

THE EFFECT OF AN INFORMATION MANAGEMENT RESOURCE KIT (IMARK)
DVD-BASED TECHNOLOGY ON TRAINING EXTENSION OFFICERS ON
COMMUNITIES OF PRACTICE

MASTER'S DISSERTATION

By

Astrid Angel Straussner

Submitted in accordance with the requirements.

for the degree of

MASTER OF SCIENCE

in the subject of

Technology Education

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROFESSOR HARRISON I. ATAGANA

CO-SUPERVISOR: PROFESSOR BYUNG-IN SEO

FEBRUARY 2021

DECLARATION

Name: Astrid Angel Straussner

Student number: 08802866

Degree: MASTER OF SCIENCE

THE EFFECT OF AN INFORMATION MANAGEMENT RESOURCE KIT (IMARK)
DVD-BASED TECHNOLOGY ON TRAINING EXTENSION OFFICER ON
COMMUNITIES OF PRACTICE

I declare that the dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.



8 February 2021

SIGNATURE

DATE

Abstract

The 2020 UN Millennium Development Goals Strategy (MDGS) vision is to make use of Extension Officers (EO) to deliver information and training to various communities with the focus on the development of self-sustainability, food security and poverty alleviation. In essence, EO's are used to address gaps between service policies and actual output by citizens.

It is against this backdrop that this research was undertaken with the IMARK DVD based technology used as the intervention tool. This dissertation covered the study on the effect of an Information Management Resource Kit (IMARK) DVD based technology on training Extension Officers on Communities of Practice (COP), the research focus was on the effectiveness of using this technology.

The research design followed a quantitative pre/post-test experimental design. The pre/post-test experimental design is primarily used for the comparison of two groups. Two distinct groups were selected, the Control and the Experimental groups. The Control group was Honours Information Knowledge Management (IKM) students based on their understanding and use of technology as a focus of their degree. The Experimental group consisted of EO.

The research instrument consisted of the intervention tool, the IMARK DVD-based technology, and a pre/post questionnaire (ref Annexure A and B). Both groups took the same pre- and post-test. Both the Experimental and Control groups were subjected to the same intervention tool prior to completing the post-test. Both groups were asked to provide their written experience after the completion of the post-test. All the study participants expressed the benefits of this simple method of knowledge transfer particularly in rural environments, where there is inconsistent technology access and poor infrastructure.

Analysis of the data showed that this technology has proven to be simplistic, relevant, inexpensive, and efficient enough to be used in areas with limited technological access and infrastructure.

As a result, basic understanding and use of ICT technology would be imperative for the effective transfer of knowledge programmes. Therefore, this technology should be implemented without delay.

Dedication

I dedicate this dissertation to my husband Dieter, and daughter, Nikita, for always supporting and believing in my abilities and, at times, making me feel like a superhero.

I also dedicate this in memory of my mother, Irma, a woman who endured as a single parent with six children and no support. During my master's struggles, I knew that my challenges were nothing compared to what my mother endured: "Always in our hearts mommy."

And to our Lord for strength during difficult times.

Acknowledgements

I would like to express my gratitude to my supervisor, Prof HI Atagana, who guided and supported me during my studies, to ensure I reach final submission and completion. This process has felt never ending and lonely, but the reward of completion cannot be expressed in words.

I would also like to thank my family and friends, especially Prof Kruger UNISA - Faculty of Industrial Engineering and Dr Janet Brumme, Henley Business School for their insightful support with my studies.

I wish to acknowledge the help provided by the UNISA bursary team for funding, especially during my retrenchment period. I am humbled and emotional by this gesture and cannot ever describe my gratitude – Thank you UNISA.

Last but certainly not least is Prof B Seo from the Chicago State University USA. She has been my mentor and friend through personal/emotional and dark study days. When this work became too much, Prof Seo grounded me and made me understand that writing a dissertation is not supposed to be easy, yet it is worth every effort. Her hand of guidance is a gift for every student who has had the privilege of working with her.

Prof Atagana and Prof Seo, the “A Team”

Table of Contents

Abstract	3
Dedication	4
Acknowledgements	5
Chapter1: Introduction.....	9
1. Introduction	9
1.1 Background to the study.....	11
1.2 DVD-based training	15
1.3 Extension Officers and DVD-Based Training	15
1.4 Statement of the Problem.....	16
1.5 Purpose of the study	17
1.6. Significance of the Study.....	19
1.7 Scope and Delimitation of the Study	19
1.7.1 Scope	19
1.7.2 Delimitation	19
1.8 Research Questions.....	19
1.9 Definition of Terms	20
1.10 Structure of the Dissertation.....	21
Chapter 2: Literature review	23
2. Introduction	23
2.1 Theoretical Framework by Kumar	23
2.1.1 Search for Existing Literature,	23
2.1.2 Review the Selected Literature.....	24

2.1.3 Developing a Conceptual Framework	24
Figure 1: Conceptual Framework	25
2.2 History of Extension Officers	26
2.2.1 The Functions of Extension Officers in SA	26
2.2.2 The Challenges of Extension Services in South Africa.....	28
2.2.3 EOs and DVD-Based Training.....	31
2.3 Understanding IKM.....	32
2.4 DVD-Based Training	34
2.4.1 Utilizing DVD-Based Training.....	35
2.4.2 Factors influencing DVD-Based Training	37
2.5 Technological Advancements and Requirements	38
2.6 The Importance of COP Support for Rural Communities in SA.....	39
2.6.1 COP and EOs.....	39
2.6.2 Types and Purpose of COP	41
2.6.3 Challenges of COP in South Africa	42
2.6.4 COP in Extension and Rural Development Fields.....	44
2.6.5 COP for EOs	46
2.6.6 How COP Benefit EOs	47
2.6.7 IKM of EOs through COP	48
2.7 Summary.....	48
Chapter 3: Research Methodology.....	50
3.1 Introduction	50
3.2 Research Design.....	50
3.3 Participants	51
3.3.1 Ethical Issues Concerning Participants	52
3.4 Research Instrument.....	52

3.4.1 The Questionnaire Design.....	53
3.4.2 Issues of Reliability and Validity	54
3.5 Participant Selection.....	51
3.6 Data Procedures	56
3.6.1 Data Collection Techniques	56
3.6.2 Data Analysis	57
3.7 Limitations/Delimitations of This Research.....	59
3.8 Conclusion	59
Chapter 4: Research Findings and Discussions.....	60
4.1 Introduction	60
4.2 Findings.....	60
4.2.1 Statistical Findings per Group	60
4.2.2a Tabulated Experimental Group Responses.....	61
4.2.2b Tabulated Control Group Responses	62
4.3 Data Analysis	65
4.3.1 Inductive Statistical Calculations	65
4.4 Summary of the Findings	64
Chapter 5	
5.1 Introduction.....	74
5.2 Analysis of the Findings.....	Error! Bookmark not defined.
5.2.1 Data Analysis of the Control group	65
5.2.2 Data Analysis of the Experimental Group.....	67
5.2.3 Cross Tabulated Data Analysis of the Control and Experimental Groups	70
5.3 Discussion	Error! Bookmark not defined.
5.4 Areas for Further Study	75

5.5 Conclusions.....**Error! Bookmark not defined.**

References..... 76

Annexures

Annexure A 84

Annexure B 91

Annexure C 96

Annexure D 97

Annexure E 99

Annexure F..... 100

Annexure G 102

Annexure H 103

Letter of Ethical Clearance.....101

Letter of English Language Editing 104

Chapter 1: Introduction

1. Introduction

Chapter 1 provides insight to the background and responsibilities of Agricultural Extension Officers (AEO) as set by the UN Millennium Development Goals (MDGS). It looks at the challenges and importance of technology training with emphasis on DVD technology as the set for the significant of the study.

1.1 Background to the study

The 2020 vision of the International Food Policy Research Institute (IFPRI, 2012) was launched in 1993 for food security and environmental and poverty support. The purpose of the IFPRI vision was to reach the same objectives as those set out by the UN Millennium Development Goals Strategy (MDGS). This vision was to launch workshops, seminars, and conferences for the awareness of food, agricultural and environmental needs, and challenges of rural communities. The importance of policy building, information sharing, and market improvement all lead to the benefit and emphasis of infrastructure development for the safeguard and protection of the poor. The UN Millennium Development Goals Strategy was to be managed and obtained by means of expansion and access to employment opportunities, knowledge, and natural resource management (Sachs, 2012). The 2020 vision is to be achieved by making use of Agricultural Extension Officers (AEO) and Development Workers (DW) who are expected to deliver information and training to various communities regarding agricultural and nutritional needs for the development of self-sustainability, food security and poverty alleviation (Sachs, 2012). In essence, the development worker is used to address gaps between service policies and actual output by citizens. The Development Workers program provides a means to bring government and communities' closer together and enhance coordination between governments with special emphasis on development programs as described in the draft policy of the Community Development Workers Programme (Tshandu & Karuki, 2010). Development workers are therefore considered important role players in mainstream government programmes that address inequality, imbalances and encourage economic development. The specific functions of development workers are broad, and they are listed in the Department of public services and administration.

