to the innovations' success (Bernewitz, 2001). E-detailing does show a higher ROI than traditional doctor detailing (Trucco & Amirkhanova, 2006).

South Africa being an emerging market and having limited studies in the area of e-learning and e-detailing, a comparison to an emerging market like India was made to ascertain whether e-detailing plays a role in the education of doctors. There is a global view among healthcare professionals that e-detailing is not a replacement for traditional face-to-face doctor detailing (Banerjee & Dash, 2011). The rate of adoption of e-detailing is important, in the US, the rate ranges from 25 per cent to 60 per cent (Alkhateeb & Doucette, 2009). Another study found that residents, younger physicians, practicing alone and from rural areas where more likely to adopt e-detailing (Alkhateeb & Doucette 2009). It was also reported that cardiologists and endocrinologists were most likely to participate in e-detailing programmes (Business Wire, 2005).

Following from all the effects of e-detailing and the landscape of detailing as described in this chapter, the study by Banerjee and Dash, (2011) explored the existence of a significant relationship between acceptability of e-detailing and factors like age, qualifications, service type, number of prescriptions per week, number medical sales representative visits per week, ownership of gadgets like desktop computers, laptop computers, personal digital assistants, and association between invitations received to participate in e-detailing and acceptability of e-detailing. These formed the hypothesis of their study.

The results of this study showed some positive outcomes of e-detailing, in that it delivered the science in a structured format. It allowed doctors the time and space to grasp the facts. E-detailing provides the clarity of concept in the science of the drugs detailed. When it comes to product education in smaller group discussions, e-detailing allows for that type of discussion and flow of information. With e-detailing information can be uploaded and updated in real time. However, like all traditional methods, traditional detailing has its advantages and that is the one-on-one interactions and building of relationships (Banerjee & Dash, 2011).

2.9 E-learning as a self-directed educational tool for doctors

The use of the internet by doctors has increased considerably since 2010, looking for educational material on products, diagnoses, management of a condition, and dissemination of educational material to patients. A survey conducted by The American Medical Association has shown an increase in internet usage by doctors, from 20 per cent in 1997 to 78 per cent in 2001 (Bennett, Casebeer, Kristofco, & Strasser, 2004). This internet information-seeking behaviour is on the increase and is gaining popularity among doctors and healthcare professionals (Harris Jr, Novalis-Marine, & Harris, 2003); information is readily available to physicians to access, interpret, contrast and make decisions to diagnose and treat patients (Bennett et al., 2004). The study by Bennett et al. (2004) focussed on how patient care is influenced by the internet with its rapidly changing repository of information.

Physicians' online usage is increasing rapidly; however, the amount of information on the internet poses another challenge for busy physicians; a host of information needs to be sifted through according to relevance, source, and credibility. In terms of clinical information, 73 per cent of physicians found the internet to be a more credible resource and the credibility of the information and source ranked high with physicians. On their internet searching behaviour, more than half were very confident using the internet. Male physicians were more confident in using the internet compared to female physicians. The top three barriers to information seeking were navigation and searching difficulties (59.4

per cent), too much information (50.8 per cent), and disease or product specific information not available (47.4 per cent).

On their internet information use, more than half declared that they used the internet daily or weekly searching for clinical information, 24 per cent reported monthly use and 15.6 per cent never used the internet (Bennett et al., 2004). Many physicians are increasing the use of internet and online resource in their clinical practice; with this increase, the barriers to information searching are also increasing. Understanding the patterns of physicians' searches for information on the internet allows companies to develop and design educational content that matches their searching patterns.

A study conducted among doctors found an oversupply of educational content that was unbearable for doctors to manage (Smith, 1996). In a 1993 study in Norway, one third of doctors found that it was difficult to keep updated with the influx of information in their daily work (Nylenna, Aasland, & Falkum, 1996). A random sample of 1 646 physicians were targeted, which made up 10 per cent of Norwegian physicians. Those completing the survey numbered 1 276, of whom 283 were primary care physicians and 741 were hospital doctors. It was evident that primary care physicians spent more time on congresses, meetings, and courses than did hospital doctors. Both groups spent an equal amount of time on the internet; approximately 50 minutes per week, despite hospital doctors having higher access to the internet. The primary care physicians, in comparison to hospital doctors, found the internet a very important and excellent source of information for them to keep up-to-date professionally (Nylenna & Aasland, 2007).

Many studies exist today on physicians' internet seeking patterns with different results. Little evidence exists on the theories of physician learning and change, and its contribution to online searching behaviours. Physicians are motivated to learn to fill a knowledge gap in understanding a therapeutic area in order to fulfil a specific need to treat a patient as effectively as possible. This brings about the behaviour change (Slotnik, 1999).

When a need is the motivator to fill a knowledge gap then self-directed learning takes place by searching for this critical information. This self-directed learning takes place in three phases. The first phase is the awareness of the need to change a habit or set practice to which they are accustomed. Phase two involves the learning needed to master the new practice, and phase three puts this practice into use in a clinical setting. Self-directed learning that brings about a change needs resources and support to be maintained. These resources are made up of three types: material resources in the form of journals; human resources in the form of colleagues; and formal CME programs. What doctors choose to learn is self-directed according the need that arises and the gaps in knowledge (Johnson & Meischke, 1993).

Figure 10 shows motivators that drive internet search behaviour.

	Mean	SD
Particular patient problem	1.75	1.16
Scanning new information in a disease area	2.32	1.10
Latest research on a specific topic	2.60	1.28
New product information	3.38	1.14
Specific drug dosage	3.94	1.31

1 = highest motivation; 6 = lowest motivation.

Figure 10: Motivations for physicians searching on internet

(Casebeer, Bennett, Kristofco, Carillo, & Centor, 2002, p. 37)

Searching for educational content online, as in previous studies, the credibility of the information and the source of the information are ranked highly by doctors. A barrier found was too much information on the internet, and a lack of tagged referencing to overcome this barrier.

Factors important to physicians using online platforms are detailed in Figure 11.

	Mean	SD
Ease of program use	2.5	1.7
Validity of content	2.6	1.7
Category 1 credit	3.8	2.4
Evidence-based content	4.2	2.0
Faculty credentials	4.3	1.9
Length of course	4.2	1.9
On-line CME certificate	5.3	2.2
Provider credentials	6.0	2.0

1 = most important; 6 = least important.

Figure 11: Factors important to physicians in accessing online CMEs

(Casebeer et al., 2002, p. 37)

The key to CME is overcoming physicians' barriers to internet searching. These barriers are information overload, navigating abilities, unable to find the information, internet speeds for loading information, and additional plug in programmes required. This is evidence for CME developers and designers when providing credible, relevant, and easy to find information, which delivers quality education to doctors for effective patient treatment (Casebeer et al., 2002).

2.10 Effects of the COVID-19 pandemic

In light of the COVID-19 pandemic, e-learning platforms will serve as a portal to unify doctors, share best practices, and deliver real-time education in a much faster and more efficient way. With social distancing regulations in place, the time available to see patients and representatives is going to be further compromised; therefore, pharmaceutical companies will need to look at other channels for educating doctors. The way in which representatives call on doctors and healthcare professionals has changed, and e-learning allows them to meet doctors in a different way.

The medical profession has not undergone any drastic changes in the past few decades, as evidence has shown in this research. The onset of COVID-19 has changed the CME for doctors, representatives, and pharmaceutical companies. A recent study looked at the influence of COVID-19 and the CME of doctors

visited by representatives. A study was conducted in India, which has high number of medical representatives calling on doctors. The pandemic and subsequent implementation of social distancing has confined the medical representatives to their homes, which has brought about a radical shift in the industry. This is not only in India but also across the globe. This has forced pharmaceutical companies to look at alternative ways to educate doctors and they have adopted the omni-channel approach (face-to-face and digital) to reach doctors (Chiplunkar, Gowda, & Shivakumar, 2020). This study makes mention of the adoption of e-detailing during the COVID-19 times, to reach doctors with critical education. Doctors see representatives as an important source of pharmaceutical information; however, trends in the pharmaceutical industry show digital has become a supportive alternative to face-to-face interactions brought about by the COVID-19 disruption, and a new normal has emerged not only in the pharmaceutical sector but also the world. COVID-19 has brought about an increased trend in internet searching behaviours for doctors to satisfy their need for information through online platforms, webinars, medical sites, e-detailing, video-conferencing, and telemedicine. There is a clear tendency for pharmaceutical companies to adopt a social media strategy and a digital strategy in the pharmaceutical marketing process (Chiplunkar et al., 2020).

Many reports have identified the gaps in digital transformation in the healthcare system and the added benefits it could bring in driving efficiencies and bringing about high ROIs. Digital transformation is a long drawn-out process including key stakeholders such as government and business to assist in instigating the adoption of digitalisation of health systems. Although this process has proved a success in some countries, a divide in terms of infrastructure support, quality, access, and funding or budgetary constraints still poses a threat to the adoption rates of digitalisation. For digitalisation to be successful, a collaborative effort is required of the health fraternity, government, and industry (Jones, Peter, Rutter, & Soumaroo, 2019).

In pre-COVID-19 times, there was much talk on virtual health being at the forefront of the health system for the past 10 to 15 years. The adoption process of this virtual health drive has been very slow. The disruption of COVID-19 has

pushed the health system and doctors to adopt this process. The trend is an increase in virtual health, with doctors consulting with patients online, which saves patient commuting time and reduces overall costs. Other considerations playing a critical role are physicians' alignment of work flow design and their CME to assist in this adoption process of virtual health (Fowkes, Fross, Gilbert, & Harris, 2020). Virtual health will form part of the next normal, post-COVID-19 times, and an innovative e-learning platform will be well positioned to reinvent itself as the need and times dictate.

A survey conducted by Deloitte in February 2020 on the virtual health landscape in the US showed a very different landscape before COVID-19 (Abrams, Shah, Korba, & Elsner, 2020). The survey was conducted to research physicians' perspectives and understanding of virtual health. The results post-COVID-19 showed an increase in physicians engaging in virtual health with their patients, where the interaction rate rose from 38 per cent in 2018 to 63 per cent in early 2020. Almost 90 per cent of physicians noted that essential services in the virtual health setting were missing. They did not know how to show empathy in a virtual setting; however, expressed an interest in training that is required for their upskilling. During this survey, it was noted that the business models should change for doctors of the future to have a better understanding of the business of medicine, and a robust knowledge based on prevention and well-being. The onset of COVID-19 changed the landscape drastically and the survey showed an increase in virtual health by between 50 and 70 per cent (Abrams et al., 2020).

Virtual health is well poised to becoming the channel of consulting with patients, as it is a time saver for both doctors and patients. In view of these learnings Deloitte's recommendations on facilitating and increasing the adoption process of virtual health are:

(1) Prioritise training and continued education as physicians saw this lacking in their practice, and there was a need for it;

(2) Integrate data and automate processes to help with the seamless technology incorporation into doctors' day-to-day operations; and

(3) Redefine traditional best practices and scale up what works, this is critical as in this way the information is shared fast and efficiently (Abrams et al., 2020).

With the evolution of health over the years and with the shift in healthcare, studies show that 80 per cent of health outcomes are unrelated to the medical system. Eating habits, life style habits, socio-economic status, and location have a greater impact on our health outcomes than healthcare itself. The focus is shifting back to communities and according to Deloitte's Centre for Health Solutions; the next 20 years will see communities focus on prevention and wellbeing. This has led to a concept called Smart Health Communities (SHCs); a key feature is the use of digital technology and behaviour science. Hence, CME for doctors and health information for consumers will entail education on prevention and wellbeing in a digitally connected community (Dhar, Friedman, Chang, & Majerol, 2019).

China has been leading the way on the key learnings of COVID-19, since it is the originator country. This has also led China and the Biopharma industries to operate in the new COVID-19 normal and share the emerging trends with the rest of the world. China is the world's second largest pharmaceutical market; its high complexity has been exacerbated as the pandemic has rolled out. From the pandemic five themes emerged for business and their future:

(1) Constrained budgets;

(2) Shifting patient flows;

(3) Need for new go-to-market models;

(4) Disruption in clinical development programmes and supply chain; and

(5) Changes in government policy (Chen, Le Deu, Zhou, & Zhou, 2020).

With regard to go-to-market models, the pandemic has had three major effects. First, an increase in digital solutions, second, a more prominent role of pharmacies, and third the relationship between pharmaceutical companies and

doctors as the face-to-face consultation during COVID-19 was not allowed (Chen et al., 2020).

This led to an increase in digital platforms; hospitals launched platforms to educate doctors and nurses, online pharmacy numbers expanded, and virtual consultations increased. Medical associations and authorities ramped up educational webinars, online education, and services for patients to consult. Various platforms and apps were launched to drive education to both doctors and consumers. Pharmaceutical companies have started with an approach of a new go-to-market model encompassing the omni-channel approach to educate doctors. Pharmaceutical companies made more use of digital platforms and online education during the crisis to drive education on products and understanding of the disease (Chen et al., 2020).

Digitising is the theme when it comes to both pharmaceutical and MedTech companies during the COVID-19 pandemic and in the recovery phases of these companies in the aftermath of the pandemic. The way business has been done has been reshaped and reimagined for the future. McKinsey's (Chadha, Ennen, Parekh, & Pellumbi, 2020) recommendations for the future are that companies should quickly prioritise scaling up digital capabilities of reaching their customers and being in touch; digital capabilities that look at an omni-channel approach of online web casts, representative detailing, CME conferences, and training. Some companies have already shown changes to their go-to-market models by adopting digital detailing, digital media, and product demonstrations. The majority of the companies will be reluctant to make structural changes to their sales forces and commercial teams; however, face-to-face restrictions with doctors and hospitals will continue for some time into the future. Companies must use this time to upskill their sales force and become digitally connected with their customers, as this will put them in a stronger position after the COVID-19 pandemic (Chadha et al., 2020).

From May 2020, Africa has seen a constant increase in infections and for the continent this poses a further challenge in countries managing infant mortality rates, Ebola virus, and HIV, to name only a few. McKinsey's report can assist the

continent in spending their billions wisely on the emergency of saving lives now and future investments in the health system to make countries more resilient in post-COVID-19 times (Chadha et al., 2020).

In the global race for a vaccine, Egypt and South Africa are the two countries in the continent involved in trials; this shows the divide in sharing of best practices and knowledge. One of the ideas suggested is to build consumer-centric digital health ecosystems, which are lacking in Africa. This would help to streamline processes and have a much more efficient system of accessing patients and linking them to healthcare professionals, a model very successful in Moscow (Chadha et al., 2020).

The other idea that resonates with e-learning is the use of digital platforms. In Africa, this has been very slow, and the onset of the pandemic pushed countries to adopt digital platforms in the education the healthcare sectors. This has been well demonstrated in Australia, where nursing staff were educated on the coronavirus and the use of protective equipment. The same could happen in Africa to pave the way for education, training, and coaching for the future (Chadha et al., 2020).

Following from recent trends and reports, certain themes are emerging for the future, especially managing the new normal post-COVID-19. The themes that resonate under the umbrella of online platforms are digitalisation, online education, virtual health, digital health solutions, and health communities.

2.11 Conceptual model of analysis

Figure 12 shows the conceptual model of analysis on the channels of e-learning and face-to-face detailing contributing to the continued education of doctors.

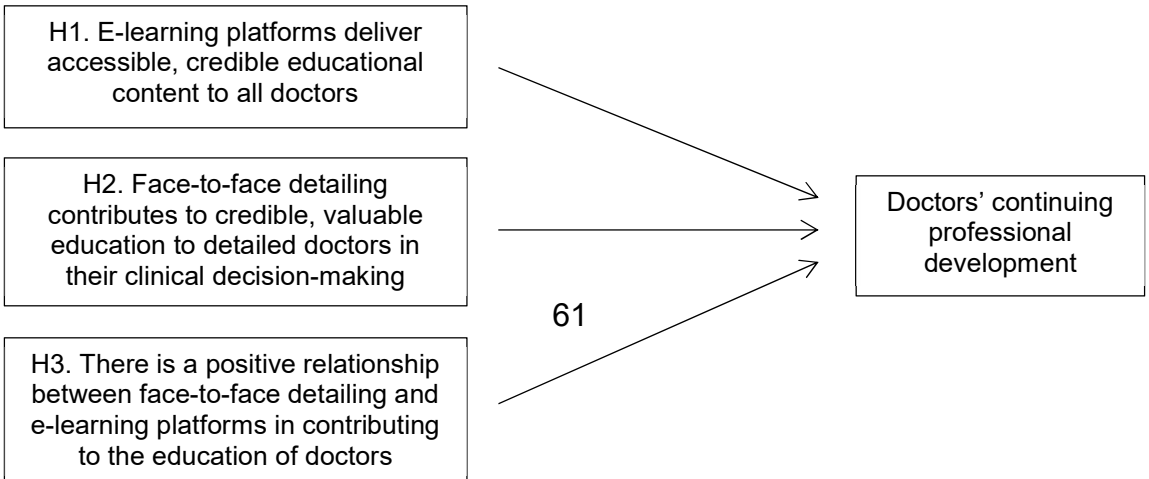


Figure 12: Conceptual model of analysis

2.11.1 Hypothesis 1

H1: E-learning platforms deliver accessible, credible educational content to all doctors.

2.11.2 Hypothesis 2

H2: Face-to-face detailing contributes to credible valuable education to detailed doctors in their clinical decision-making process.

2.11.3 Hypothesis 3

H3: There is a positive relationship between face-to-face detailing and e-learning platforms in contributing to the education of doctors.

2.12 Conclusion of literature review

This chapter has analysed the themes, theories, contexts, and subjects that concern the main problem, to determine and develop a more effective way to provide education for all doctors using an E-learning platform as an alternative to face-to-face academic detailing.

This research had its roots in diffusion theory. This theory is critical for new information or innovations that are emerging in medical science; the new e-learning platform for CME of doctors is the innovation. After reviewing the literature, it was evident that the diffusion process is not linear but multifaceted.

The rate of diffusion needs to resemble concentric circles. To understand how fast the diffusion will spread among healthcare professionals, an awareness of the critical mass that will be needed where the adopters become the advocates of the innovation and go on to creating self-sustaining innovation.

Networks play an important role in understanding how a new idea or innovation spreads through interpersonal channels. In the medical profession, this is critical, as there is hierarchy among the medical experts and within their circles of colleagues and influence. There are ongoing interactions between professors, physicians, doctors, nurses, and pharmacists. The knowledge transfer from one person to another can be sticky and this affects the diffusion process.

While an innovation is diffusing, it also has the propensity to be re-invented as the early adopters see fit; this is something that can easily happen to an e-learning platform. From a simple online education platform to one that include webcasts and live video conferencing are just some of the examples that can be added onto this platform.

An innovation like an e-learning platform can be overwhelming for some medical doctors. In launching an e-learning platform for doctors, their acceptance of technology, skills with navigating technology, and barriers preventing them using the technology, needs to be considered. The e-learning platform needs to be credible, easy to ease, convenient, and be the solution to educating doctors and bringing about effective patient outcomes.

The literature review has shown that for an innovation to be successfully adopted it needs to have a relative advantage, be compatible, trial-able, and observable, and the complexity needs to be overcome. In designing the e-learning platform, this will be critical.

Academic doctor detailing is still seen as a very effective way to educate doctors. On a yearly basis, huge investment is made in recruiting, training, and deploying medical representatives to educate and detail doctors. As noted in the literature review, the initial launch of a new product brings new clinical news to doctors. Over a period with no new news doctors' detailing visits are merely driven by a

relationship established and the marketing tactics deployed by pharmaceutical companies. This is in the form of invitations to CMEs, golf days, lunches, and special launches. This is done by targeting and segmenting the high potential, high prescribing doctors that will generate incremental revenue for the company. This opens the door for many unethical practices that questions the credibility of information provided by the representatives and the leaves doctors vulnerable to these unethical practices. Some doctors opt not to see representatives at all. A huge educational divide thus arises from doctors being detailed and doctors not being detailed by representatives.

Doctors not being visited by representatives must find alternative ways to cater for the gaps in their CME. The internet searching behaviour among doctors is increasing; they are searching for clinical content to assist them in their day-to-day decision-making process. This limits wasting time seeing representatives and receiving the same messages; they can dedicate time to seeing more patients and continuing their medical education at their convenience. Some doctors prefer a hybrid model of gaining education, seeing a representative and increasing their internet searching to validate their decision.

The review has demonstrated that academic face-to-face detailing did bring about changes in prescription behaviour among doctors. This was done by educating doctors on wrongful prescriptions, which lowered healthcare costs and brought about effective patient outcomes.

E-learning among doctors has increased with the rise of the internet and having more than one electronic device at their disposal. Studies have shown that doctors are taking more responsibility for self-directed e-learning as the industry faces budgetary constraints on face-to-face detailing, invitations to events, and funding of CMEs. However, this increase in e-learning is taking place in developed worlds and brings with it is owns challenges, such as internal buy in from management to support such applications. The issue of funding upgrades and bandwidth connectivity are other challenges to be faced. For an e-learning platform to be effective, these barriers need to be overcome.

From the literature review it is conclusive that e-detailing, as part of e-learning, will complement face-to-face detailing and in this way a hybrid model of detailing will be effective in establishing relationships, building networks and having an online education platform, which will be beneficial should representatives not have enough time to detail all doctors.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter includes the following sections: (1) an introduction; (2) research methodology; (3) the research approach or paradigm; (4) the research design; (5) the population and sample; (6) the research instrument; (7) the procedure for data collection; (8) the data analysis techniques; (9) the validity and reliability of research design; and (10) the limitations of the study.

3.2 Research methodology

There are many different types of research methodology. For the purpose of this research, the quantitative approach was used. Literature shows that different researchers give different definitions of quantitative research (Sukamolson, 2007).

Quantitative research looks at the empirical evidence answering empirical statements, in other words, it looks at the real case, which this is then represented in numbers (Cohen, Manion, & Morrison, 1980). Statistical analysis programs are used to input the data gathered to help prove the empirical statements and arrive at conclusive answers that allow very little room for error (Creswell, 1994). Quantitative research, aims to understand and explain a phenomenon.

3.3 Research approach / paradigm

In trying to explain a phenomenon, data needs to be analysed, but data does not appear naturally and thus needs to be collected. To collect data, research instruments are designed which measure intentions, behaviour patterns, and attitudes of a populations' sample. Thus, quantitative research explains the real situation in a societal context (Sukamolson, 2007). Quantitative research is used to answers six types of questions:

(1) When a numerical quantitative answer is required. For example, if the number of doctors who will adopt an e-learning innovation is required, quantitative, not qualitative, research will provide this number.

(2) When there is change taking place and the result that is needed is a number: For example, the number of doctors who have not registered for an e-learning course in the past two years.

(3) To conduct audience segmentation in terms of geographical location and age, which worked well for this research, as that is what it set out to do.

(4) To quantify attitudes, behaviours, and intentions to use the innovation; in this study quantitative research provided this data set.

(5) It helps to explain certain phenomenon. In this research, it helped to explain the motivation and barriers behind adopting or rejecting an innovation.

(6) To test hypotheses and establish the relationships that exist between variables.

The first four are called differential research because something is being described, the next two are called inferential research because something is being explained (Sukamolson, 2007).

Different types of quantitative research exist in the form of survey research, correlation research, experimental research, and casual-comparative research. The common approach to quantitative research can take the form of:

(1) surveys,

(2) custom surveys,

(3) mail / e-mail / internet surveys,

(4) telephone surveys,

(5) self-administered questionnaire surveys,

(6) omnibus surveys,

(7) correlation research,

(8) trend analysis,

(9) exploratory research,

(10) descriptive research, and

(11) experimental research.

This research took the form of survey research among medical doctors in South Africa. The reason behind using the survey research was to make use of scientific sampling and questionnaire design with statistical precision. The research helped to answer questions around behaviours and attitudes, assisted managers in group comparisons, and ensured that it can be applied to the wider or entire population with a good degree of certainty. This research's quantitative approach looked at the adoption of a five-point Likert agreement scale to provide an indication of the behavioural traits pertaining to doctors' purchasing behaviour, occupational behaviour, social media behaviour, and other personal and work-related issues (Parasuraman & Colby, 2015).

This was important for this research as it provided a strong indication of the likelihood of an innovation being adopted, and the period over which is would be adopted. This further enhanced the placing of pillars to ensure a successful innovation among healthcare professionals completing their annual CME.

Quantitative research differs from the contrasting method of qualitative research. For quantitative research, the truth is out there, and it is the researcher's duty to provide the data and the evidence by objective methods. This is also termed realist or positivist, while qualitative research is seen as subjectivist.

3.4 Research design

There are numerous types of research design for various research projects. The problem to be solved in alignment with aim of the research dictates the choice of research design to be employed. Each design has set methods of collecting and analysing the data; these comprise historical, descriptive, correlation, experimental, simulation, evaluation, action, ethnological, feminist, and cultural (Walliman, 2011). For this study, the research design employed was evaluation, which is a descriptive type of research design. This design looks at the social constructs, with the main aim of going beyond merely the facts. It provides information to make sense of and understand the social complexities of human interaction, as well as political, cultural, and contextual factors. This design can employ a range of system analyses, which investigates the relationship between variables. The main aim of this type of evaluation design is to measure levels of awareness and cost effectiveness, to achieve objectives, and have a level of quality assurance. The results that arise from this design are used to bring about changes to improve and develop the situation (Walliman, 2011).

This study's design was critical, as the e-learning platform's objective is improvement of the clinical decision-making process by providing CME. The attitudinal rating scale adopted was the Likert scale, which was used to measure the attitude of doctors in their use and adoption of the innovation in their continued professional development. This rating scale was also used in TRI 2.0 (Parasuraman & Colby, 2015). The Likert scale, formerly known as the agree or disagree scale, was developed by Rensis Likert (Likert, 1961), and provides respondents with a battery of attitudinal dimensions with which respondents are asked to agree or disagree. Each item is given a score ranging from one to five, negative or positive, and -2 or +2, which are scored at the end of the process. As these are interval data, means and standard deviations can be calculated for each statement (Brace, 2018). The full application of the Likert scale to this study meant the sum of scores for each respondent providing an overall attitudinal score for the sample.