Handbook (Davids & Cloete, 2012) as:

- Regularly communicate government and other information to communities in an accessible and orderly manner.
- Pass concerns and issues on to service providers who may be influenced.
- Coordinate teams of volunteers in community projects for a structured approach.
- Coordinate the teams employed by the public work programs.
- Help communities develop and submit proposals for inclusion in the Integrated Development Plan to municipalities and other spheres of government and donor agencies.
- Coordinate inter-departmental programs and encourage integration and participation for all.
- Maintain communication with Community based officers (CBO) and workers.
- Promote the principles of Batho Pele and community participation by all communities. “The Batho Pele (“People First”) principles are aligned to the Constitution – know the service you’re entitled to. Government officials must follow the “Batho Pele” principles which require public servants to be polite, open and transparent and to deliver good service to the public.”
- Inform communities about problems in the delivery of basic services and help implement projects.
- Liaise with and advocate on behalf of communities with parastatals, Non-Government Organizations (NGO) and private donors.
- Monitor evaluate and report on the impact of developmental projects in the community.
- Help communities deal with and control disease (such as TB, HIV and AIDS).
- Intensify education and awareness of sexually transmitted diseases and other health risks.
- Help government achieve the People’s Contract of a better life for all.

- Act as a resourceful and dedicated public servant for the delivery of these best practices (Davids & Cloete, 2012)

The target group of AEO's and DW's receiving this training are often from varying backgrounds and are expected to disseminate information to a diverse range of people (Sachs, 2012). The push from the government to address policies for agriculture and agricultural skills require effective and efficient facilitation on a large scale in the shortest possible time. The challenge of practical agricultural understanding, production and job creation makes the urgency to providing communities with self-sustainable knowledge through the transfer of relevant information by AEO and DW a priority. The difference between AEO and DW can be distinguished by what they do. DW work with communities to bring about social change and improve quality of life (Gaunt, 2008). They work with individual families or whole communities and often act as links between the government, communities, and the local government. Their primary task is to manage projects targeted at disadvantaged communities, inequalities, race, and gender issues (Gaunt, 2008). DW is usually project based, focusing on a specific geographic community or social group and sets goals for improvement on issues affecting the lives of the community through empowerment and participatory processes (Gaunt, 2008). These workers work in generic environments and specialized fields, formulating strategies and developing services to address issues and to identify needs of a group within a specific region. Examples are homeless families, unemployment, and drug dependency (Gaunt, 2008). The function of AEO include the facilitating of farmers' acquisition of new knowledge and skills, providing technical advice and information, mobilizing, and establishing farmers' organizations; and building self-reliance to promote sustainable rural development (FAO, 2013).

Facing challenges arising from globalization, privatization, and decentralization, AEO are expected to promote participatory approaches while considering the environment and the various needs of communities (FAO, 2013). Agricultural Extension Officers are no longer expected to be the experts with all the information for the promotion of collective partnerships between them and farmers. Farmers are encouraged for the sole purpose of addressing the needs and problems of farmers (FAO, 2013). Furthermore, AEO are expected to actively seek advice and communicate between

governmental, private, or other non-governmental organizations (NGO) to improve efforts to eliminate poverty. They need to reach farmers who do and do not own land (FAO, 2013). Since they are often the only link between rural men and women and policymakers, AEO's can provide decision makers at district and national level with valuable information concerning a better basis for planning, because they are often the only voice for rural men, woman, and other groups (FAO, 2013). The institutional response to the extension challenges includes steps to broaden the role of the extension services to increase client-orientation by using participatory, bottom-up approaches, as well as by decentralizing and privatizing extension services (FAO, 2013). The importance of collaborating and sharing information with AEO and/or DW must include training for the emergence of the development of communities of practice (COP) as a mechanism to collaborate and to share knowledge/information.

In the context of extension, skill development training is a common constraint for the development of the AEO. It has been reported that in-service training either limited or may not have had a positive effect on their job performance due to poor planning, inadequate resources and less cooperation amongst extension providers (Tshandu & Karuki, 2010). The Community Development Workers (CDW) curriculum requires a clear alignment and adjustment to the strategic objectives of the program. Currently, the program has had more emphasis on theoretical concepts and does not sufficiently accommodate prior learning (Tshandu & Karuki, 2010). Due to globalization and rapid growth extension services will need to address the competencies required to compete at a national and international level (Kumar, 2010). For EOs to competently perform extension services at national and international levels, they will require exposure to a platform of high-level skills acquisition. EOs will need to address, promote, and stimulate agriculture learning, to younger generations through education and skill transfer. The emphasis will need to focus on modern agriculture with the focus on large-scale commercial farming and the use of modern and information communication technologies (Kumar, 2010). The function of the EO is to encourage and motivate the community to make use of Good Agricultural Practices (GAP), modern farm management techniques and the increased use of new technologies (Kumar 2010).

1.2 DVD-based training

The knowledge economy is driven by digital technology and has resulted in a global village with people who are interconnected, regardless of their geographical location. The advantages of this technology could be harnessed by organizations worldwide for the benefit of humanity and extension services (Desai, 2013). Since 2005, the power of digital technology has increased, and organizations have harnessed this power. ICT is defined as technologies used in processing, retrieving, collecting, and implementing data and information using micro-electronics, optics, and computers. These technologies may include radio, television, mobile phones, the worldwide web and computer databases, and systems like CD and DVDs. Computer based learning, such as a DVD, is self-paced, interactive and can provide the learner with feedback on progress, tests, and evaluation forms (Leeuwis, 2013). Programs can be in various forms such as text, multimedia, graphics, and video, and can provide simulation, tests, and other interactive learning tasks. DVD-based training is one of the most simplistic and effective forms of training because it requires little technology or computer proficiency on the part of the user (Munasinghe, 2014).

1.3 Extension Officers and DVD-Based Training

The Department of Agricultural Extension (DAE) in Cambodia significantly contributed to rural communities and their environments with the establishment of well organized, planned and supported extension programs (Leeuwis, 2013). The extension service program of Cambodia was established before 1970, with the aim of transferring new improved techniques. EO's used several ICT methods for the dissemination of technology and technical information to rural communities (Leeuwis, 2013). The application of ICT used by EO requires specific information to provide solutions for different environments and to achieve sustainable improvement efforts (Leeuwis, 2013). ICT is relevant in rural areas as it reduces the cost of acquiring information, is easy to use, and can provide a faster means of obtaining information (Maumbe, 2013). Some of the technologies already in use include pocket radios, video cassettes and DVD-based programs. Closer analysis of these findings revealed that although they may prove to be cost effective and relatively reliable, the information may be outdated, by the time they reach their destinations (Maumbe 2013). In a study that investigated the factors that influence the adoption and non-

adoption of technologies by students attending courses at the Denman Rural Training Centre in Botswana revealed that:

The results revealed the following statistics.

61% of the participants made use of the acquired technologies learned, and 39% did not use these technologies.

36% of the participants indicated the training had no effect on their efficiency.

45% did indicate a moderate improvement in efficiency.

64% of the EOs reported a negative status in the use of their acquired technologies (Maumbe 2013).

One of the most crucial factors of non-adoption is the lack in resources and insufficient user proficiency (Maumbe, 2013).

1.4 Statement of the Problem

In this dissertation study, a DVD was the intervention technology tool for the research and the content explains and describes the importance of COP for rural communities. COP's are important as they are used to promote the sharing of knowledge and skill amongst different organizations and people. By building COP individuals can solve problems, address crucial matters, share ideas, and learn about new developments (Chetty, 2012). Their findings can then be documented and included on a database, providing access to all EO's involved (Chetty, 2012).

Mandates from the government to address policies for agriculture, agricultural skills, and technology transfer, will require effective and efficient facilitation. EO's are tasked with the responsibility by the government to address these skills shortages and to address the upliftment of rural communities through training and development programs. The problem is the uncertainty of the EO's competence and skills with the use of technology methods as transference of knowledge and information. Other challenges include the rural environments with limited infrastructure access and communities that may not have the necessary competencies to work with ICT technology.

1.5 Purpose of the study

Humans learn daily whether formally, informally, experientially, or accidentally. Serious learning takes place for the sake of survival, whether it is to know how to plant and harvest food or whether it is to be able to conduct a task as part of a job function. The way humans learn could vary significantly between formal, academic education and/or informal colloquial education.

The purpose of this study is to determine the effectiveness in the use of this simplistic technological tool - that being the Information Management Resource Kit (IMARK) DVD. This simplistic technological tool is readily available. Also, it can be used as an intervention tool for teaching and assisting EO's to empower communities in the development of COP.

Various considerations were made when identifying the research problem. They were interest, magnitude, measurement of concepts, level of expertise, relevance, availability of data and ethical issues (Kumar & Phrommathed, 2005). These considerations are used to determine the research problem:

- **Interest:** The topic of the study is the use of a DVD-based training and its effectiveness in the understanding and forming of COP's. Even though the EO's were provided the training, the people who designed the DVD-based programs were computer experts. As a result, there may be a disconnection between the two groups of people.
- **Magnitude:** DVD-based technology is a broad subject. For this study, it was reduced to a manageable size by limiting the study to the testing of the IMARK DVD. As a result, of the IMARK DVD program for EO focussed on the subject of COP. This focus limited the population to EO and the control group of Honours students studying Information Knowledge and Management (IKM).
- **Measurement of Concepts:** Concepts such as COP and the effectiveness of the DVD-based program needed to be measured via a questionnaire.
- **Level of Expertise:** Although DVD-based programs can get quite technical, especially when defining its infrastructure, technologies that were originally unrelated have become more integrated and even unified as they developed

and advanced. The purpose of this dissertation was to determine the effectiveness of the DVD-based IMRAK program amongst EO.