3.5 Population and sample

3.5.1 Population

The population for this research consisted of medical doctors that had completed their full university study and were in practice, from their first year of work to age of retirement. This population comprised male and female doctors working in both private and government settings in the nine provinces in South Africa.

3.5.2 Sample and sampling method

In quantitative research, two types of sampling are generally used, the first and the most common is representative sample. The second is convenience sample. When doing research with convenience sample, the results cannot be adopted to explain a phenomenon to a larger population, as it is only descriptive in nature. However, this method is considered exploratory and can be used in an area of research where there has no prior study done. The representative sample results can be used to explain the phenomenon in larger populations; therefore, the size of the representative sample is important (Shields & Twycross, 2008).

The sample size for this research comprised 456 medical doctors obtained from an online database of medical doctors in South Africa. This large sample increased the value of the results by being statistically significant. The use of large sample sizes assists in obtaining stable estimates of the standard errors to assure that the factor loadings are the true reflection of the true population values (Hinkin, 1998).

3.6 The research instrument

A research instrument is simply a device to collect data. Each instrument has its own strengths and weaknesses and no one instrument is superior to another. How the instrument is used is critical to the data being weak or strong (Wilkinson & Birmingham, 2003). A questionnaire is the most favoured tool in research; it is cost effective to produce and is easily manageable. Designing a questionnaire

can be very detailed and cover many topics, or very focussed and look at one specific area. It is most useful in acquiring data on a range of subjects and from different respondents. A carefully constructed questionnaire, properly disseminated and analysed, can give a very good view of respondents' answers.

There are three broad types of questionnaires, the mail survey, the group-administered questionnaire, and the household drop-off survey. The mail survey is the most common where the survey is posted to respondents; today this is available via the internet and web platforms. The group survey involves gathering respondents in one location and administering the survey. The household drop-off survey is delivered by hand to specific houses. In drafting the questionnaire, there are different types of questions. These are closed questions, requiring a simple 'yes' or 'no' response, and open-ended questions which leads the respondents to expand on their answers. This type of questionnaire is a bit more difficult to analyse. Another option is multiple-choice questions, which give the respondents choices, in this way the survey is managed (Wilkinson & Birmingham, 2003).

There are also scale-item questions, which require respondents to answer via a scale system. The scale-item aspect was used in this research survey and consisted of technology readiness statements that were on a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree). This research instrument (Appendix A) comprises of the following sections:

- Attitudes towards doctor detailing representatives;
- Source of educational information for doctors;
- E-learning behaviour among doctors;
- Demographics and employment sectors of doctors;
- Doctors skill set towards handling of technology and use of technology; and

- Work related questions concerning occupation, employment status, and whether their employment is technology related (Parasuraman & Colby, 2015).

This survey investigated the source of credible, accurate, clinical, medical information and the technology readiness of the sample was an important predictor of technology-related behaviours, particularly in the e-learning domain.

3.7 Procedure for data collection

The data collection took place through an online platform for doctors in South Africa. The informed consent form (Appendix B) was posted online together with the survey. The survey consisted of 15 questions that measured the attitude of doctors toward medical representatives, their sources of information, and e-learning behaviour among doctors. The survey was posted on the online platform for doctors to complete over a month. At the end of the month, a sample size of 456 respondents was sufficient to proceed with the analysis.

3.8 Data analysis

The data was analysed using the IBM Statistical Package for Social Sciences (SPSS) statistics software (version 25). Descriptive statistics was utilised to describe the sample data in such a way as to portray the typical respondent and to reveal the general pattern of responses from the questionnaire. Factor and reliability analyses were performed to test for construct validity and reliability.

The independent samples T-test was used to test for differences in construct scores between males and females in the sample.

Correlation analysis using the Pearson correlation coefficient was used to describe the strength, direction, and statistical significance of the relationship between attitude towards detailed representatives, source of information (education) and e-learning behaviour.

Multiple regression analysis was used to test the predictive power of the independent variables: Attitude towards detailed representatives and e-learning behaviour on the dependent variable: doctors' education. The model is detailed in this equation:

$$Y = \beta_0 + B_1X_1 + B_2X_2$$

Where: X_1 is attitude towards detailed representatives
X_2 is e-learning behaviour
Y is the dependent variable: doctors' education

The analysis consists of the following:

(a) Frequencies;

(b) Custom tables;

(c) Means and standard deviations;

(d) Exploratory factor analysis;

(e) Reliability analysis;

(f) Independent samples T-test;

(g) Correlation analysis; and

(h) Multiple regression analysis.

3.9 Validity and reliability

In quantitative studies, validity and reliability are commonly used to test whether the analysis conducted on the data set is accurate and followed the correct methodology (Golafshani, 2003). Both form the fundamentals of good research in evaluating the measurement tool. What an instrument sets out to measure and how well it does this measurement is the main objective of validity. Reliability on the other hand is concerned with the faith that one has in the data gathered from the measuring instrument (Mohajan, 2017). Thus, the purpose of reliability and

validity in research is to ensure that the data is sound and can be replicated, and that the findings are accurate.

As mentioned above, validity in quantitative research is the degree to which the instruments set out to measure what it is designed to measure (Thatcher, 2010). Validity has two aspects: external (transferability) and internal (credibility) which are discussed in the next subsections.

3.9.1 External validity

This validity shows whether the results achieved by the study can be transferred to other groups that have similar interests (Mohajan, 2017). External validity can be increased by making use of various strategies such as using random selection, heterogeneous groups, non-reactive measures, and precise descriptions so that the study can be replicated in other populations.

In this study, since all three hypotheses were tested, the sample size, the collected usable survey data, and the use of the measuring instrument (Likert scale) enhanced the validity.

3.9.2 Internal validity

Internal validity refers to the results' truthfulness in relation to sample size selection, data collection procedure, and data analysis (Willis, Jost, & Nilakanta, 2007). To guarantee this thoroughness, strategies of the results can be described and research can be peer reviewed, triangulation strategies can be employed, contact with the sample can be prolonged, and member checks conducted (Mohajan, 2017). One distinct feature of internal validity is the consistency of reliability and that all processes and methods are testing the same concept (Thomson, 2011). The Cronbach's alpha coefficient is the most widely used measure to test for internal consistency of reliability (Sun et al., 2007).

3.9.3 Reliability

Reliability in quantitative studies is defined as the measurement that provides consistent results with equal values (Blumberg & Schindler, 2005). It gives assurance by measuring consistency and accurateness, being repeatable and credible, and ensuring the trustworthiness of the research (Chakrabartty, 2013). This helps in indicating the extent to which the research is free of error and shows consistency across the various measurements set out in the instrument (Mohajan, 2017).

In quantitative research, there are two types of reliability: stability and internal consistency reliability (Mohajan, 2017). This study measured and reported on the internal consistency reliability following the collection of the Likert scale data. The common measure on internal consistency is Cronbach's alpha, which is usually interpreted as a mean of all possible split-half coefficients. It shows average inter-correlation of items and the number of items in the scale. The Cronbach's Alpha is widely used in the social sciences, nursing, business, and other disciplines. It was first named alpha by Lee Joseph Cronbach in 1951. The numerical measurement is between 0 and 1, where 0 means no relationships between the variables and thus no reliability, and 1 denotes a perfect, absolute internal consistency (Tavakol & Dennick, 2011). Cronbach alpha values of 0.7 are considered acceptable and satisfactory, above 0.8 is considered good, and above 0.9 denotes exceptional internal consistency (Cronbach, 1951).

The five-point Likert scale was adopted in this study and thus it was imperative to make use of Cronbach's alpha to measure internal consistency. The Pearson correlation matrix software SPSS was used to calculate the Cronbach's alpha scores. The usable data collected was analysed with the SPSS software to measure the correlations between variables. This test is important as it shows the relationships between variables. The useable sample was more than adequate to conduct factor analysis, reliability analysis, correlations, and multiple regression analysis.

3.10 Limitations of the study

This study is limited to doctors in South Africa. It would be beneficial to conduct a study like this in Africa, and then globally. This e-learning innovation can re-invent itself and bridge the educational gap that exists among doctors on different continents and provide education for all doctors, not just those visited by medical representatives. This study did not study the gap in education between doctors detailed to and doctors not detailed to by medical representatives; this could be the basis for future research. Finally, this study included only online surveys, which meant that doctors without or with limited access to the internet could hot have responded. This could skew the results in favour of e-platforms.

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter represents the results received from the online survey sent out to doctors. The sample size aim was to achieve 250 responses; the responses received numbered 456, all of which contained usable data. The variables of attitudes toward doctor detailing representatives, source of information for doctors, and e-learning behaviour were tested. In analysing this data set, SPSS software was employed with P-values of no less than 0.05 statistical significance (Sun et al., 2007). The 456 usable data sets underwent the first part of the analysis that looked at descriptive analysis of the demographics and characteristics of the respondents. The second part involved complete analysis using the SPSS package investigating and reporting on descriptive statistics, factor analysis, reliability analysis, t-tests to investigate the difference in construct scores between the male and female doctors, correlation analysis, and multiple regression analysis.

4.2 Demographic characteristics of the respondents

4.2.1 Gender

Table 1 and Figure 13 indicate that 160 (35.1 per cent) doctors were male and 296 (64.9 per cent) were female, totalling 456 respondents.

Table 1: Gender distribution

Gender	Frequency	Per cent
Male	160	35.1
Female	296	64.9
Total	456	100

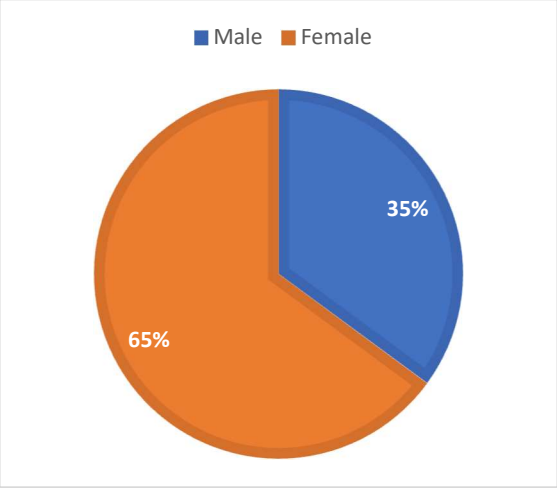


Figure 13: Gender distribution

4.2.2 Home language

Table 2 and Figure 14 show that of the total sample of 456 doctors, 219 (48 per cent) were English, 198 (43.4 per cent) were Afrikaans, 16 (3.5 per cent) were Nguni, 18 (3.9 per cent) were Sotho, three (0.7 per cent) were Venda/Tsonga, and two (0.4 per cent) were German.

Table 2: Home language

Home language	Frequency	Per cent
English	219	48
Afrikaans	198	43.4
Nguni	16	3.5
Sotho	18	3.9
Venda/Tsonga	3	0.7
Other (German)	2	0.4

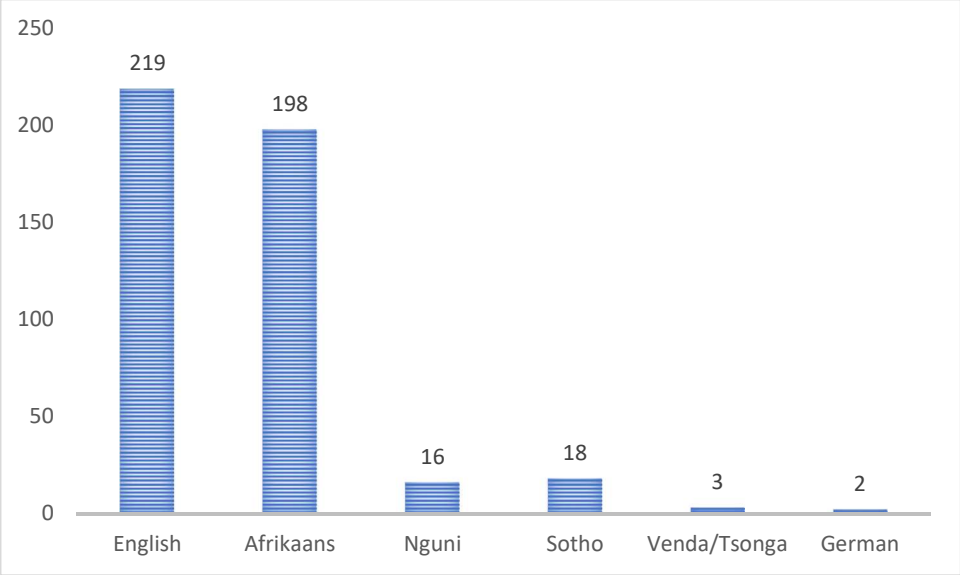


Figure 14: Home language

4.2.3 Province of practice

Table 3 indicates that 157 (34.4 per cent) doctors practiced in Gauteng, 23 (five per cent) in the Free State, 13 (2.9 per cent) in Limpopo, 37 (8.1 per cent) in the Eastern Cape, 121 (26.5 per cent) in the Western Cape, eight (1.8 per cent) in the Northern Cape, 64 (14 per cent) in KwaZulu-Natal, 16 (3.5 per cent) in Mpumalanga, and 17 (3.7 per cent) in the North West province.

Table 3: Province of practice

Province	Frequency	Per cent
Gauteng	157	34.4
Free State	23	5
Limpopo	13	2.9
Eastern Cape	37	8.1
Western Cape	121	26.5
Northern Cape	8	1.8
KwaZulu-Natal	64	14
Mpumalanga	16	3.5
North West	17	3.7

4.2.4 Practice sector

Table 4 and Figure 15 indicate that 92 (20.2 per cent) doctors practiced in the state sector and 364 (79.8 per cent) in the private sector.

Table 4: Practice sector

Practice sector	Frequency	Per cent
State sector	92	20.2
Private sector	364	79.8

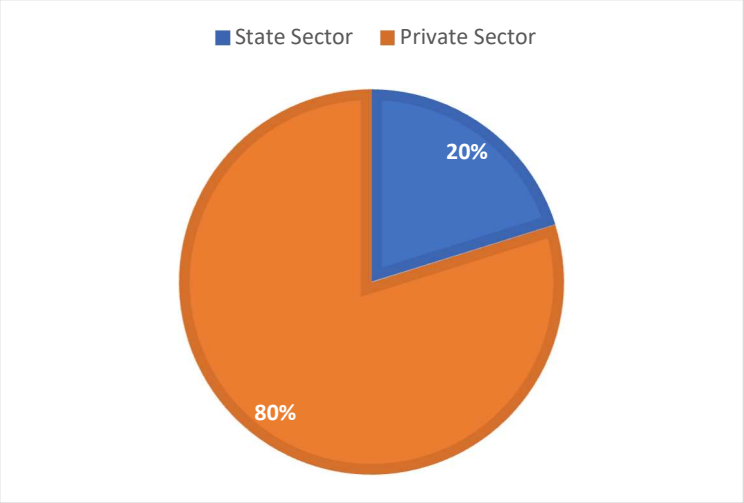


Figure 15: Practice sector

4.3 Descriptive statistics

This section presents a summary of the Likert scale questions. The response scale used was ordinal. The categories used were 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The results are presented in two tables per section. The first table shows the per cent of responses per category and the second table presents the mean and standard deviation of each question.

4.3.1 Attitude towards detailing representatives

The results in Table 5 indicated that on average the respondents were in agreement with the three statements: detailing representatives add clinical value to their practice; the source of information detailed by representatives is accurate and credible; and the professional relationship with representatives is important for doctors' decision-making process. This is shown in Table 6 by the mean values of 3.75, 3.76, and 3.62 respectively. Doctors were neutral about the statement: detailing representatives over-emphasise the clinical messages of a drug, with the mean value of 3.32; and doctors either disagreed with or were neutral about the statement: the detailing representative is seen as manipulative.

Table 5: Agreement scale: Attitude towards detailing representatives

Attitude		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
AB1 Visiting detailing representatives add clinical value to my practice.	Count	11	16	118	244	67
	Row N %	2,4%	3,5%	25,9%	53,5%	14,7%
AB2 The source of information detailed by representatives is accurate and credible.	Count	5	8	123	277	43
	Row N %	1,1%	1,8%	27,0%	60,7%	9,4%
AB3 The professional relationship with the representative is important for my decision-making process.	Count	11	42	124	213	66
	Row N %	2,4%	9,2%	27,2%	46,7%	14,5%
AB4 Detailing representatives over-emphasise the clinical messages of a drug.	Count	6	62	199	159	30
	Row N %	1,3%	13,6%	43,6%	34,9%	6,6%
AB5 The detailing representative is seen as manipulative.	Count	23	177	193	55	8
	Row N %	5,0%	38,8%	42,3%	12,1%	1,8%

Table 6: Mean and standard deviation: Attitude towards detailing representatives

Attitude	Mean	Std. Deviation
B1 Visiting detailing representatives add clinical value to my practice.	3,75	0,837
AB2 The source of information detailed by representatives is accurate and credible.	3,76	0,689
AB3 The professional relationship with the representative is important for my decision-making process.	3,62	0,926
AB4 Detailing representatives over-emphasise the clinical messages of a drug.	3,32	0,837
AB5 The detailing representative is seen as manipulative.	2,67	0,819

4.3.2 Source of information for doctors

The results in Table 7 indicate that on average doctors were neutral on the statement: detailers are their primary source of information, and Table 8 showed a mean value of 2.73. Doctors agreed with the two statements: CMEs, journal clubs and conferences contribute educational and clinical practice decisions; and fellow colleagues are an important source in clinical decision-making processes with mean values of 4.14 and 3.77 respectively. Doctors in the study agreed with the two statements: internet usage and e-learning as a major source of clinical information in their practice; and internet searching and ease of use of e-learning platforms is excellent, showing mean values of 4.03 and 3.85 respectively.

Table 7: Agreement scale: Source of information

Sources		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
SI1 Detailers are the primary source of information in my practice.	Count	39	165	152	80	20
	Row N %	8,6%	36,2%	33,3%	17,5%	4,4%
SI2 CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	Count	3	12	43	264	134
	Row N %	0,7%	2,6%	9,4%	57,9%	29,4%
SI3 My fellow colleagues are an important source in my clinical decision-making process.	Count	0	31	94	278	53
	Row N %	0,0%	6,8%	20,6%	61,0%	11,6%
SI4 Internet usage and e-learning platforms are a major source of clinical information in my practice.	Count	4	14	61	263	114
	Row N %	0,9%	3,1%	13,4%	57,7%	25,0%
SI5 My internet searching and ease of use of e-learning platforms is excellent	Count	3	24	88	266	75
	Row N %	0,7%	5,3%	19,3%	58,3%	16,4%

Table 8: Mean and standard deviation: Source of information

Sources	Mean	Std. Deviation
SI1 Detailers are the primary source of information in my practice.	2.73	0.99
SI2 CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	4.13	0.73
SI3 My fellow colleagues are an important source in my clinical decision-making process.	3.77	0.74
SI4 Internet usage and e-learning platforms are a major source of clinical information in my practice.	4.03	0.77
SI5 My internet searching and ease of use of e-learning platforms is excellent	3.85	0.78

4.3.3 E-learning behaviour of doctors

The results in Table 9 indicated that on average doctors were in agreement with the four statements: they have two or more electronic devices; the majority of their continued professional development points are earned online; they prefer receiving product detailing information via an e-learning platform; and their skill set for online searching of clinical information is excellent. Table 10 showed mean values of 4.16, 3.84, 3.73, and 3.83 respectively. Doctors however in disagreed or were neutral on the statement: they search online educational platforms for a minimum of two hours a day.

Table 9: Agreement scale: E-learning behaviour

E-learning behaviour		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
EL1 I have two or more electronic devices.	Count	6	16	13	283	138
	Row N %	1,3%	3,5%	2,9%	62,1%	30,3%
EL2 I search online educational platforms for a minimum of two hours a day.	Count	34	208	105	89	20
	Row N %	7,5%	45,6%	23,0%	19,5%	4,4%

E-learning behaviour		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
EL3 The majority of my CPD points are earned online.	Count	8	80	39	181	148
	Row N %	1,8%	17,5%	8,6%	39,7%	32,5%
EL4 I prefer receiving product detailing information via an e-learning platform.	Count	5	44	91	245	71
	Row N %	1,1%	9,6%	20,0%	53,7%	15,6%
EL5 My skill set for online searching of clinical information is excellent.	Count	1	34	87	255	79
	Row N %	0,2%	7,5%	19,1%	55,9%	17,3%

Table 10: Mean and standard deviation: E-learning behaviour

E-learning Behaviour	Mean	Std. Deviation
EL1 I have two or more electronic devices.	4,16	0,751
EL2 I search online educational platforms for a minimum of two hours a day.	2,68	1,012
EL3 The majority of my CPD points are earned online.	3,84	1,116
EL4 I prefer receiving product detailing information via an e-learning platform.	3,73	0,877
EL5 My skill set for online searching of clinical information is excellent.	3,83	0,808

4.4 Factor analysis

The factor analysis (Appendix C) comprises Kaiser-Meyer-Olkin (KMO) and Bartlett test results, and the factor analysis results.

Doctors' perceptions on detailing representatives and e-learning behaviour were investigated. Three constructs were derived theoretically namely, attitude towards detailing representatives, source of information, and e-learning behaviour. The construct items were analysed to test for construct validity. The

three constructs were individually factor analysed to determine the underlying dimensions using the principal component analysis with varimax rotation method.

Table 11 shows the KMO test of sphericity value for the attitude towards detailing representatives construct was 0.7, which exceeds the recommended value of 0.6 and Bartlett's test of adequacy was statistically significant shown by the p-value of 0.000. Table 12 indicates one factor with eigenvalues greater than 1. Item AB4 was omitted as it had MSA value of 0.456, below the recommended value of 0.6.

The source of information construct showed a KMO test of sphericity value of 0.659, which is above the recommended 0.6 value while the Bartlett's test of adequacy was statistically significant shown by the p-value of 0.000. The results showed one factor with eigenvalues greater than 1. Item SI1 was omitted as it had MSA value of 0.280, below the recommended value of 0.6.

The e-learning behaviour construct showed a KMO test of sphericity value of 0.644, which is above the recommended 0.6 value while the Bartlett's test of adequacy was statistically significant shown by the p-value of 0.000. The results showed one factors with eigenvalues greater than 1. Item EL1 was omitted as it had MSA value of 0.560, below the recommended value of 0.6.

Table 11: KMO and Bartlett test results

Factor	KMO test of Sphericity	Bartlett's Test of Adequacy	df	Approx. Chi-Square
Attitude	0.700	0.000	6	327.537
Source of information	0.659	0.000	6	211.790
E-Learning behaviour	0.644	0.000	6	158.820

Table 12: Factor analysis results

Constructs		Factor loading	% of Variance	Eigenvalue
Attitude towards detailing representatives	AB2 The source of information detailed by representatives is accurate and credible.	0.817	52.331	2.092
	AB1 Visiting detailing representatives add clinical value to my practice.	0.650		
	AB3 The professional relationship with the representative is important for my decision-making process.	0.553		
	AB5 The detailing representative is seen as manipulative.	0.392		
Source of information	SI4 Internet usage and E-Learning platforms are a major source of clinical information in my practice.	0.819	46.738	1.870
	SI5 My internet searching and ease of use of e-learning Platforms is excellent	0.529		
	SI2 CMEs, Journal Clubs and Conferences contribute to my educational and clinical practice decisions.	0.450		
	SI3 My fellow colleagues are an important source in my clinical decision-making process.	0.363		
E-Learning behaviour	EL4 I prefer receiving product detailing information via an e-learning platform.	0.576	43.885	1.755
	EL5 My skill set for online searching of clinical information is excellent.	0.560		
	EL2 I search online educational platforms for a minimum of 2 hours a day.	0.470		
	EL3 The majority of my CPD points are earned online.	0.401		

4.5 Reliability analysis

The reliability analysis (Appendix C) comprises the Cronbach's alpha values and t-test results. The reliability analysis tests whether all items measure the same underlying construct. The Cronbach's alpha coefficient is used to test for the internal consistency. An ordinal scale was used to test for the respondents'

perceptions. The categories used were 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

Table 13 shows the Cronbach alpha coefficient of values were 0.675, 0.613, and 0.556 for attitude towards detailing representatives, source of information, and e-learning behaviour constructs respectively. The constructs had Cronbach's alpha values below the acceptable level of 0.7; however, according to Pallant (2007), constructs with 10 items or less with inter-item correlation mean value between 0.2 and 0.4 shows good internal consistency.

Table 13: Cronbach's alpha values

Constructs	Cronbach's Alpha Coefficient	Inter-item Correlation Mean
Attitude towards detailing representatives	0.675	0.355
Source of information	0.613	0.283
E-learning behaviour	0.556	0.250

4.6 Testing for differences between groups

The gender t-test results and sector t-test results (Appendix C) show the comparison between genders, private- and state-sector doctors.

4.6.1 Doctors' gender

The difference in perception between male and female doctors on the attitude towards detailing representatives and e-learning behaviour were tested using the independent samples T-test. The results in Table 14 indicate no significant difference in the perception between male and female doctors on the two constructs. Attitude towards detailing representatives was indicated by a p-value of 0.510 with mean values of 3.64 and 3.60 for male and female doctors respectively. E-learning behaviour was indicated by a p value of 0.778 with mean values of 3.51 and 3.52 for male and female doctors respectively.

Table 14: Gender t-test results

Demographic	Attitude		E-Learning behaviour	
	Mean	P-value	Mean	P-value
Male doctors	3.638	0.510	3.506	0.778
Female doctors	3.599		3.524	

4.6.2 Doctors' practice sector

The study investigated differences in attitude and e-learning behaviour in doctors that practice in the state sector and those practicing in the private sector. The difference in attitudes and behaviour between doctors from the two sectors was tested using the independent samples T-test. The results in Table 15 indicate a significant difference in e-learning behaviour as indicated by the p value of 0.039 with mean values of 3.64 and 3.49 for state-sector doctors and private-sector doctors respectively. State-sector doctors have a more positive e-learning behaviour than do doctors in the private sector. However, no significant difference in attitude towards detailing representatives, as indicated by the p value of 0.261 and mean values of 3.55 and 3.63 for state-sector doctors and private-sector doctors respectively. State-sector doctors have more positive e-learning behaviour than do doctors in the private sector.