- **Relevance:** This subject is directly relevant to current strategies being developed for the training of EO's in rural areas.
- **Availability of Data:** DVD-based training has been a subject of great interest to businesses and the public. Therefore, there are prior studies on its effectiveness, DVD-based training is one of the most simplistic and effective forms of training requiring little technology or computer proficiency on the part of the user (Munasinghe, 2014). Although the electronic component distribution industry is not as well documented, there was enough information on similar subjects to make the research practical. A research study compared the effectiveness of making use of a DVD. There was a comparison between a 30-minutes mobile app versus a 50-minutes DVD-based training to teach practical cardiopulmonary resuscitation (CPR) The DVD-based group was found to be more competent in the application of CPR skills (Han & Lee, 2018). Despite studies showing that teaching professionals had little knowledge about the development of human communication and related disorders, the importance of these professional having this knowledge pointed to the importance of continues professional development. A proposal was drafted involved applying the content in different locations, as there were teachers in some regions of the country with limited access to the Internet. Therefore, the tools that did not need the Internet were the DVD based technologies (Gonçalves & Crenitte, 2011).
- **Ethical Issues:** The developers of the IMARK DVD-based program, participants, supervisors, and all concern provided written permission to use their information (Refer to Annexure E). A main objective for this study is to determine the effectiveness of using DVD-based training program for EO. Additionally, various sub-objectives or specific aspects of the main topic were used to determine the current situation, the future situation and mechanisms or strategies to go from the current situation to the future situation. Research of this nature has not been documented yet, and the developers of the IMARK DVD are interested in understanding the outcome of the research for future development. The use of this information in communication technologies could enhance the testing and

effectiveness of the IMARK DVD as an intervention tool for the transfer of COP knowledge used by EO's. This simplistic ICT technology is well suited for rural areas with limited access and network infrastructure and for communities who may not be familiar with ICT technologies.

1.6. Significance of the Study

The Information Management Resource Kit (IMARK) is a partnership-based e-learning initiative developed by the Food and Agriculture Organization (FAO) of the United Nations and partner organizations. It was developed to support EO, individuals, institutions, and networks worldwide in the effective management of information and agricultural development. The IMARK e-learning program DVD was targeted at Information Knowledge and Management (IKM) specialists and EO in 137 developing countries in the world of which South Africa was one. Hence, the developers requested to provide feedback based on this study.

1.7 Scope and Delimitation of the Study

1.7.1 Scope

The scope of this study is Gauteng Province, South Africa.

1.7.2 Delimitation

The target group were EO's within the Gauteng region. This group was limited by its size and region.

1.8 Research Questions

The research questions that guided this study are:

R1: What is the performance level of the Extension Officers prior to their exposure to the use of the IMARK DVD technology?

R2: What is the performance level of the Extension Officers after their exposure to the use of the IMARK DVD technology?

R3: To what extent will the IMARK DVD technology affect the skills acquisition of COP amongst the Extension Officers?

R4: What are the main reasons listed for the usefulness of COP?

1.9 Definition of Terms

➤ **Extension Officer (EO)**

In this study, the term Extension Officers (EOs) play a crucial role in addressing the needs of agriculture and providing the training to the communities they serve. Without the relevant training, competencies, and technical skills, EOs in South Africa will find it difficult to perform effectively. Hence the study's focus is on the importance of the relevant training for EO to develop successful implementation of their responsibilities, For the purpose of this research, EO will include: AEO, DW, CDW, Extension Worker (EW), Agricultural Extension Worker (AEW), Technical Extension Officer (TEO) and Rural Development Workers (RDW) (Sachs, 2012).

➤ **Information Knowledge and Management (IKM)**

Students studying IKM are expected to understand all concepts pertaining to information and communication technology. They are also expected to manage personnel in these environments. There is no universal definition of knowledge management and no agreement that constitutes knowledge. Hence, it is best to define knowledge management for the context of this research. The successful application of information management knowledge involves the understanding and systematic utilization of information for organizational learning (Kumar & Anwarul 2014).

➤ **DVD-Based Program**

DVD-based training is one of the most simplistic forms of training, requiring little technology or computer proficiency. The abbreviated term DVD describes a Digital Versatile Disc, an optical disk technology similar to the CD-ROM and used as a medium to combine sound and graphics (Desai, 2013). The IMARK DVD was used in this study as a means of determining its effectiveness for training of EO. This DVD-based program is an Information Management Resource Kit (IMARK) consisting of a series of e-learning modules developed to assist AEO's and DW's for the training of rural communities in developing COP (Desai, 2013).

➤ **Information and Communication Technology (ICT)**

This term applies to the processing, retrieving, collecting, and implementing data and information using the computers (Leeuwis, 2013). In this study, Information and Communication Technologies (ICT) are technologies used in computer data storage retrieval systems such as the IMARK DVD.

➤ **Communities of Practice (COP)**

Communities of Practice (COP) is defined as the ability to network with other EO and communities using the available information and communication technologies for the benefit of knowledge transfer (Serrat, 2008).

1.10 Structure of the Dissertation

➤ **Chapter 1: Introduction**

Chapter 1 discusses the background of the study, the statement of the problem, the purpose, and the significance of the study. Also, it explains how this study will add to the body of knowledge in the field.

➤ **Chapter 2: Review of Related Literature**

Chapter 2 reviews literature from many sources to illustrate the concepts of this current research project. The introduction provides a synopsis of human learning and follows through with a conceptual framework. The history of EO and their functions are included and how their roles have changed in a world driven by technology and instant demand. This section leads the study to explain DVD based technology the advantages, success in application and relevance for the study. DVDs are a powerful communication and learning tool because they are cheap, easy to use and readily available which works well for EO. The presentation of COP, in the context of DVD technologies, is the key concept for the necessary background of this research the purpose and function of “Communities of Practice” as the communication networks, which promote the spread of methodologies and technologies. The studies provide background to the development of COP and the understanding of COP including ICT usage, DVDs, and the related electronic media.

➤ **Chapter 3: Research Methodology**

Chapter 3 provides a detailed description of the specific methodology implemented to collect the data and the ethical considerations of the research. The following topics are discussed: Research methodology and procedure, research design, conceptualizing a research design, conducting the study by taking into account, ethical issues concerning participation and ethical issues concerning the researcher. This chapter also provides information on the study's participants the study's instruments, and the data analysis procedures.

➤ **Chapter 4: Research Findings**

This chapter looks at the research results. First is the determination of the effectiveness of the IMARK DVD-based training for EO. The research results are looked at in terms of the data analysis as a processing method the data. These functions are discussed in terms of the frequency of the answers. Data between the control and experimental groups were analyzed and interpreted. The chapter concludes with the interpretation of the survey questionnaire results.

➤ **Chapter 5: Conclusions and Recommendations**

This chapter discusses what the findings mean in relation to the theoretical body of knowledge and the research questions. Recommendations are also included and forwarded to all interested parties.

Chapter 2: Literature review

2. Introduction

This chapter investigates a literature scope as suggested by Kumar and Phrommathed (2005). It researches the history of EO, challenges and an informal learning approach that has become popular over recent years namely Communities of Practice (COP). COP could be online or face-to-face. These techniques can run informally or with specific rules of governance. This study evaluated the effectiveness of an Information Management Resource Kit (IMARK) a DVD program as an intervention tool to teach and assist EO's to empower communities to develop COP.

It is for this reason that DVD-based learning is also discussed further on in the chapter. Chapter 2 also includes a summary of the importance of continuous training for EO's and the advantages and disadvantages of DVD-Based training programs. The chapter also highlights the tasks, challenges, and benefits of EOs using DVD-based training.

2.1 Theoretical Framework by Kumar

All the steps suggested by Kumar and Phrommathed (2005) were used in conducting the literature review. These steps were: Search for existing literature, review the selected literature, and develop a conceptual framework. The conceptual framework forms the basis of the research problem. These steps are examined in the following sub-sections.

2.1.1 Search for Existing Literature,

In this dissertation, most sources in the literature review have been secondary sources of books, periodicals, and government publications. Books used are both academic books (e.g., Research methods for students) and books aimed at the general market (e.g. Social research). Periodicals included magazines and academic journals. Government documents included Green and White gazetted papers.

2.1.2 Review the Selected Literature

The knowledge relevant to the conceptual framework has been confirmed. In many cases such as the definition of terminology there were confirmed definitions, for example the meaning of EO, COP were well defined and accepted. In addition, various theories on topics such as the definition of DVD based technology and Information Management Knowledge (IKM) strategies were found. These theories are discussed, and the merits and disadvantages of each were shown.

There were differences in IKM strategies and definitions of DVD-based technology. These differences are discussed, along with commentary about the validity of each theory.

A literature study on the effectiveness of DVD-based training pertaining to the South African industry was conducted.

2.1.3 Developing a Conceptual Framework

The steps as suggested by Kumar and Phrommathed (2005) were used in conducting the literature review. These steps were: Search for existing literature, review the selected literature and develop a conceptual framework, which forms the basis of the research problem. To limit the literature review to a manageable size, a conceptual framework was developed which defines the problem to be investigated into main themes and theories (Kumar & Anwarul, 2014).

The key points that the literature focused on are EO, COP, and DVD-based technology training. These points were then broken down into major themes, which then gave the major headings for the literature review as illustrated in the Conceptual Framework. These themes are EOs, COP, and DVD-Based Technology (See Figure 1).

➤ Extension Officers (EOs)

EOs perform crucial roles in addressing the needs of rural communities. For an EO to provide relevant and up-to date training, they will require strategic training on the latest techniques and technologies. Without the required technical skills EO will find it difficult to address and maintain sustainable development within the fourth industrial space.