Table 15: Sector t-test results

Demographic	Attitude		E-Learning behaviour	
	Mean	P-value	Mean	P-value
State-sector doctors	3.552	0.261	3.639	0.039
Private-sector doctors	3.628		3.487	

4.7 Correlation analysis

The correlation analysis (Appendix D) comprises the attitudes towards detailing representatives, e-learning behaviour, and source of information. The Pearson

correlation coefficient was used to investigate the relationship between continuous variables. The four ordinal variables in the source of information section were treated as continuous variables with a range of 1 to 5. The constructs that the relationships were tested on were face-to-face detailing and e-learning behaviour. When testing for a relationship between a pair of variables three measures are investigated. First, the direction of the relationship can either be positive (high values of one variable are associated with high values of the other and vice versa) or negative (high values of one variable are associated with low values of the other). Second, the strength of the relationship is investigated where a Pearson correlation coefficient of less than 0.3 indicates a weak relationship, the value between 0.3 and 0.5 indicates a medium strength relationship, and a value of more than 0.5 indicates a strong relationship. The third is the p-value, which if less than 0.05 indicates a statistically significant relationship.

Table 16 show a weak positive relationship between attitude towards detailing representatives and e-leaning behaviour, r=0.032, n=456, p=0.501, the relationship was however not statistically significant.

There was a medium strength positive relationship between attitude towards detailing representatives and detailers as primary source of information; r=0.344, n=456, p=0.000, the relationship was statistically significant.

There was a weak positive relationship between attitude towards detailing representatives and CMEs, journal clubs and conferences contributing to their educational and clinical practice decisions; r=0.170, n=456, p=0.000, the relationship was statistically significant.

There was a weak positive relationship between attitude towards detailing representatives and their colleagues being an important source of their clinical decision-making process; r=0.030, n=456, p=0.523, the relationship was however not statistically significant.

There was a weak positive relationship between attitude towards detailing representatives and internet usage and e-learning platforms as being major

source of clinical information; r=0.095, n=456, p=0.043, the relationship was statistically significant.

Table 16: Correlation analysis: Attitude towards detailing representatives

Correlation	Attitude Towards Detailing Representatives		
	Pearson Correlation	p-value	N
E-learning behaviour construct	0.032	0.501	456
Source of Information			
SI1 Detailers are the primary source of information in my practice.	0.344	0.000	456
SI2 CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	0.170	0.000	456
SI3 My fellow colleagues are an important source in my clinical decision-making process.	0.030	0.523	456
SI4 Internet usage and e-learning platforms are a major source of clinical information in my practice.	0.095	0.043	456

Table 17 shows a weak positive relationship between e-learning behaviour and detailers as primary source of information, r=0.169, n=456, p<0.000, the relationship was statistically significant.

There was a weak positive relationship between e-learning behaviour and CMEs, journal clubs and conferences contributing to their educational and clinical practice decisions; r=0.115, n=456, p=0.014, the relationship was statistically significant.

There was a weak positive relationship between e-learning behaviour and their colleagues being an important source of their clinical decision-making process; r=0.087, n=456, p=0.064; however, the relationship was not statistically significant.

There was a medium strength positive relationship between e-learning behaviour and internet usage and e-learning platforms as being major source of clinical

information; r=0.299, n=456, p<0.000, the relationship was statistically significant.

Table 17: Correlation analysis: E-learning behaviour

Correlation	E-leaning behaviour		
	Pearson Correlation	P-value	N
Source of Information			
SI1. Detailers are the primary source of information in my practice.	0.169	0.000	456
SI2. CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	0.115	0.014	456
SI3. My fellow colleagues are an important source in my clinical decision-making process.	0.087	0.064	456
SI4. Internet usage and e-learning platforms are a major source of clinical information in my practice.	0.299	0.000	456

Table 18 shows a weak positive relationship between source of information and attitude towards detailing representatives; r=0.145, n=456, p=0.002, the relationship was statistically significant.

There was a medium strength positive relationship between source of information and e-learning behaviour; r=0.365, n=456, p<0.00, the relationship was statistically significant.

Table 18: Correlation analysis: Source of information

Correlation		Attitude Towards Detailing Representatives	E-learning Behaviour
Source of information	Pearson Correlation	0.145	0.365
	P-value	0.002	0.000
	N	456	456

4.8 Multiple regression

4.8.1 Prediction level of education

The multiple regression analysis (Appendix D) comprises of the ANOVA p-value and coefficient analysis. Multiple regression was used assess the effect of doctors' attitudes towards detailing representatives and their e-learning behaviour on their clinical education. Table 19 shows the ANOVA p-value for the model was less than 0.05 indicating that the model had strong predictive power and was statistically significant, R squared=0.151, F(2,455)=40.319, p<0.000. The model as a whole explained 15 per cent of the variance in education.

Table 19: Multiple regression analysis: Education

Construct	ANOVA p-value	N	df	F	R Square
Education	0.000	455	2	40.319	0.151

When assessing whether each of the two dependent variables, namely attitude towards detailing representatives and e-learning behaviour, made a statistically significant unique contribution to the model. The results in Table 20 show that both measures made a unique statistically significant contribution to predicting the level of relevance of the clinical education of doctors, as p-values were less than 0.05. The beta value indicated that attitude towards detailing representatives (beta=0.117) had a positive impact on education. The beta value also indicated that E-leaning behaviour (beta=0.294) had a positive impact on clinical education.

Table 20: Multiple regression coefficient analysis

Construct	P-value	Beta value
Attitude towards detailing representatives	0.002	0.117
E-learning behaviour	0.000	0.294

CHAPTER 5: DISCUSSION OF RESULTS

5.1 Introduction

This chapter of the report summarises the results of the research, the interpretation of the data, and the testing of the hypotheses to ascertain if the sample data is able to support the hypotheses.

5.2 Demographic profile of respondents

The sample consisted of both male and female doctors practicing in the private and state sectors. They were from the nine provinces of South Africa, and had access to online resources.

5.3 Hypothesis testing

A hypothesis is a theory that is not yet tested against collected evidence but has the possibility of being accepted or rejected once data is collected (Walliman, 2011). Research is much more valuable when it provides newfound data that can be used to solve a puzzling, inconsistent problem (Booth, Colomb, Williams, Bizup, & Fitzgerald, 2016).

In this research, inferential statistics was performed to assess the hypothesis. This type of statistics is used to make a generalisation from a sample of an entire population of interest. It therefore relies on approximate sampling methods to ensure a maximum representation of the population. It is based on probability theory and used for the testing of hypotheses. Inferential statistics encompasses a variety of statistical significance tests, which allows deductions to be made from findings. This statistic examines relationships and differences between variables, and makes predictions (Allua & Thompson, 2009).

5.3.1 Hypothesis 1

H1: E-learning platforms deliver accessible, credible, educational content to all doctors.

The results are as follows in Table 21.

Table 21: Correlation analysis for source of information

Correlation		Attitude	E-learning Behaviour
Source of information	Pearson correlation	0.145	0.365
	P-value	0.002	0.000
	N	456	456

The Pearson correlation coefficient indicated a medium strength positive relationship between education and e-leaning behaviour; r=0.365, n=456, p<0.00, the relationship was statistically significant. Hypothesis 1 was thus accepted; doctors were positive towards e-learning and this added to their clinical decision-making treatment processes.

It is evident that e-learning platforms were a major source of information for doctors. The findings in this construct matches with a survey undertaken by The American Medical Association (AMA), which showed that doctors' use of the internet increased daily as they searched for medical information. Physicians ranked e-learning on the internet high and having credible educational content (Bennett et al., 2004). Similar findings were evident among physicians in Norway that ranked e-learning on the internet as a great source of information (Nylenna & Aasland, 2007). The findings in this research were also consistent with other studies in the domain of self-directed learning and internet searching behaviour patterns by doctors (Harris et al., 2003). The need to fill the gap in their knowledge is the key motivator to enhancing their e-learning behaviour thus closing the gap in education (Slotnik, 1999)

5.3.2 Hypothesis 2

H2: Face-to-face detailing contributes to credible, valuable education to detailed doctors in their clinical decision-making process.

The results of the study are detailed in Table 22. The Pearson correlation coefficient indicated that there was a weak positive relationship between education and attitude towards detailing representatives; r=0.145, n=456, p=0.002, the relationship was statistically significant. Hypothesis 2 was thus accepted.

Table 22: Attitude towards doctor detailing representatives

Construct		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
AB1 Visiting detailing representatives add clinical value to my practice.	Count	11	16	118	244	67
	Row N %	2.4%	3.5%	25.9%	53.5%	14.7%
AB2 The source of information detailed by representatives is accurate and credible.	Count	5	8	123	277	43
	Row N %	1.1%	1.8%	27.0%	60.7%	9.4%
AB3 The professional relationship with the representative is important for my decision-making process.	Count	11	42	124	213	66
	Row N %	2.4%	9.2%	27.2%	46.7%	14.5%
AB4 Detailing representatives over-emphasise the clinical messages of a drug.	Count	6	62	199	159	30
	Row N %	1.3%	13.6%	43.6%	34.9%	6.6%
AB5 The detailing representative is seen as manipulative.	Count	23	177	193	55	8
	Row N %	5.0%	38.8%	42.3%	12.1%	1.8%

It is evident that doctors agreed that the detailing representatives added clinical value to their practice; the source of information that they delivered was credible, and the relationship they had with the representative was important. Doctors

were neutral on representatives over-emphasising clinical messages, and disagreed with or were neutral about perceiving representatives as manipulative.

On the first two survey questions, the results agreed with other research findings, that representatives deliver accurate and credible scientific information to change prescribing behaviours and decrease prescribing errors (Soumerai & Avorn, 1990). This face-to-face detailing delivered credible information in reducing antibiotic prescriptions has also proven successful in and has led to change in behaviour for both doctor and patient (Soumerai & Avorn, 1986). Research findings in incorrect prescriptions to old patients with delayed renal clearance showed that accurate, credible information given by detailing representatives did bring about a reduction in prescription of drugs that caused severe adverse effects (Roberts et al., 2010).

On the survey on relationships, doctors placed high value on relationships. Many studies echoed this, where relationships have assisted in educating doctors on prescribing the correct products for patient outcomes; however, it can make doctors susceptible to unethical practices (Fugh-Berman & Ahari, 2007).

On the last two survey questions of representatives, over-emphasising a clinical message and being perceived as manipulative, this study's results showed doctors as either being neutral or disagreeing. These findings were consistent with the extensive research that doctors did not see the negative effects of detailing and their relationships with representatives; they saw this as part of their professional development (Keim et al., 1993). Doctors in South Africa felt the same way towards seeing detailing representatives.

5.3.3 Hypothesis 3

H3: There is a positive relationship between face-to-face detailing and e-learning platforms in contributing to the education of doctors.

The results are shown in Table 23 Multiple regression was used assess the effect of doctors' attitudes towards detailing representatives and their e-learning behaviour on their clinical education. The model had strong predictive power and

was statistically significant, R-squared=0.151, F(2,455)=40.319, p<0.000. The total variance explained by the combination of the two independent variables on education was 15 per cent. The results also showed that both independent variables made a unique statistically significant contribution to predicting the level of relevance of the clinical education of doctors, as the p-values were less than .05. The beta value indicated that attitude towards detailing representatives (beta=0.117) had a positive impact on education. The beta value indicated that e-leaning behaviour (beta=0.294) had a positive impact on clinical education.

Table 23: Multiple regressions coefficient analysis

Construct	P-value	Beta value
Attitude representatives	0.002	0.117
E-learning behaviour	0.000	0.294

From these results, it was evident doctors' attitudes towards representatives contributing to their education had an impact on their clinical practice; however an even stronger impact on their education was e-learning and their online searches, which closed the gap in their education.

The research showed that e-learning was being adopted at a much faster rate in the medical profession, and was seen as an important component in uniting doctors and having a coordinated distributed approach of education and best practices sharing (Ellaway & Masters, 2008).

In face-to-face detailing, evidence shows that the time spent with doctors averages seven to eight minutes and the information given is often rushed (Soumerai & Avorn, 1990). E-detailing is an alternative that involves educating doctors on new clinical findings and products on an online platform. This proved to have a higher ROI for pharmaceutical companies and at the same freed up doctors' time that would have otherwise gone to seeing representatives. Their time can now be spent with patients. E-detailing takes two forms, one of self-directed detailing, where doctors search for their own information, and the other, live detailing, with representatives educating doctors online (Trucco & Amirkhanova, 2006).

Around the globe, studies on e-detailing via e-learning platforms are very limited. In both Europe and the US, pharmaceutical companies have similar challenges of low frequency calls, short call durations, high costs of maintaining the representatives, inconsistency in targeting the correct doctors, and delivering the correct message. E-learning platforms hosting e-detailing content are an alternative channel to educating doctors (Heutschi et al., 2003).

Evidence shows that e-detailing would be a good add on to the normal face-to-face detailing as relationships do play an important role (Fugh-Berman & Ahari, 2007). An important aspect for pharmaceutical companies is not to place emphasis on either form of detailing being better than the other, but strive to reach doctors via different channels with the aim of delivering constant, consistent education (Heutschi et al., 2003).