➤ **Communities of Practice (COP)**

COP provide an essential platform for information sharing particularly in rural communities. The DVD technology/intervention tool provides interactive learning modules with a set questionnaire after each section. This format allows for individual testing on the concepts learned on COP.

➤ **DVD-Based Technology**

DVD based technology is one of the most simplistic forms of training, requiring minimum infrastructure and systems. The DVD technology used in this research was the intervention tool used to train EO on COP for the dissemination of knowledge and communication within rural communities.

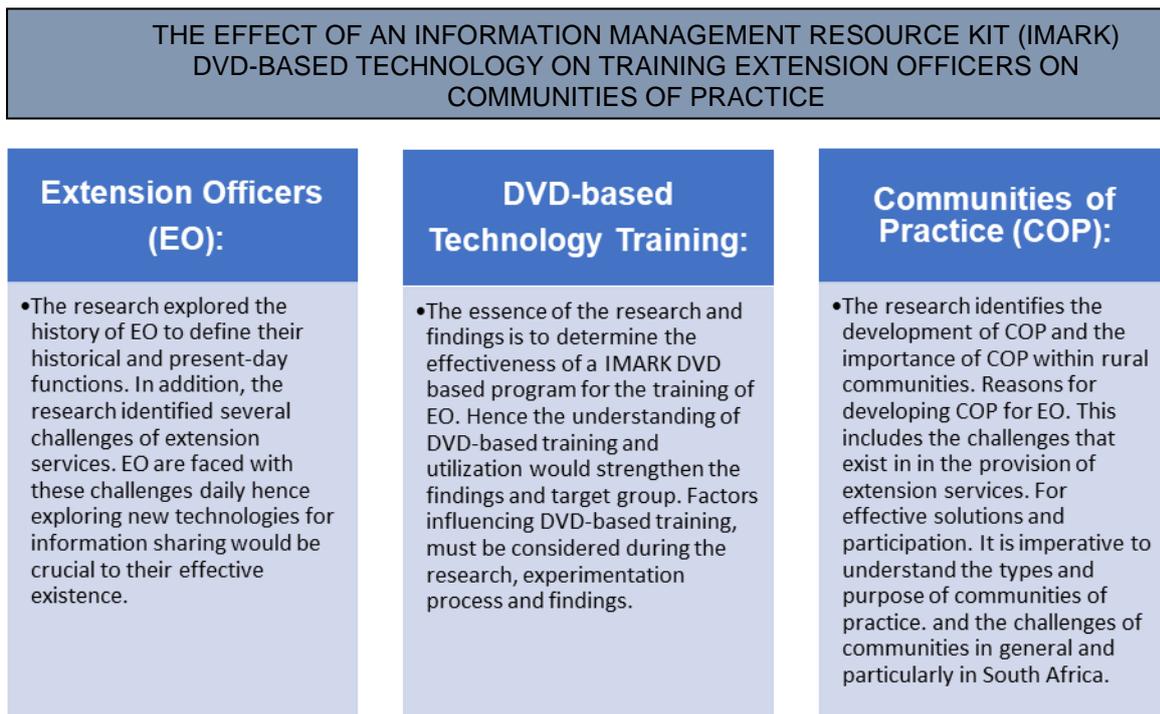


Figure 1: Conceptual Framework

2.2 History of Extension Officers

Today, agricultural extension is largely adapted for the benefit of the farmer and farming communities to transfer knowledge and adjust to changing technologies (Garforth 2010). The word “extension” dates to the second half of the 19th century from two universities, Oxford, and Cambridge. It was used to explain how they served the educational needs of their community. According to the Oxford and Cambridge report, the first practical “university extension” was established in 1867, and it covered lectures on literary and social topics. Later, it moved towards more specific agricultural subjects. The success of this work moved abroad quickly, and more formal structures and organizations were established. The word “extension” however remained (Garforth 2010). The history of agricultural extension shows the movement with the times from medieval farming techniques to printed publications. Farm owners looked to improve their revenue, so they established societies for meetings and discussion on improved farming techniques. It was within these circles that science and agriculture crossed roads with Philipp Emanuel von Fellenberg. He purchased the estate of Hofwyl in Switzerland and established an agricultural school for the poor and elite, The Hofwyl Institute (Garforth 2010). Although this school was not the first agricultural school, it was the model on which other schools were established (Simpson & Burpee 2014). This institute started the training ground for EO.

2.2.1 The Functions of Extension Officers in SA

In South Africa, extension services changed drastically from a dualistic system to an amalgamated system of services directed towards rural areas and small-scale farming communities (Mafetsa 2012). Initially, the services were split into two groups. One group of EOs provided services only to areas under tribal and communal land tenure. The other group of EOs served large scale commercial farmers who were mostly of European origin. With all the changes, very little has happened concerning the improvement in effectiveness and efficiency of extension delivery. In fact, the impact of extension support has decreased significantly (Mafetsa 2012). One reason may be that 2.8% of EOs follow their own trend and meet their own expectations in terms of productivity (Sikwela & Mushunje 2013). The quality of life survey conducted by the Department of Labour and Agriculture (DLA) in the late 1990s,

found that EOs had poor work ethics and visited less than half of their expected project groups. Farm Africa's assessment of extension services in the Northern Cape describes them as "sketchy" (Sikwela & Mushunje 2013, p. 2502-2511). The Department of Agriculture employs approximately 32 EOs and many have neither the technical nor the social skills to support emerging black farmers, even though they are required to spend most of their time supporting emerging farmers. It is highly unlikely that such a small number of people who are poorly and, in some cases, inappropriately trained will be able to assist approximately 80 land reform groups. Only nine of the 12 beneficiaries involved in agriculture have reported receiving extension advice from the Department of Agriculture (DoA), and all assistance given has been because of direct requests (Sikwela & Mushunje 2013).

Further research was completed by the Eastern Cape region of the Environmental Conservation Agreage Reserve Program (ECARP). It highlighted the inadequate extension support supplied by the DoA to meet the requirements for small scale commercial farming. As a result, this lack of support has had an impact on their inability to produce effectively (Mafetsa 2012).

The roles of EOs form a crucial part in the investment in the sustainability of South African agriculture (Atkinson 2008). Extension services are lacking in the agricultural arena. Therefore, training, mentoring and technical advice forms part of a solution to service enhancement. However, little support and continuous training are provided to EOs. A strong knowledge base is required to address agricultural and environmental issues. EOs should not only be responsible for facilitating the relationship between small-scale farmers and municipalities but also the mentoring services to small-scale farmers (Atkinson 2008).

This importance is further highlighted as a main concern in the Organization for Economic Co-operation and Development (OECD) for rural development in South Africa. OECD (2016) emphasizes the need for sustainable agricultural skills and training throughout all nine provinces and recognizes the world-wide importance of this discipline. Although South Africa has made some headway in areas of extension education and food security, national pressure and international competition is forcing a rapid change within the structures of agricultural support. A demand for training arises in order to meet and benefit from national and international contacts.

The influx of new emerging farmers and the necessity for rural farmers to access the commercial market will require extension support. This support should cover agricultural practices, sustainable livelihood management, and food and nutrition security (OECD 2016). The urgency of agricultural extension requires that all agriculturalists share their specialized knowledge directly with other farmers. In addition, successful farmers have also been tasked with the responsibility to equip and train EOs with skills to assist communities with environmental and agricultural issues. These issues do not form part of the formal or non-formal educational training for EO's (OECD 2016)

2.2.2 The Challenges of Extension Services in South Africa

The definition of extension officers and services have changed over time. Extension Officers (EOs) played a crucial role as intermediaries between researchers and farmers. They operate as facilitators and communicators addressing the needs of agriculture and providing the training to the communities they serve. Extension was originally understood as a service to improve the lives of farmers in the rural sector by providing research-based knowledge (Davis 2008). These services include technology transfer, broader rural development goals, management skills, and non-formal education. The traditional view of extension in Africa was focused on the increase of production, improving yields, training farmers, and transferring technology (Davis 2008). The current understanding of extension services reaches beyond technology transfer to facilitation, learning, and farmer assistance (Davis 2008).

During the last part of the 20th century, extension services formed part of informal structures generally organized by agricultural colleges or farming organizations. With time, extension services became more formal with government funding, directed towards agricultural extension. Duties of EOs broadened, and their training requirements became more professional (Simpson & Burpee 2014). As agricultural extension services and organizations grew and changed so did their hierarchical structures and bureaucracy. The management and control of extension services has become one of the major functions of the agricultural organizations because of the diversified demands set by agricultural production. The South African agriculture and rural development extension services are based on the American Cooperative

Extension Service model established in 1914, by the Smith-Lever Act. This Act initiated agricultural and home economic extension services for rural Americans (Coleman & Barranti 1988). The American models of extension services separate the role of extension services into agriculture and home economics. This separation created the split between male and female dominated functions. The provision of female extension services was based on the welfare approach, with an emphasis on child-rearing and homecare. This emphasis has since changed to anti-poverty, equity, empowerment, and efficiency (Moser 2012). However, the development approaches to agricultural and rural extension services remain unchanged in South Africa. As a result, it is imperative that extension services in South Africa be monitored and evaluated to ensure the relevance of services provided to rural communities. By monitoring and evaluating extension services, planners can make better judgment on the effectiveness and efficiency of the services and report back on the strengths or weaknesses of an extension program (Moser, 2012; Mtshali 2000). This feedback process could aid in the scheduling of a training plan, guidelines for staff development, training of EOs and the development of relevant programs (Mtshali 2000). Extension services include training, visit-systems for small-scale farmers and socioeconomic guidance. The focus is on maintaining income levels from resources and methods to ensure the long-term welfare of farmers and their families. Extension services have become an important mechanism for the delivery of information and advice to improve technologies for rural communities. Today, there is stronger social dimension to the profession (Simpson & Burpee 2014). In the following years, extension services provided those in agriculture with information and advisory services which formed key points in the sustainability of food reserves for a growing population. Rural communities will have to learn specialized skills to ensure efficient farming. Therefore, they must become better educated because of mass media. This created an even bigger demand for specialized and well trained EOs. Extension services will have to adapt to the changing rural population and their specific requirements. These services will need to acquire and develop skills suited to a different type of client, clients who will be educated and concerned with market trends, commercialization, and good farming practices. This forces the need to a participatory approach of information and technical solutions sharing (Simpson & Burpee 2014).

During the 1980s, EOs lacked the appropriate training that was required of them to support emerging farmers to achieve a commercial farming status (Simpson & Burpee 2014). The Tenure Rural Action Committee (TRAC) expressed their concerns regarding the average EO who do not have the required skills to deal with the complex requirements of the beneficiaries, such as developing a marketing plan and engaging in conflict resolution (Sikwela & Mushunje 2013). EOs are not ready to embrace new techniques and technology. It could be matter of mind-set. In other times, it is a matter of money. EOs have certain skills geared towards assisting commercial farmers and not emerging farmers. They often have to provide innovative ideas to convince emerging farmers of the value of using modern technologies. However, this sometimes also falls by the wayside (Sikwela & Mushunje 2013). The beneficiaries involved struggle with new or innovative ideas and find the concepts difficult to apply or grasp perhaps because they are new to farming. These methodologies and ideas are not familiar to new farmers, creating uncertainty and scepticism. For experienced farmers recommendations and exposure to these technologies by EO would be appreciated and applied (Sikwela & Mushunje, 2013). Other problematic areas include the lack of linkage between land reform beneficiaries and other sector players. Only 50% of EOs found a need to provide such services. In some cases, emerging farmers acquire new land to till rather than make use of their existing land to the optimum (Sikwela & Mushunje, 2013).

Most often EOs have little or no experience in farming and lack the necessary skills and understanding of the dynamics involved in agriculture, marketing and finance. EOs are often faced with questions relating to effective farming practices, farming products, pricing and animal or plant disease and prevention measures. EOs with no agricultural training will have to be re-trained to competently provide effective and efficient service (Sikwela & Mushunje, 2013). There is a severe lack or inadequacy of government, extension services. If the government is unable to rectify this problem, other avenues of meeting this need should be explored. The future of agricultural extension training will require more care. The need for well trained and professionally competent EOs has increased. They must adapt to dynamic environmental and technological changes. There is a critical shortage of technical manpower in a varying number of fields, including agricultural extension (Sikwela &

Mushunje, 2013). Community expectations are far greater now than ever before. Extension services now and in the future, will have to be formed and created around overly complex social economic and political situations. EOs were and still are expected to prioritize problems according to urgency while maintaining their relationships with the communities they serve.

In May 2003, the SA National Department of Agriculture in consultation with the National Strategy Formulation Team and the Food and Agricultural Organization (FAO) of the United Nations launched a program for the development of strategies for AET. The twelve-month strategic plan involved a participatory research and consultation with all write out the full name [AET] stakeholders and role-players at provincial and national level. This process was facilitated by the FAO in collaboration with the South African national and provincial DoA. The strategic plan identified the importance and crucial need for agriculture to sustain environmental and economic development (Sikwela & Mushunje, 2013). Agriculture can provide an alternative for rural dwellers to enter the economic market not currently accessible to them. Informal AET is offered by a range of public, private, NGO providers, and universities and colleges. The most important AET delivery method lies with EOs, because they are the practitioners, agricultural scientists, and technicians. The knowledge flow is bi-directional: both are recipients and providers. (Sikwela & Mushunje, 2013).

2.2.3 EOs and DVD-Based Training

The Department of Agricultural Extension (DAE) in Cambodia contributed significantly to rural communities and the environment with the establishment of well organized, planned, and supported extension programs. The extension service program of Cambodia was established before the 1970s with the aim of transferring new improved techniques. EO's used make use of several ICT methods for the application and transfer of knowledge to rural communities (Leeuwis, 2013). The application of ICT used by EOs requires specific information to provide solutions for different environments and to achieve sustainable improvement efforts (Leeuwis, 2013). ICT is relevant in rural areas as it reduces the cost of acquiring information is easy to use and can provide a faster means of obtaining information (Maumbe & Okello, 2013). Some of the technologies already in use include pocket radios and DVD-based programs. Closer analysis of these findings revealed that although they

may prove to be cost effective and relatively reliable, the information may be outdated by the time it reaches their destinations. In a study on the influence the adoption and non-adoption of technologies, the following statistics emerged:

61% of the participants made use of the acquired technologies learned,

39% did not.

36% of the participants indicated the training had no effect on their efficiency

45% did indicate a moderate improvement in efficiency

64% of the EO reported a negative status in the use of acquired technologies.

(Maumbe & Okello,2013)

A research undertaken by the Cocoa Research Institute in South-west and North-central Nigeria assessed the differences in ICT use amongst EOs. A multistage sampling technique was used in selecting 140 EO's from four state development programs. Results showed ICT use was slightly higher in different areas of a region or country. For example, North-central Nigeria was slightly higher than South-west Nigeria (Leeuwis, 2013). In another study there was a significant increase in rural training and technical efficiency of rural communities as a direct result of the involvement and visits by the EO (Hitayezu, Zegeye & Ortmann 2014). In 2005, the Improving Productivity and Market Success (IPMS) project run by the International Livestock Research Institution established a series of information centres throughout Ethiopia. The centres are equipped with a variety of ICT methods providing rural communities with information on new product, sustainable development, and training (Lemma, Sehai & Hoekstra 2011). The success of the project varies from district to district, and communities take advantage of the opportunity to make use of the library, computers, and the internet. One drawback is cost. Routine internet access is limited due to the excessive cost involved (Lemma 2009). However, it is the use of DVDs that proved to be the most popular. EOs make use of whatever DVD system is available and appropriate (Lemma et al., 2011).

2.3 Understanding IKM

The concept of knowledge management (KM) appeared in the first decade of the 1990s as a necessity for dealing with larger amounts of data and the digitalization of

information. Despite its simplicity, this definition encompasses the most important character of this concept: knowledge must be collated and put into a form that is comprehensible to all its users and can be considered the most vital resource of today's enterprises. The collective knowledge residing in the minds of an organization's employees, customers, and vendors. Organizations are increasingly valued for their intellectual capital. The most important criteria for a sustainable KM model is the ability to provide the necessary information in the required time, organizational costs, and level of user satisfaction (Salama, 2019)

For the past 30 years, the world witnessed a significant growth in electronic media, mainly because of satellite communication and cost efficiency. The global impact was mainly in industrial areas. To a lesser extent, Asian and African countries benefitted. In these countries, 70% of the population live in rural areas (Spicer-Sutton, Lampley & Good 2014). IKM systems have been established as a key knowledge strategy in many libraries, a concept that has generated extensive interest. Libraries are no longer ranked according to the type of collections but, rather by the access to information resources (Kumar & Anwarul, 2014) The business world was the first to recognize the importance of knowledge in a global economy. Hence, IKM has now spread to other organizations and has been established as a specialized field used to improve the performance of organizations. The successful application of IKM systems involves understanding and systematic utilization of information for organizational learning. Governmental, non-governmental and social science institutions are knowledge intensive, and the use of advanced technology may transform these institutions and organizations in the future (Kumar & Anwarul, 2014). An IKM system is technology that consists of many practical methods, best practices, systems, and approaches to manage knowledge-related processes within an organization (Rao, 2012). It is because of this technology growth and the drive of the fourth Industrial revolution that IMK forms a crucial part for the training of EO. As previously stated, the IMARK DVD development has a focus not only on EO, but also knowledge specialists within the field of COP. Specialists studying IKM are expected to understand all concepts pertaining to information and communication technology. They are also expected to manage personnel in these environments. The research makes use of Honours IKM

students as a control group for their stability in both their pre-post assessments responses because of their prior experience and expertise in the development of COP.

2.4 DVD-Based Training

The knowledge economy is driven by digital technology which has resulted in a global village with people who are interconnected, regardless of their geographical location. The advantages of this technology could be harnessed by organisations worldwide for the benefit of humanity and extension services (Desai & Potter 2013).

The French Military Medical Service supported the development of 3D-SC1, game designed for their Tactical Combat Casualty Care (TCCC) program. The study assessed the performance of soldiers randomly assigned to one of two groups, pre (measure 1) and post (measure 2) receiving additional training. This training involved either 3D-SC1(Intervention group), or a DVD (Control group). The principal measure was the individual performance, assessed by two investigators during a hands-on simulation. First, the mean performance score was compared between the two measures for Intervention and Control groups using a two-tailed paired *t*-test.

Second, a multivariable linear regression was used to determine the difference in the impacts of 3D-SC1 and DVD training, Overall, the study found that supplementing SC1 training with either 3D-SC1 or DVD improved performance (Planchon, Vacher, Comblet, Rabatel, Darses, Mignon & Pasquier, P. 2018). Since 2005, the power of digital technology has increased, and organisations have harnessed it.