Internet usage among healthcare professionals is increasing, as shown in the survey conducted by The American Medical Association, showing an increase from 20 per cent in 1997 to 78 per cent in 2001 (Bennett et al., 2004). Similar research showed an increase in similar patterns of behaviour such as internet browsing (Harris et al., 2003).

5.4 Conclusion

This study provided insight into three factors that influence the CME of doctors:

(1) E-learning platforms allowed for ease of accessibility and provided credible, accurate information;

(2) Face-to-face detailing by representatives provided credible, valuable information, and

(3) The value that doctors placed on e-learning platforms and visiting detailing representatives contributed to their medical education.

The results show that all three factors had a positive effect on the CME of doctors. The face-to-face detailing had a weak positive relationship on education, the e-

learning platforms had a medium strength positive relationship and there was a positive relationship between face-to-face detailing and e-learning platforms contributing to doctors' medical education.

These findings are consistent with similar studies conducted by Fugh-Berman and Ahari (2007), Brody (2005), Soumerai and Avorn (1990), Chimonas et al. (2007), and Steinman et al. (2012). These looked at the credibility and value of the education provided and the extent and implications of the relationships between representatives' and doctors.

E-learning has been on the increase since 2010 and continues to increase in line with technology. Many doctors in this research found the e-learning platforms to be a source of more credible and valuable information for their clinical decision-making processes. The few studies done in the area of e-learning showed that a number of doctors were searching online and moving towards self-directed learning. Similar studies on the impact, the increased use of e-learning, and the credible value add of e-learning were conducted by Heutschi et al. (2003), Bernewitz (2001) and Trucco and Amirkhanova (2006).

Although similar studies have been carried out in different regions of the world, it is evident that many factors play a role in the adoption of an innovation that is dependent on internet infrastructure. These factors include access to online education, the budget set aside to support this type of education, and a joint collaboration between industries, medical schools, and the government.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter concludes the study, includes theoretical and managerial implications, and makes recommendations for future research.

6.2 Conclusions of the study

The main problem was to determine and develop a more effective way to reach and provide accurate, credible education for all doctors by using an innovation such as an e-learning platform as an alternative to representatives' detailing visits.

The two sub-problems aimed to determine whether there was a preference by doctors to utilise visiting representatives or an e-learning platform for their education, and if there was a positive correlation between the impact of e-learning behaviour on doctors' education and clinical decision making in South Africa. The outcome of this study revealed some important implications as it followed the research methodology, tested the validity and reliability of the measuring instruments, and proved the hypothesis. The outcome of the three hypotheses was statistically significant and has similar outcomes of other studies conducted in Canada, US, Australia, Norway and India.

6.2.1 E-learning platforms deliver accessible, credible educational content to all doctors

The results from this study showed that South African doctors were positive towards e-learning and that this contributed to their clinical decision-making process. E-learning platforms around the globe, more so in first world countries, is on the increase as is the internet searching behaviour of doctors. The study results have shown a similar e-learning behaviour pattern with studies from the

US (Bennett et al., 2004) and Norway, where physicians searched online as they believed that this source of information was more credible and accurate (Nylenna & Aasland, 2007). The need to fill a gap in knowledge is the key motivator to internet searching behaviour, as evident in this study's findings with doctors in South Africa, which was similar to other studies (Harris et al., 2003; Slotnik, 1999).

The results from the South African doctors' e-learning behaviour showed a positive trend in terms of electronic devices owned, searching to earn continuing professional development points, and spending at least two hours a day on the internet. This shows that South African doctors are displaying similar search behaviour patterns evident in the literature reviews.

6.2.2 Face-to-face detailing contributes to credible valuable education to detailed doctors in their clinical decision-making process

The results showed that South African doctors have a positive relationship between education and attitude towards detailing representatives. The findings show that doctors agreed that representatives added to their clinical decisions and they placed a high value on their relationships with representatives. They remained neutral or disagreed as to whether representatives over emphasised clinical messages and were being manipulative in influencing prescribing habits.

The findings from this research is consistent with similar studies where the effect of the representative has amended incorrect prescribing behaviours by providing credible accurate information (Soumerai & Avorn, 1990), and brought about the reduction in prescribing errors and mortality rates (Roberts et al., 2010).

When it came to representative and doctor relationships, certain studies affirmed that representatives played a critical role in doctor education, as mentioned above; however, other studies were contradictory (Fugh-Berman & Ahari, 2007) as representatives were perceived as manipulative, persuading doctors to over prescribe the products.

The study found that doctors were neutral or in disagreement with representatives over-emphasising clinical messages or being manipulative, these findings are consistent with similar studies. Doctors questioned about the ethical aspects of representative relationships, their response was that they did not see the relationships as such, but saw the process as part of their job (Keim et al., 1993). In the South African context, similar reasons were assumed in doctors who gave neutral responses when questioned on the relationships with representatives.

6.2.3 The positive relationship between face-to-face detailing and e-learning platforms contribute to the education of doctors

Of the three-hypothesis tested and accepted, the positive relationship between face-to-face detailing and e-learning platforms in contributing to the education of doctors in South Africa had the strongest predictive power and was statistically significant. Both independent variable: face-to-face detailing and e-learning, made a uniquely statistically significant contribution to predicting the level of relevance of the clinical education of doctors.

Globally, more pharmaceutical companies have increased their detailing representatives in the field, the quality of time to detail doctors is diminished and pharmaceutical companies are in competition for this face-to-face time with doctors (Soumerai & Avorn, 1990). This is also the case in South Africa, as global and local companies are present in South Africa; representatives compete for the same face-to-face detailing time.

Studies have shown that e-learning is being adopted at a much faster rate and is seen as an important utility in unifying doctors, co-ordinating approaches, and sharing best practices (Ellaway & Masters, 2008). As previously mentioned, e-learning behaviour patterns are also on the increase (Harris et al., 2003).

Detailing on an e-learning platform is referred to as e-detailing. This form of detailing is an alternative channel of reaching all doctors and thus freeing doctors' time to be used with patients. This self-directed learning allows doctors to consult

with a representative online should the need arise for more information and education (Trucco & Amirkhanova, 2006).

Studies on e-detailing are very limited, and the evidence shows that in both Europe and the US the challenges of low frequency of visits, limited time spent with doctors, and high investment in representatives is similar (Heutschi et al., 2003). This can also be assumed in South Africa, as mentioned the same companies exist in South Africa and the challenges are much the same.

South African doctors place high importance on their relationships with representatives, and on e-learning platforms. The pharmaceutical companies must be aware that one method is not better than the other is; but different channels can be used to reach doctors with a consistent, credible, and valuable message to provide effective, clinical outcomes for their patients.

6.3 Implications of the study

This section covers the theoretical and managerial implications of the study.

6.3.1 Theoretical implications

This study will contribute to the existing and future e-learning innovations in the CME of doctors in South Africa. Globally, there are numerous studies on e-learning innovations in the medical fraternity, but these are very limited in the South African context. The results of this study will assist in understanding the different channels that doctors use in their continued professional development. The study shed light on the importance of relationship between doctors and representatives, the attitudes doctors have towards visiting representatives, and how doctors see representatives as key educators contributing to their professional development. The influence of three different variables was examined: face-to-face detailing, e-learning platforms, and the relationships between face-to-face and e-learning in providing accessible, credible, and valuable education to doctors. The results help to understand the behaviour

patterns of South African doctors searching online and their readiness to adopt innovations pertaining to e-learning.

6.3.2 Managerial implications

In the pharmaceutical industry, companies are seeking ways to reach more doctors than their current representative force can do, with consistent, credible, and valuable information. This is seen in their strategic three-year and five-year plans. The results from this study allows pharmaceutical companies in South Africa to understand the value that doctors place on representatives relationships, the different channels doctors use for self-education, and doctors online searching behaviour. In view of these results, there is no singular method of reaching doctors, but rather an omni-channel approach is needed. E-learning in the South African context is an increasingly popular and available channel to reach doctors. The results showed that online behaviour of doctors in South Africa were similar to the global online searching trends of doctors. Thus, for managers of pharmaceutical companies, a hybrid model, which entails face-to-face detailing and an e-learning platform as an add-on, is proposed; this will have a higher ROI of time, money, and resources. Pharmaceutical companies in South Africa should all look at adopting such a model and, in this way, provide education to all doctors in South Africa and not just doctors that their representatives visit. In addition, online education programmes can be accredited by the government thus contributing to the overall continued professional development of doctors and easing the burden on government to carry out this mammoth task.

6.3.3 COVID-19 implications

The pandemic has brought about a shift in the way the medical profession moves forward; for both doctors and pharmaceutical companies the way of doing business has changed. The themes of constrained budget and shifting patient flows, the need for new go-to-market models, disruptions in the supply chain, and changes in government policy has emerged from this pandemic.

With regard to go-to-market models, the pandemic has had three major effects. First, an increase in digital solutions, second, a more prominent role of pharmacies, and third the relationship between pharmaceutical companies and doctors as the face-to-face consultation during COVID-19 was not allowed.

The implications are thus an increase in digital platforms; hospitals launching platforms to educate doctors and nurses, online pharmacy numbers expanded, and virtual consultations increasing. Medical associations and authorities have to ramp up educational webinars, online education, and services for patients to continue consultations. This drives the need for various online platforms and apps to be launched to drive education to both doctors and consumers. Pharmaceutical companies have to adopt a new go-to-market model encompassing the omni-channel approach to educating doctors.

The majority of the companies will be reluctant to make structural changes to their sales forces and commercial teams; however, face-to-face restrictions with doctors and hospitals will continue for some time into the future. Companies must use this time to upskill their sales force and become digitally connected with their customers, as this will put them in a stronger position after the COVID-19 pandemic.

6.4 Recommendations for future e-learning

The proposal and recommendations from this study is an innovative e-learning platform to deliver CME to doctors in South Africa will be well poised to both government and the pharmaceutical industry to emerge successfully from its current state to a post COVID-19 state. This platform will address the short comings in the educational divide among doctors and prepare the country to provide credible valuable education in real time, irrespective of a doctor being visited by a representative or not. It will bring a co-ordinated effort in education sharing and best clinical practices and bridge the gap in education in the continent and globally. As an innovation, it will lend itself to re-invention as it is adopted; it can include many add ins, such as web conferencing, virtual

platforms, chat bots, e-detailing, and video conferencing which has been noted in the well-researched reports of McKinsey and Deloitte in section 2.10.

6.4 Suggestions for future research

A similar study should be considered for the African continent, conducted with detailed and undetailed doctors. Another study should be on the impact of COVID-19 and the changes in the jobs of representatives that call on doctors.

REFERENCES

Abrams, K., Shah, U., Korba, C. & Elsner, N. (2020). *How the Virtual Health Landscape is Shifting in a Rapidly Changing World.* Retrieved 3 August 2020, from: https://www.modernhealthcare.com/technology/how-virtual-health-landscape-shifting-rapidly-changing-world

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*(2), 179-211.

Alkhateeb, F. M., & Doucette, W. R. (2009). Influences on physicians' adoption of electronic detailing (e-detailing). *Informatics for Health and Social Care, 34*(1), 39-52.

Allua, S., & Thompson, C. B. (2009). Inferential Statistics. *Air Medical Journal, 24*(8), 168-171.

Alsop, S. (1999, July 5th). Have I told you lately that I hate Windows? *Fortune*, pp. 177-178.

Avorn, J., & Soumerai, S. B. (1983). Improving drug-therapy decisions through educational outreach: a randomized controlled trial of academically based detailing. *New England Journal of Medicine, 308*(24), 1457-1463.

Avorn, J., Soumerai, S. B., Everitt, D. E., Ross-Degnan, D., Beers, M. H., Sherman, D., ... & Fields, D. (1992). A randomized trial of a program to reduce the use of psychoactive drugs in nursing homes. *New England Journal of Medicine, 327*(3), 168-173.

Avorn, J., Soumerai, S. B., Taylor, W., Wessels, M. R., Janousek, J., & Weiner, M. (1988). Reduction of incorrect antibiotic dosing through a structured educational order form. *Archives of Internal Medicine, 148*(8), 1720-1724.

Banerjee, S., & Dash, S. K. (2011). Effectiveness of e-detailing as an innovative pharmaceutical marketing tool in emerging economies: Views of health care professionals of India. *Journal of Medical Marketing, 11*(3), 204-214.

Bates, A., Bailey, E., & Rajyaguru, I. (2002). Navigating the e-detailing maze. *Journal of Medical Marketing, 2*(3), 255-262.

Bennett, N. L., Casebeer, L. L., Kristofco, R. E., & Strasser, S. M. (2004). Physicians' internet information-seeking behaviors. *Journal of Continuing Education in the Health Professions, 24*(1), 31-38.

Bennett, N. L., Davis, D. A., Easterling Jr, W. E., Friedmann, P., Green, J. S., Koeppen, B. M., ... & Waxman, H. S. (2000). Continuing medical education: a new vision of the professional development of physicians. *Academic Medicine, 75*(12), 1167-1172.