ICT is defined as technologies used in processing, retrieving, collecting, and implementing data and information using micro-electronics, optics, and computers. It may include but are not limited to radio, television, mobile phones, the worldwide web and computer databases and systems like CDs and DVDs. Computer-based learning such as a DVD is self-paced, interactive and can provide the learner with feedback on progress, tests, and evaluation forms (Leeuwis, 2013). Programs can be in various forms such as text, multimedia, graphics, and video and can provide simulation, tests, and other interactive learning tasks. DVD-based training is one of the most simplistic and effective forms of training requiring little technology or computer proficiency on the part of the user (Munasinghe, 2014).

2.4.1 Utilizing DVD-Based Training

A review of recent research indicates a wide range of available technologies. However, the adoption of technology use has been slow. Scientists can no longer just spend their time developing modern technologies, they also need to ensure that these technologies are widely used (Dercon & Gollin 2014). The research agenda, for technology development and use, should be prioritization by stakeholders, end-users, processors, and traders to encompass all sectors, to ensure easy access to relevant and up-dated technology trends (Dercon & Gollin 2014).

While this field has covered a range of issues and interesting findings, more needs to be completed especially concerning the impact of technology-based training amongst diverse cultures, genders, and the impact on learning environments Merchant, Goetz, Cifuentes, Keeney-Kennicutt, & Davis (2014).

Many case studies attest to the success that DVD-based training has had for various organizations. Almost all university graduates, whatever the profession, are expected to have an acceptable level of proficiency in ICT systems (Aydin, 2013). For this reason, in 2003, the University of Ege in Turkey embarked on a project called “The University of Information Society Project” A total number of 3100 students enrolled from varying faculties, universities and vocational schools. By 2004 a 19% increase of the total number of students had enrolled. As a result, students graduated after three years with an acceptable level of ICT systems knowledge. To standardize the course content, the syllabus was designed according to the European Computer Driver’s License (ECDL) version 4.0 (Aydin, 2013).

DVD-based training was utilized to assist teachers in the remote Marshall Islands. The remote location of the islands made it difficult for teachers to find access to professional development (Munasinghe, 2014). To address this situation, a DVD-based program was designed. The DVD consisted of seven lessons and each lesson was divided into ten segments. The student could at any time during a segment progress to the teacher interview section where more than 200 different questions were asked and answered by different teachers. The study reported that teachers had difficulty maintaining and acquiring new skills, which had to be disseminated to the community for educational training. While not addressing or availing them of all that is available and advantageous for teachers, the DVD-based training provided

them with a cost-effective and efficient path to technological training (Munasinghe, 2014).

In this research, the study focus was on fingerprint identification and directed on how to enhance the training model with the increase of the testing accuracy using DVD technology. Fingerprints are the most popular way to identify persons, it is assumed a unique identity, which enable us to return the record of specific person through his fingerprint, and could be useful in many applications, such as military applications, social applications, criminal applications... etc. (Alkhalid, 2020).

In 1994, a case study was conducted that included a computer-based training model. The failure rate of the computer literacy course, at the University of the Western Cape, has been a cause of concern. Of the 516 students who registered in 1994, only 414 wrote the final examinations, and of those students only 35% were successful (O'Malley, 2012). Therefore, an investigation was launched into understanding the factors that contribute to the failure rate. Both quantitative and qualitative research methods were used to collect data. Initially, it was assumed that students with mathematical ability and those who had no fear for technology would be successful. Contrary to their expectations, no correlation was found between the results of an introductory statistics course (first semester) and the more practical computer literacy course (second semester). However, a distinct correlation became apparent between home language, the language of instruction (English) and success rate in computer literacy (O'Malley, 2012).

In 1996, O'Malley (2012) conducted a follow-up study. In this study, a computer-based training (CBT) system was used to teach Computer Literacy. Students could pace their own learning according to their own abilities. With the CBT model, students would spend more time at the computer both reading English and practicing basic computer skills. The pass rate of the students applying the CBT method increased from 42% to 75%. Student profiles had not changed significantly since 1996, and the inability of many students to understand and speak English was again highlighted. The compact disk (CD), that accompanied the prescribed book, contained video clips and presentations on each chapter. This additional information may have been the contributing factor to the higher success rate (O'Malley, 2012). In addition, learners with low verbal ability learnt significantly better when the material

was presented on the video. These results were so successful that it created an opportunity to export this computer-based education model to communities outside the university framework (O'Malley, 2012).

The Philippines has The Open Academy for Philippine Agriculture. It is a network of institutions providing education, training, extension, and communication, especially to researchers, extension workers, farmers, and support service providers (Le, Smith & Herbohn 2014). National, local, and international organizations work together in order to utilize and tap into the potentials of existing infrastructure from government and private sectors. Their content and information databases exist, in an open environment (Le, et al, 2014). This alliance links policymakers, researchers, service providers, markets, business organizations, and farm communities using ICT and distance learning.

The experiments on the Virtual Academy for the Semi Arid Tropics (VASAT) based in a field location in India offered some clues for the development of new linkages between research and extension sub-systems. It was clear that new intermediaries were needed in rural locations to support ongoing, conventional extension processes. Solving this issue is of the near impossibility because of the tackling the scale and demands for services required of EOs (Meena, Singh & Singh 2012). The challenges of cultural and environmental change required even faster response times than originally envisioned. The results, which emerged from the Virtual Academy for the Semi-Arid Tropics (VASAT) field studies, show that when creatively deployed, DVD-based support systems can provide supportive outcomes in terms of quality information services. The service must be accurate as well as timely (Meena, et al, 2012). It is also possible to formulate newer linkages with different components of the extension system, provided that EOs have access to ICT however limited.

2.4.2 Factors influencing DVD-Based Training

Higher Education institutions must work with the challenges of globalization, internationalization, and the demand for a computer literate workforce. ICT courses are, therefore, essential to address the technological demands placed on higher educational institutions. The research undertaken by Bhavnani, Peck & Reif (2008) identified a framework to organize effective and efficient strategies to use computer applications, to train students. This approach was called strategy-based instruction.

Working with disadvantaged engineering students, this study observed the following findings that had the potential to hamper this type of training:

- Language issues
- Time pressure
- Lack of access to computers
- Under-prepared students had a significant impact on the results and success of the research project. (Bhavnani, et al, 2008)

In another study, EOs showed a 100% use of DVD-based systems. However, the research also pointed to 10 structured constraints in the use of ICT. The constraints included lack of electricity, lack of funding, inadequate ICT systems, excessive costs of ICTs, connectivity problems and the lack of technical know-how (Leeuwis, 2013). There are additional challenges related to DVD-based development programs, such as social correctness and attention to detail. Another area included grammar and language, suitable and appropriate for the type of cultural group who will be viewing the DVD (Munasinghe, 2014).

Under the FAO project in the Philippines, interactive facilities were established at municipality level to assist decentralized EO's with the use of DVD systems. The EOs were compensated for routine visits to rural areas, which were often costly and time-consuming. An alternative is telecentres. Many developing countries are experimenting with telecentres which have exhibited these benefits in several European countries (Desai & Potter 2013). The simplicity in DVD-based training requires a small infrastructure and is far cheaper than annual meetings and the costs involved in travelling expenses. EOs who have access to DVD equipment will have the added benefit of an endless supply of materials, including the possibility of re-visiting areas that proved to be more challenging (Munasinghe, 2014).

2.5 Technological Advancements and Requirements

Most industries have only now started to look for alternative methods to improve and promote self-learning, individual enhancement, and on-the-job-training. However, many have not explored the vast possibilities that technology may afford. From an educational perspective to on-the-job training, providing a platform for continuous

development towards career advancement (Rennie & Morrison 2013). With the integration of knowledge management systems and processes the emphasis shifts towards self-improvement and performance (Rennie & Morrison 2013). The adaption of technological learning will shift the focus from IT and program certifications to business requirements and needs (Rennie & Morrison 2013). Internally developed courses for company specifics or relevant issues will be tailored for the business. There will be a change from a primarily top-down management directed training process to a learning system designed for disseminating information in a flexible, reusable, and easily modified manner independent of delivery media (Rennie & Morrison, 2013).

2.6 The Importance of COP Support for Rural Communities in SA

COPs are important as they are used to promote the sharing of knowledge and skill amongst different organizations, communities and EOs. By building COP, individuals can solve problems, address crucial matters, share ideas, and learn about new developments. Findings can then be documented and included on a database providing access to all members involved, such as organizations, communities and EOs (Chetty & Mearns, 2012). Most community members interact electronically with face-to-face meetings organized periodically. Another benefit of working within a COP is that varying organizations, communities, and EOs can collaborate by sharing ideas, promotions, and skills (Chetty & Mearns, 2012).

2.6.1 COP and EOs

The African economy is predominantly agrarian with 82% of the labour force working in rural communities. However, there is a weak link between supply and demand. Only one-third of total food production is marketed (Ajani, 2014). Past and ongoing agricultural education, research and extension have yet to be proven effective. Over the past 100 years, little has changed in the transformation of traditional farming systems and the livelihood of people. In fact, based on traditional indicators, there has been a marked decline in per capita productivity, and a non-transformation of farming systems (Ajani, 2014). The minimal impact of scientific research particularly in Africa has been attributed to three major problems. One is the tendency of agricultural researchers to ignore the management contexts of agricultural /farmer innovations in the process of technology development. Two is the failure to target real needs of the key actors including small-holder farmers, and three is the lack of

economic appraisal of experimental results before extension recommendation are formulated (Ajani, 2014).