Bernewitz, T. (2001). *E-Detailing: Where Does it Fit in Pharmaceutical Sales: How web-supported Promotion could Reshape Sales Activity*. Retrieved 10 April 2019, from: http://www.infozyme.com/documents/zs_edetailing.PDF

Berry, L. L. (1981). The employee as a customer. *Journal of Retail Banking, 3*(1), 33-40.

Berry, L. L. (1999). *Discovering the Soul of Service: The Nine Drivers of Sustainable Business.* New York: Free Press.

Berwick, D. M. (2003). Disseminating innovations in healthcare. *Journal of the American Medical Association, 289*(15), 1969-1975.

Blumberg, B. C. & Schindler, P. S. (2005). *Business Research Methods*. Berkshire: McGraw Hill Education.

Booms, B. H. & Bitner, M. J. (1981). Marketing strategies and organization structures for service firms. In Donnelly, J. H. & George, W. R. (Eds.), *Marketing of Services*, (pp. 47-51). Chicago, IL: American Marketing Association.

Booth, W. C., Colomb, G. G., Williams, J. M., Bizup, J., & Fitzgerald, W. T. (2016). *The Craft of Research* (4th ed.). Chicago: The University of Chicago Press.

Bowman, M. (1986). The impact of drug company funding on the content of continuing medical education. *Mobius: A Journal for Continuing Education Professionals in Health Sciences, 6*(1), 66-69.

Brace, I. (2018). *Questionnaire Design: How to Plan, Structure and Write Survey Material for Effective Market Research.* London: Kogan Page.

Brahima, S. (2013). *The World in 2013. ICT Facts and Figures*. Geneva Switzerland: Telecommunication Development Bureau, International Telecommunications Union.

Broadhead, R. S., Heckathorn, D. D., Grund, J. P. C., Stern, L. S., & Anthony, D. L. (1995). Drug users versus outreach workers in combating AIDS: preliminary results of a peer-driven intervention. *Journal of Drug Issues, 25*(3), 531-564.

Brody, H. (2005). The company we keep: Why physicians should refuse to see representatives. *The Annals of Family Medicine, 3*(1), 82-85.

Business Wire. (2005). *Verispan Reports: Cardiologists and Endocrinologists are the Most Likely to Participate in ePromotion*. San Francisco, CA: Business Wire.

Casalino, L., Gillies, R. R., Shortell, S. M., Schmittdiel, J. A., Bodenheimer, T., Robinson, J. C., ... & Wang, M. C. (2003). External incentives, information technology, and organized processes to improve health care quality for patients with chronic diseases. *Journal of the American Medical Association, 289*(4), 434-441.

Casebeer, L., Bennett, N., Kristofco, R., Carillo, A., & Centor, R. (2002). Physician internet medical information seeking and on-line continuing education use patterns. *Journal of Continuing Education in the Health Professions, 22*(1), 33-42.

Chadha, S., Ennen, M., Parekh, R., & Pellumbi. G. (2020). *Reimagining Medtech for a COVID-19 World*. Retrieved 20 July 2020, from:

https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/reimagining-medtech-for-a-covid-19-world

Chakrabartty, S. N. (2013). Best split-half and maximum reliability. *IOSR Journal of Research and Method in Education, 3*(1), 1-8.

Chen, S., Le Deu, F., Zhou, G. & Zhou, J. (2020). *How COVID-19 Changes the Game for Biopharma in China*. Retrieved 20 July 2020, from: https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/how-covid-19-changes-the-game-for-biopharma-in-china

Chimonas, S., Brennan, T. A., & Rothman, D. J. (2007). Physicians and drug representatives: exploring the dynamics of the relationship. *Journal of General Internal Medicine, 22*(2), 184-190.

Chiplunkar, S. S., Gowda, D. V., & Shivakumar, H. G. (2020). Adaptation of pharmaceutical marketing and drug promotion practices in times of pandemic COVID-19. *International Journal of Health & Allied Sciences, 9*(5), 11-17.

Choudhry, N. K., Fletcher, R. H., & Soumerai, S. B. (2005). Systematic review: the relationship between clinical experience and quality of health care. *Annals of Internal Medicine, 142*(4), 260-273.

Cohen, L., Manion, L. & Morrison, K. (1980). *Research Methods in Education*. London: Croom Helm.

Creswell. (1994). *Research Design: Qualitative and Quantitative approaches*. London: Sage.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrikca, 16*(3), 297-334.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Derouin, R. E., Fritzsche, B. A., & Salas, E. (2005). E-Learning in organisations. Journal of Management 31(6), 920-940.

Dhar, A., Friedman, D., A., Chang, C. D., & Majerol, M. M. (2019). *Smart Health Communities and the Future of Health.* Retrieved 20 July 2020, from: https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/life-sciences-health-care/lu-smart-health-communities.pdf

Eccles, M. P., Hrisos, S., Francis, J., Kaner, E. F., Dickinson, H. O., Beyer, F., & Johnston, M. (2006). Do self-reported intentions predict clinicians' behaviour: a systematic review. *Implementation Science, 1*(1), 28. https://doi.org/10.1186/1748-5908-1-28

Ellaway, R., & Masters, K. (2008). AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. *Medical Teacher, 30*(5), 455-473.

Fischer, M. A., & Avorn, J. (2012). Academic detailing can play a key role in assessing and implementing comparative effectiveness research findings. Health Affairs, 31(10), 2206-2212.

Fitzgerald, L., Ferlie, E., Wood, M., & Hawkins, C. (2002). Interlocking interactions, the diffusion of innovations in health care. *Human relations, 55*(12), 1429-1449.

Flexner, A. (2002). Medical education in the United States and Canada. *Bulletin of the World Health Organisation, 80*(7), 594-602.

Fowkes, J., Fross, C., Gilbert, G., & Harris, A. (2020). *Virtual Health: A Look at the Next Frontier of Care Delivery*. Retrieved 17 July 2020, from: https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/virtual-health-a-look-at-the-next-frontier-of-care-delivery

Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., ... & Kistnasamy, B. (2010). Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. *The Lancet, 376*(9756), 1923-1958.

Fugh-Berman, A., & Ahari, S. (2007). Following the script: how drug reps make friends and influence doctors. *PLoS Medicine, 4*(4), e150. https://doi.org/10.1371/journal.pmed.0040150

Gehlbach, S. H., Wilkinson, W. E., Hammond, W. E., Clapp, N. E., Finn, A. L., Taylor, W. J., & Rodell, M. (1984). Improving drug prescribing in a primary care practice. *Medical Care, 22*(3), 193-201.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report, 8*(4), 597-607.

Gonul, F. F., Carter, F., Petrova, E., & Srinivasan, K. (2001). Promotion of prescription drugs and its impact on physicians' choice behaviour. *Journal of Marketing, 65*(3), 79-90.

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education in the Health Professions, 26*(1), 13-24.

Harris Jr, J. M., Novalis-Marine, C., & Harris, R. B. (2003). Women physicians are early adopters of on-line continuing medical education. *Journal of Continuing Education in the Health Professions, 23*(4), 221-228.

Hemminki, E. (1977). Content analysis of drug - detailing by pharmaceutical representatives. *Medical Education, 11*(3), 210-215.

Hershey, C. O., Porter, D. K., Breslau, D., & Cohen, D. I. (1986). Influence of simple computerized feedback on prescription charges in an ambulatory clinic: A randomized clinical trial. *Medical Care, 24*(6), 472-481.

Heutschi, R., Legner, C., Schiesser, A., Barak, V., & Österle, H. (2003). Potential benefits and challenges of e-detailing in Europe. *Journal of Medical Marketing, 3*(4), 263-273.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods, 1*(1), 104-121.

Hoerup, S. L. (2001). *Diffusion of an Innovation: Computer Technology Integration and the Role of Collaboration*. Doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

Horner, R. D., Salazar, W., Geiger, H. J., Bullock, K., Corbie-Smith, G., Cornog, M., & Flores, G. (2004). Changing healthcare professionals' behaviors to eliminate disparities in healthcare: What do we know? How might we proceed? *The American Journal of Managed Care, 10*(Spe.), 12-19. https://doi.org/10.13016/xcne-5fag

Inui, T. S., Yourtee, E. L., & Williamson, J. W. (1976). Improved outcomes in hypertension after physician tutorials: A controlled trial. *Annals of Internal Medicine, 84*(6), 646-651.

Johnson, J. D., & Meischke, H. (1993). A comprehensive model of cancer-related information seeking applied to magazines. *Human Communication Research, 19*(3), 343-367.

Jones, G. L., Peter, Z., Rutter, K-A., & Soumaroo, A. (2019). *Promoting an Overdue Digital Transformation in Healthcare.* Retrieved 30 September 2019, from: https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/promoting-an-overdue-digital-transformation-in-healthcare#

Keim, S. M., Sanders, A. B., Witzke, D. B., Dyne, P., & Fulginiti, J. W. (1993). Beliefs and practices of emergency medicine faculty and residents regarding professional interactions with the biomedical industry. *Annals of Emergency Medicine, 22*(10), 1576-1581.

Kelly, J. A., St Lawrence, J. S., Diaz, Y. E., Stevenson, L. Y., Hauth, A. C., Brasfield, T. L., ... & Andrew, M. E. (1991). HIV risk behavior reduction following intervention with key opinion leaders of population: an experimental analysis. *American Journal of Public Health, 81*(2), 168-171.

Klein, L. E., Charache, P., & Johannes, R. S. (1981). Effect of physician tutorials on prescribing patterns of graduate physicians. *Academic Medicine, 56*(6), 504-11.

Latour, B. (1987). *Science in Action: How to Follow Scientists and Engineers Through Societies*. Cambridge, Massachusetts: Harvard University Press.

Leventhal, H., & Cleary, P. D. (1980). The smoking problem: a review of the research and theory in behavioral risk modification. *Psychological Bulletin, 88*(2), 370-405.

Likert, R. (1961). *New Patterns of Management*. New York, NY: McGraw-Hill

Lilien, G. L., Rao, A. G., & Kalish, S. (1981). Bayesian estimation and control of detailing effort in a repeat purchase diffusion environment. *Management Science, 27*(5), 493-506.

Lipsky, B. A., Baker, C. A., McDonald, L. L., & Suzuki, N. T. (1999). Improving the appropriateness of vancomycin use by sequential interventions. *American Journal of Infection Control, 27*(2), 84-90.

Lomas, J., Enkin, M., Anderson, G. M., Hannah, W. J., Vayda, E., & Singer, J. (1991). Opinion leaders vs audit and feedback to implement practice guidelines: Delivery after previous cesarean section. *Journal of American Medical Association, 265*(17), 2202-2207.

Manchanda. P., &. Honka, E. (2005). The effects and role of direct-to-physician marketing in the pharmaceutical industry: An integrative review. *Yale Journal of Health Policy, Law & Ethics, 5*(1), 785-822.

McKenzie, J. (2001). Head of the class: How teachers learn technology best. *American School Board Journal, 188*(1), 20-23.

Mick, D. G., & Fournier, S. (1998). Paradoxes of technology: Consumer cognizance, emotions, and coping strategies. *Journal of Consumer research, 25*(2), 123-143.

Mohajan, H. K. (2017). Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University. Economic Series, 17*(4), 59-82.

Nylenna, M., & Aasland, O. G. (2007). Doctors' learning habits: CME activities among Norwegian physicians over the last decade. *BMC Medical Education, 7*(1), https://doi.org/10.1186/1472-6920-7-10

Nylenna, M., Aasland, O. G., & Falkum, E. (1996). Keeping professionally updated: Perceived coping and CME profiles among physicians. *Journal of Continuing Education in the Health Professions, 16*(4), 241-249.

Pallant, J. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows*. Maidenhead: Open University Press.

Parasuraman, A. (2000). Technology Readiness Index (TRI): A multi-item scale to measure readiness to embrace new technologies. *Journal of Service Research, 2*(4), 307-320.

Parasuraman, A. & Colby, C. L. (2015). An updated and streamlined technology readiness index: TRI 2.0. *Journal of Service Research, 18*(1), 59-74.

Putzer, G. J., & Park, Y. (2012). Are physicians likely to adopt emerging mobile technologies? Attitudes and innovation factors affecting smartphone use in the Southeastern United States. *Perspectives in Health Information Management, American Health Information Management Association, 9*(Spring), 1b.

Roberts, G. W., Farmer, C. J., Cheney, P. C., Govis, S. M., Belcher, T. W., Walsh, S. A., & Adams, R. J. (2010). Clinical decision support implemented with academic detailing improves prescribing of key renally cleared drugs in the hospital setting. *Journal of the American Medical Informatics Association, 17*(3), 308-312.

Robertson, T. S. (1967). The process of innovation and the diffusion of innovation. *The Journal of Marketing, 31*(1), 14-19.

Rogers, E. M. (1995). *Diffusion of innovations*. New York: Simon and Schuster.

Rogers, E. M. (2003). *Elements of diffusion*. New York: Free Press.

Rogers, E. M. (2004). A prospective and retrospective look at the diffusion model. *Journal of Health Communication, 9*(S1), 13-19.

Rogers, E. M. (2010). *Diffusion of innovations*. New York: Simon and Schuster.

Rogers, E. M., Medina, U. E., Rivera, M. A., & Wiley, C. J. (2005). Complex adaptive systems and the diffusion of innovations. *The Innovation Journal: The Public Sector Innovation Journal, 10*(3), 1-26.

Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of e-learning in medical education. *Academic Medicine, 81*(3), 207-212.

Ryan, B., & Gross, N. C. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology, 8*(1), 15.

Scott, S. D., Plotnikoff, R. C., Karunamuni, N., Bize, R., & Rodgers, W. (2008). Factors influencing the adoption of an innovation: An examination of the uptake of the Canadian Heart Health Kit (HHK*). Implementation Science, 3*(1), 41. https://doi.org/10.1186/1748-5908-3-41

Shields, L. & Twycross, A. (2008). Sampling in Quantitative Research. *Paediatric Nursing, 20*(5), 37.

Singh, A. S. (2014). Conducting case Study Research in Non Profit Organisations. *Qualitative Market Research: An International Journal, 17*(1), 77-84.

Slotnik, H. B. (1999). How doctors learn: Physician self-directed learning episodes. *Academic Medicine, 74*(10), 1106-1117.

Smith, R. (1996). What clinical information do doctors need? *British Medical Journal, 313*(7064), 1062-1068.

Solomon, D. H., Van Houten, L., Glynn, R. J., Baden, L., Kurtis, K., Schrager, H., Avorn, J. (2001). Academic detailing to improve use of broad-spectrum antibiotics at an academic medical centre. *Archives of Internal Medicine, 161*(15), 1897-1902.

Soumerai, S. B., & Avorn, J. (1984). Efficacy and cost-containment in hospital pharmacotherapy: state of the art and future directions. *The Milbank Memorial Fund Quarterly. Health and Society, 62*(3), 447-474.

Soumerai, S. B., & Avorn, J. (1986). Economic and policy analysis of university-based drug “detailing”. *Medical Care, 24*(4), 313-331.

Soumerai, S. B., & Avorn, J. (1990). Principles of educational outreach ('academic detailing') to improve clinical decision making. *Journal of the American Medical Association, 263*(4), 549-556.

Soumerai, S. B., McLaughlin, T. J., & Avorn, J. (1989). Improving drug prescribing in primary care: a critical analysis of the experimental literature. *The Milbank Quarterly, 67*(2), 268-317.

Soumerai, S. B., McLaughlin, T. J., & Avorn, J. (1990). Quality assurance for drug prescribing. *International Journal for Quality in Health Care, 2*(1), 37-58.

Steinman, M. A., Landefeld, C. S., & Baron, R. B. (2012). Industry support of CME--are we at the tipping point? *The New England Journal of Medicine, 366*(12), 1069-1071.

Sukamolson, S. (2007). *Fundamentals of Quantitative Research*. Bangkok, Thailand: Language Institute, Chulalongkorn University.

Sun, W., Chou, C. P., Stacy, A. W., Ma, H., Unger, J., & Gallaher, P. (2007). SAS and SPSS macros to calculate standardized Cronbach's alpha using the upper bound of the phi coefficient for dichotomous items. *Behavior Research Methods, 39*(1), 71-81.

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2011*(2), 53-55.

Thatcher, R. W. (2010). Validity and reliability quantitative electroencephalography. *Journal of Neuropathy, 14*(2), 122-152.

Thomas, K. & Schmidt, M. S. (2012, July 3). *Drug firm guilty in criminal case*. New York Times.

Thomson, S. B. (2011). Qualitative research: Validity. *Journal of Administration and Governance, 6*(1), 77-82.

Tierney, W. M., Hui, S. L., & McDonald, C. J. (1986). Delayed feedback of physician performance versus immediate reminders to perform preventive care: Effects on physician compliance. *Medical Care, 24*(8), 659-666.

Trucco, M. Y., & Amirkhanova, S. (2006, June). Transforming pharmaceutical marketing through e-detailing: Case studies and recommendations. In *The 8th IEEE International Conference on E-Commerce Technology and The 3rd IEEE International Conference on Enterprise Computing, E-Commerce, and E-Services* (CEC/EEE'06) (pp. 25-25). IEEE.

Valente, T. W. (1999). Accelerating the diffusion of innovations using opinion leaders. *The Annals of the American Academy of Political and Social Science, 566*(1), 55-67.

Van de Ven, A. P. (1999). *The Innovation Journey*. New York: Oxford University Press.

Van Eijk, M. E., Avorn, J., Porsius, A. J., & de Boer, A. (2001). Reducing prescribing of highly anticholinergic antidepressants for elderly people: Randomised trial of group versus individual academic detailing. *British Medical Journal, 322*(7287), 654. https://doi.org/10.1136/bmj.322.7287.654

Walliman, N. (2011). *Research Methods: The Basics*. New York: Routledge.

Wilkinson, D. & Birmingham, P. (2003). *Using Research Instruments - A Guide for Researchers*. London: RoutledgeFalmer.

Williamson, P. (1992). From dissemination to use: Management and organisational barriers to the application of health services research findings. *Health Bulletin, 50*(1), 78-86.

Willis, J., Jost, M. & Nilakanta, R. (2007). *Foundations of Qualitative Research: Interpretive and Critical Approaches.* Thousand Oaks, CA: Sage Publications.

Zipkin, D. A., & Steinman, M. A. (2005). Interactions between pharmaceutical representatives and doctors in training: A thematic review. *Journal of General Internal Medicine, 20*(8), 777-786.

APPENDIX A – RESEARCH INSTRUMENT

Instruction on completion of survey

Mr Terence Pillay, a student at Wits Business School is conducting a survey towards his research for his degree in Masters of Management in Strategic Marketing under the guidance of his supervisor Mr Laurence Beder. The topic of this research is:

'E-learning as an innovative platform for
medical doctors in South Africa'

CONFIDENTIALITY AND ANONYMITY

All information provided and captured is anonymous and remains confidential. Answer the questions to the best of your knowledge and as honestly as possible.

Section A: Biographical Details

What is your gender?

Male	1
Female	2

What is your home language?

English	1
Afrikaans	2
Nguni (Zulu, Xhosa, Swati, Ndebele)	3
Sotho (Sepedi, SeSotho, Tswana)	4
Venda/Tsongo	5
Other, please specify	6

Which province do you practice in?

Gauteng	1
Free State	2
Limpopo	3
Eastern Cape	4
Western Cape	5
Northern Cape	6
KwaZulu-Natal	7
Mpumalanga	8
North West	9

4. Which sector do you practice in?

State Sector	1
Private Sector	2

Section B: Actual Research Instrument:

On a scale of 1 to 5 where 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Disagree or Agree, 4 = Agree and 5 = Strongly Agree, indicate the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Neither disagree or	Agree	Strongly agree
Attitude towards doctor detailing representatives					
AB1. Visiting detailing representatives add clinical value to my practice.	1	2	3	4	5
AB2. The source of information detailed by representatives is accurate and credible.	1	2	3	4	5
AB3. The professional relationship with the representative is important for my decision-making process.	1	2	3	4	5
AB4. Detailing representatives over-emphasise the clinical messages of a drug.	1	2	3	4	5
AB5. The detailing representative is seen as manipulative.	1	2	3	4	5
Source of information for doctors					
SI1. Detailers are the primary source of information in my practice.	1	2	3	4	5
SI2. CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	1	2	3	4	5
SI3. My fellow colleagues are an important source in my clinical decision-making process.	1	2	3	4	5
SI4. Internet usage and e-learning platforms are a major source of clinical information in my practice.	1	2	3	4	5
SI5. My internet searching and ease of use of e-learning platforms is excellent	1	2	3	4	5
E-learning behaviour					
EL1. I have two or more electronic devices.	1	2	3	4	5
EL2. I search online educational platforms for a minimum of two hours a day.	1	2	3	4	5

	Strongly disagree	Disagree	Neither disagree or	Agree	Strongly agree
EL3. The majority of my CPD points are earned online.	1	2	3	4	5
EL4. I prefer receiving product detailing information via an e-learning platform.	1	2	3	4	5
EL5. My skill set for online searching of clinical information is excellent.	1	2	3	4	5

APPENDIX B – RESEARCH COVER LETTER

INFORMED CONSENT FORM

RE: E-learning as an innovative platform for medical doctors in South Africa

Dear Participant

As a requirement for me to complete my Masters of Management in Strategic Marketing at Wits Business School at the University of Witwatersrand, I have to complete and conduct a research study. This invitation is extended to you, to participate in this research.

The purpose of the study is to understand the effectiveness of e-learning in the medical profession and to develop a more effective way to provide accurate, credible education for all doctors as an alternative to selective representative visits.

Please note the following:

Anonymity:

By participating in this study survey, your name, and details will not be asked of you and neither will any information appear on the responses. No personal information will be requested. You are at liberty to withdraw from the survey at any time by activating the close function on the internet browser. Should you decide to proceed, a true and honest response will be highly appreciated.

Confidentiality:

All data gathered is totally confidential information and the response will appear in aggregate format and not by individual responses. All responses will be strictly confidential with access only to the researcher. There will be no connection between you and your responses. GDPR process are aligned and adhered to.

Should you have any questions regarding this survey you are at liberty to conduct me at 1445733@students.wits.ac.za or my research supervisor Mr Laurence Beder at laurence.beder@wits.ac.za

My sincere appreciation for your time and effort in taking part in this research study.

APPENDIX C – FACTOR ANALYSIS AND RELIABILITY

KMO and Bartlett test results

Factor	KMO test of Sphericity	Bartlett's Test of Adequacy	df	Approx. Chi-Square
Attitude	0.700	0.000	6	327.537
Source of information	0.659	0.000	6	211.790
E-Learning behaviour	0.644	0.000	6	158.820

Factor analysis results

Constructs		Factor loading	% of Variance	Eigenvalue
Attitude towards detailing representatives	AB2 The source of information detailed by representatives is accurate and credible.	0.817	52.331	2.092
	AB1 Visiting detailing representatives add clinical value to my practice.	0.650		
	AB3 The professional relationship with the representative is important for my decision-making process.	0.553		
	AB5 The detailing representative is seen as manipulative.	0.392		
Source of information	SI4 Internet usage and E-Learning platforms are a major source of clinical information in my practice.	0.819	46.738	1.870
	SI5 My internet searching and ease of use of e-learning Platforms is excellent	0.529		
	SI2 CMEs, Journal Clubs and Conferences contribute to my educational and clinical practice decisions.	0.450		

Constructs		Factor loading	% of Variance	Eigenvalue
E-Learning behaviour	EL4 I prefer receiving product detailing information via an e-learning platform.	0.576	43.885	1.755
	EL5 My skill set for online searching of clinical information is excellent.	0.560		
	EL2 I search online educational platforms for a minimum of 2 hours a day.	0.470		
	EL3 The majority of my CPD points are earned online.	0.401		

Cronbach's alpha values

Constructs	Cronbach's Alpha Coefficient	Inter-item Correlation Mean
Attitude towards detailing representatives	0.675	0.355
Source of information	0.613	0.283
E-learning behaviour	0.556	0.250

Gender T-test results

Demographic	Attitude		E-Learning behaviour	
	Mean	P-value	Mean	P-value
Male doctors	3.638	0.510	3.506	0.778
Female doctors	3.599		3.524	

Sector T-test results

Demographic	Attitude		E-Learning behaviour	
	Mean	P-value	Mean	P-value
State-sector doctors	3.552	0.261	3.639	0.039
Private-sector doctors	3.628		3.487	

APPENDIX D – CORRELATION ANALYSIS AND MULTIPLE REGRESSION ANALYSIS

Correlation analysis: Attitude towards detailing representatives

Correlation	Attitude Towards Detailing Representatives		
	Pearson Correlation	p-value	N
E-learning behaviour construct	0.032	0.501	456
Source of Information			
SI1 Detailers are the primary source of information in my practice.	0.344	0.000	456
SI2 CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	0.170	0.000	456
SI3 My fellow colleagues are an important source in my clinical decision-making process.	0.030	0.523	456
SI4 Internet usage and e-learning platforms are a major source of clinical information in my practice.	0.095	0.043	456

Correlation analysis: E-learning behaviour

Correlation	E-leaning behaviour		
	Pearson Correlation	P-value	N
Source of Information			
SI1. Detailers are the primary source of information in my practice.	0.169	0.000	456
SI2. CMEs, journal clubs and conferences contribute to my educational and clinical practice decisions.	0.115	0.014	456
SI3. My fellow colleagues are an important source in my clinical decision-making process.	0.087	0.064	456
SI4. Internet usage and e-learning platforms are a major source of clinical information in my practice.	0.299	0.000	456

Correlation analysis: Source of information

Correlation		Attitude Towards Detailing Representatives	E-learning Behaviour
Source of information	Pearson Correlation	0.145	0.365
	P-value	0.002	0.000
	N	456	456

Model Summaryb				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	**.389a**	**0.151**	**0.147**	**0.47361**

Multiple regression: Education

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.088	2	9.044	40.319	.000[b]
	Residual	101.611	453	0.224		
	Total	119.699	455			

Multiple regression: Coeffecient Analysis

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.485	0.184		13.539	0.000		
	Attitude_Reps	0.117	0.038	0.134	3.090	0.002	0.999	1.001
	Elearning_Behaviour	0.294	0.035	0.361	8.330	0.000	0.999	1.001