In addition, the generation of technology has largely been supply-driven with the tendency to deposit this information into a 'pool' without any economic appraisal. Universities have a trio function of agricultural research, education and extension and have a share in these problems (Ajani, 2014). Without the required infrastructure policies and socio-economic conditions, tertiary training and learning through research may not improve livelihoods. Rural education, research, and extension should form part of policies and practice to ensure the interaction of different actors along the supply chain (Ajani, 2014).

Also is the failure of agriculture to address real needs from production to commercialization to consumption. The differences of stakeholders within the agriculture sector and their perceptions of constraints to agricultural production can cause confusion. Graduates lacked analytic and problem-solving skills to address real life problems. EOs are not equipped to capture the multi-dimensional problems of smallholder subsistence farmers living in complex farming systems because they may not be aware of the farmers' issues. Over the years, the inability of agricultural support systems to generate relevant and appropriate knowledge and support livelihood strategies of the communities has led to a decrease in the flow of resources into agricultural tertiary institutions, research, and extension (Ajani, 2014).

ICT can be used to create linkages between formal and informal sectors for curriculum review, agricultural research, and extension. Unfortunately, most of the projects have been and are not being set for their intended purpose or community. Large imports of hardware and software benefited only those selling and supplying such technology as opposed to the intended group. It seems to be business for profit with no regard for social, economic, and cultural implications. In a frenzy to supply computers and connectivity to the masses, those who need these services are forgotten (Wilkins, Tufte & Obregon, 2014). The reality is that the vast amount of information available on the World Wide Web can be accessed through internet protocols. Statistically, 90% of this information is in English, and 99% of this information is irrelevant to this population of information seekers (Wilkins, et al, 2014). Internet users in Africa and the Middle East account for only 1% of the global

internet users, and 52% are non-English. As an example, only 0.005% of Bangladeshis use it (Wilkins et al., 2014). Money is being invested but it increases the division between the haves and the have nots. Critical voices from developing and industrial countries warn of the consequences in pushing modern technologies to third world countries irrespective of priorities, needs and local capacity to make effective use of them (Wilkins et al., 2014).

Today, projects driven by technological frenzy and those that understand ICT as a tool for the benefit of social and development change can be identified. Community networks need to be created to suit the culture, language, and society of target groups. With the development of local databases and local content, the needs of the thousands of rural and urban communities can be addressed with the use of ICT (Wilkins et al., 2014). Two or three years are not enough to determine the social impact of a communication tool. However, researcher's eagerness to test the benefit at community levels has increased. South Africa and India are two countries that are outstanding with the use of ICT for social development. Both countries have benefited by looking at their experiences with the eyes of the community (Wilkins et al., 2014).

A crucial characteristic of COP is the voluntary participation of its members. This what allows for the freedom and willingness to communicate, share knowledge, and build trusting relationships. Strategically, COP's function is to provide a service and cross boundary between formal organizations and communities. By working together, they can increase the knowledge, skills and professional trust of practitioners who serve in these organizations (Krishnaveni & Sujatha, 2012).

2.6.2 Types and Purpose of COP

There are several types of COP for example, online groups, face-to-face groups, collaboration groups, family groups, ethnic groups, and professional groups etc. When establishing a COP, distinction between a private and public sector should be understood. Private sector communities are safer and more confidential, particularly if sensitive or private issues need to be discussed. However, private communities may not allow for the inclusion of interested parties nor be large enough groups to participate. Public communities generally have a greater potential for growth and diversity (McConnell, Parker, Eberhardt, Koehler & Lundeberg 2013). Most of the

communication in widespread COP will take place over long distances. Therefore, it is imperative that the technology used is user friendly. There are electronics tools that provide a platform for accelerated knowledge sharing and have been designed for easy access and intuitive enough for members to make use of them without any formal training. Members need to be able to work electronically on building knowledge tools and assets so that face-to-face meetings are spent productively and not wasted on sitting through presentations once a quarter creating a lifeless and eventually disbanded COP (Chetty & Mearns, 2012). A study on the effectiveness of a Virtual Community of Practice, first analysed the influence of facilitating conditions, on the effectiveness of a Virtual Community of Practice and then examined the mediating role of a sense of virtual community between facilitating conditions and effectiveness. Then tested the moderating role of perceived usefulness and perceived ease of use in this relationship. The sample consisted of 110 NGO employees who used an intranet platform to create, share, store, and use knowledge about their practice. Results showed that facilitating conditions had a positive influence on effectiveness, and a virtual community partially mediated this relationship. The research also found that perceived usefulness and perceived ease of use, moderated the effects of facilitating conditions on effectiveness through a sense of virtual community. (Peñarroja, Sánchez, Gamero. Orengo & Zornoza, A. M. 2019)

2.6.3 Challenges of COP in South Africa

The context in which rural development is taking place is changing rapidly because of globalization, market liberalization, privatization, urbanization, population growth and climate change. One of the biggest challenges facing electronic online communities is the erratic and unstable power supply to rural areas. Another factor includes the cost involved in supplying alternative sources of energy for ICT installations. In some parts of Africa, only two percent of rural areas have electricity connections (Ajani, 2014). Computing facilities are poor and almost non-existent in some parts of Africa. Internet communication is limited, and basic computer applications are used. Teledensity coverage in Africa, whether mobile or fixed, is at less than 3% (Ajani, 2014). The digital divide is huge. Between rural and urban areas, the coverage averages at 80%-90% in the capital cities with little government

online services available or possible in rural areas. A major constraint factor is poor connectivity and bandwidth issues. Other issues of concern include the lack of enough funding in terms of budgeting which includes the inappropriate expenditure of this limited budget (Wilkins et al., 2014). Only a few international companies have a true understanding of the benefits and implementation of communicator tools. UNICEF for example has EOs employed at headquarters in New York and EOs working in the field wherever they are represented. Unfortunately, some of these people have little experience in developing COP as the whole recruitment process is completed by members who themselves are sometimes not experts in the development of COP. Other countries have very few EOs in the field and rely heavily on the support from only the head office staff. Nevertheless, the main players in the international arena have made little progress in terms of growth in the development of COP initiatives (Wilkins et al., 2014). Many have attempted to introduce ICT for COP development with poor results. ICT managers may have extensive knowledge and experience in technology, but they may have little in communication creating a need to effectively make use of ICT. The sudden abundance of ICT projects is obscuring the development of social change. Without the appropriate communication to ICT, computers and connectivity will only result in outdated machines and equipment (Wilkins et al., 2014).

COP presents many challenges as well as opportunities. Challenges may include the difficulty of disseminating specialized information to large groups. This challenge may become more difficult when the groups involved are not from the same academic or collegial background (Gannon-Leary & Fontainha 2013). COP requires an active and high degree of participation for growth potential and development. Another area of concern includes trust. Most individual will prefer to work autonomously, especially in an environment where there has been no face-to-face interaction. Face-to-face interaction lends itself to building trusting relations. A final area of concern includes the technological know-how to effectively establish COP by making use of ICT technologies and technical understanding. The competency levels of EOs on the use and effective implementation of technology for the development of COP will have a direct impact on the success and reach of COP in rural environments (Gannon-Leary & Fontainha 2013).

2.6.4 COP in Extension and Rural Development Fields

A critical factor for successful COP involves the understanding and use of appropriate technology. Technology needs to be regarded as an accepted and transparent means of communication (Gannon-Leary & Fontainha 2013). However technical skills alone are not the only factor required to sustain and achieve successful COP. A digital participatory video for rural extension has formed part of a drive to provide information to marginal farmers in India. The digital green video consists of four components:

- A participatory process for content production
- a locally generated digital data base
- An instruction manual for dissemination and training
- Regimented sequencing to initiate a new community (Gandhi, Veeraraghavan & Toyama 2016)

The digital green interactive video provides for the interaction of existing people-based extension systems, with the video providing the focus. Local networks are tapped to provide live interaction with experts. Television appearances of local farmers create a great deal of excitement amongst the farming community. In a four-month trial involving 16 villages, use of the digital green video increased the practice of certain agricultural methods over six to seven times more than conventional extension methods. Hardware consisted of one television, DVD player, camera and one personal computer used by all 16 villages (Gandhi, et al, 2016). The digital green system has also proven successful in Uganda. The digital green system differs from previous work by making use of cost-realistic technologies, such as television and DVD players, to assist farmers to better improve their agricultural operations. The video phase approach improved the interaction and diffusion of sound farming practices in realistic conditions. Each video was localized to a region featuring the participation of familiar farmers (Ajani, 2014). To ensure the personal connection of farmers, village mediators facilitated the showing and interaction of the videos (Wilkins, et al, 2014).

One of the most outstanding programs is the one known as “Village Knowledge Centres” previously called “Information Shops” in Chennai, India. The “Village

Knowledge Centres” were established and manned on a voluntary basis to provide information to rural communities on farming, health, medicine, and local market prices (Wilkins, et al, 2014). Each centre provides farmers with the opportunity of assisting each other to produce more centres and try to achieve a hunger free area as they identify the families who may require assistance. These centres have achieved similar success in other parts of Africa, Asia and Latin America, as they are established as community development tools. They provide information and assistance benefiting the rural farmers directly and not simply creating a fund-generating pool of users for digital technology (Wilkins, et al, 2014).

The Telecentres in Mamelodi, Gasaleka, known as the Mamelodi Centres of Technology (MCT) South Africa, Nakasela in Uganda, Info Des Project in Peru, and El Limon in the Dominican Republic are a handful of growing communities paving the way for use in the development of COP (Lesame & Seti 2014). As the case study about the MCT in South Africa indicates, these centres have become popular with government sectors who make use of the information to inform communities of meetings and relevant matters (Lesame & Seti 2014).

In Peru, the Peruvian Scientific Network (RCP) planned a program that enabled citizens to obtain copies of their birth certificates or other essential documentation via governmental-telecentre linkages. This connection saved citizens the time and cost of returning to their areas of origin when they had to personally request such documentation (Lesame & Seti 2014). Other benefits of telecentres include economic benefits, such as productivity and increased trade, transport savings, improved quality, and reduced cost of health care and education.

The case study concerning the telecentre in Nakaseke, Uganda, details how the telecentre has had an impact on information and education for medical personnel, business-people, and other citizens. Telecentres have enhanced economic growth by enabling farmers to receive market rates and trends on local crops, and they have saved people both money and time by using the telephones in the telecentres (Lesame & Seti 2014). Also, telecentres may be used to obtain and work with information in areas such as distance learning, resume preparation, social networking, as well as strengthening managerial and technical skills. Telecentres can also enhance women or privately-owned businesses by providing timely market

data and information on business opportunities and development. In addition, telecentres can act as an incentive for young people to remain in their villages and acquire new skills, whether as employees or as customers (Lesame & Seti 2014). As the Information Age and allied trends continue to sweep towards globalization and economic competitiveness, workers are required to be computer literate. By providing young people with access and training in ICTs, telecentres will increase their employability and develop a skilled workforce (Lesame & Seti 2014). For example, the telecentre staff in Mamelodi, South Africa, was trained in diverse information-gathering techniques, which they then passed on to their residents. As a result, a skilled group of people was created, and, the Mamelodi Telecentre has become anchored in the community (Lesame & Seti 2014).

2.6.5 COP for EOs

The relevance of COP for EOs is not a new concept, these knowledge-based network structures have always existed either formally or informally. In recent years, these network structures have been deployed in many leading organizations, and they have now also moved into private sectors (Krishnaveni & Sujatha 2012). These organizations rely on strategic community initiatives to compete in a global economy. Calling these knowledge-based networks “COP” has emphasized the role of *EO* [my emphasis] to take charge of knowledge issues and knowledge transfer (Krishnaveni & Sujatha 2012).

There is a need to support strategic partnerships in improving online communities, by addressing the need for multimedia material and hardware in rural areas. The importance of capturing the synergies between educational research and extension functions is imperative for providing a platform for new EOs and their capacity to face new challenges of research (Ajani, 2014). Research requires multi-disciplinary and multi-institutional collaboration. Creating opportunities for genuine collaboration requires time and energy. Working beyond existing alliances and groups is difficult without having to address translational issues that exist across professional groups and other stakeholders. COP that share innovation, effective practices, research ideas, and soft networking will enable knowledge transfer to be personalised and made meaningful through these informal social interactions (Tseng & Kuo 2014).

2.6.6 How COP Benefit EOs

Extension organizations have two major problems concerning extension services: physical distance and transportation. ICT can bypass these barriers by developing and applying appropriate interactive information programmes or mechanisms (Desai & Potter 2013). The main issue is to harness ICT for the benefit of extension services and EOs, without compromising the uniqueness of local factors such as indigenous and mother-tongue communication patterns. These require EOs to be home with the people they work with and to be motivated to keep the department up to date with ICT. EOs will always remain a much-needed element for the transfer of information and technology (Desai & Potter 2013).

The same principles could be applied to EOs who in many cases find themselves in the same predicament where they are working in rural communities far from the hub of technology. ICT can play an essential role in addressing world hunger through knowledge and skills transfer (Spicer-Sutton, et al, 2014). Training involving rural farmers and communities require EOs or subject matter experts to be the interpersonal link between knowledge and the rural farmer (Leeuwis, 2013). The use of ICT for development intervention for training has been mainly focused on training EO's interpersonal communication skills and facilitation techniques (Spicer-Sutton, et al, 2010). COP can be described as the gathering of expert practitioners to share knowledge and solutions to common problems (Serrat, 2008). Through a shared commitment to a domain of knowledge, EOs will be able to establish a social circle that will generate collaboration, coordination, shared knowledge, and skill development. In the long-term, COP will provide EOs with a foundation to implement a new kind of governance model that emphasizes participation, inquiry, and collaboration. COP can focus and address issues such as e-government, public safety, and national priorities (Holsapple, 2013). COP can cross organizational boundaries, sectors and levels in ways no current organization structure can, thus paving the way to strategies and deal with problems EOs face today. The complexity to deal with civic problems and increased performance demands will only grow more urgent in years to come, increasing the need to build COP from cross-sector groups at all levels, local, national and international (Holsapple, 2013).

2.6.7 IKM of EOs through COP

EOs have a variety of functions to perform, such as advising communities, training, sustainable development and providing information on available sources for rural communities (Matthews, Njoku, Edna, Asiabaka, & Adesope 2006). However, the realization that EO's cannot think in boxed type compartments of disseminator, creator and user has led to the development of a COP system for rural communities. The objective of a COP system is to link and engage an interaction between like-minded individuals from communities, organizations or EOs, for the purposes of problem solving, support decision making and to stimulate innovative thinking (Matthews et al., 2006). The role of extension organizations is to assist rural communities with experimentations for modern technologies. These communities will gain access to relevant information and a variety of resources, enabling them to interpretation and evaluation of this information for their own benefit and situation (Lemma, 2009). The development of a COP system is vital, as it is necessary to integrate information from researcher to EO and rural communities for the development of technologies that work (Matthews et al., 2006). The World Health Organization (WHO) (2006) explains the importance of COP. They believe that the systems that place extra value on the tacit knowledge that professionals hold within an educational or commercial setting. By making use of COP tools and information technology, COP will promote more optimum use of the collective wisdom of professionals in an institution. COP systems may be people-centric or IT-based. They may relate to safeguarding and creating intellectual assets or focus on organizational learning (OL) and knowledge sharing (Rao, 2012).

2.7 Summary

Chapter 2 reviews literature from many sources to illustrate the key concept of this current research project. The literature explains the purpose and function of COP as the communication networks, which promote the spread of methodologies and technologies. However, DVD and many other electronic communications devices and tools have empowered and have helped establish COP for the benefit of communities, businesses, and individuals. DVDs are a powerful communication and learning tool because they are cheap, easy to use and readily available, which works well for EOs. Previous studies provide background to the development of COP and

the understanding of COP including ICT usage, DVDs, and related electronic media. It is necessary to understand COP in the context of DVD technologies, as it is the necessary background of this research project.

Chapter 3: Research Methodology

3.1 Introduction

Chapter 3 focuses on the research methodology. First is an explanation of the research problem. Next is conceptualising a research design and defining the research methods. After which, the study's participants and instrument are stated. Finally, is an explanation of the data collection, analysis, and interpretation processes.

The research problem is determining competence and skills levels of EOs in the use of ICT technology. EOs are tasked with the responsibility to address the skills shortages within their communities. These skills are addressed by means of training and development programs for the upliftment of rural communities. Therefore, these programs require EO to have competent levels in the use and understanding of ICT technologies for the effective dissemination of information in rural environments.

Additional challenges include rural environments with limited infrastructure and communities without the necessary competencies to work with ICT technology.

3.2 Research Design

According to Mouton (2001), "A research design is a plan or blueprint of how you intend conducting the research" (p. 55). Firstly, there was a need to learn what is happening with the training of EOs and the use of DVD based training. Saunders (2011) states that exploratory studies is a "valuable means of finding out what is happening and to seek new insights" (p 97). One of the principal ways of conducting exploratory research is a search of literature (Saunders, 2011). Therefore, an exploratory study using literature review was completed to develop an understanding and insight into the previous research and the trends that have emerged in DVD-based training.

The research design followed a quantitative pre/post-test experimental design. The pre/post-test experimental design is primarily used for the comparison of two groups or measuring change from an experimental treatments or intervention (Dimitrov & Rumrill, 2003). The focus of this study was the comparison of two groups by means

of a pre/post-test questionnaire, after the incorporation of an intervention tool. Hence, the pre/post-test experimental design allowed for the comparison of two groups and the effect the intervention tool had on the participant's understanding of COP.

There was also a need to verify the findings of the literature review and to fill in gaps of knowledge. Thus, a questionnaire was used in this dissertation. The questionnaire was designed using the existing questions available in the DVD. Caution was taken to ensure the questions selected were clear and tested the knowledge understanding of COP.

3.3 Participants

A purposive sampling method was used to select two groups designated as control and experimental groups.

The control group consisted of IKM Honours students from a South African university. These students were final year students and were selected based on their existing knowledge of developing COP and their confidence in working with DVD-based technology.

The initial experimental group was Agricultural Extension Officers (AEO) and permission was granted. However, there were challenges in the communication and access of enough AEO for the participation in this study. As a result, 15 AEO participated in this study (Refer to Annexure F).

As a result of these challenges, the experimental group consisted of 42 participants, AEO and Technical Extension Officers/Engineers/Technicians. These EOs work in various industrial environments and companies, and they must attend yearly programs to stay updated with new technical products on the market. However, they had little understanding or experience in developing COP. The work and nature of EOs cover many fields of expertise, but the building blocks required for the development of COP would remain the same for all EOs.

The following number of respondents completed the questionnaire:

- Control group: Honours IKM students--30 participants
- Experimental group--42 participants
 - EO: Various industries (n=27)
 - EO: Agriculture (n=15)

3.3.1 Ethical Issues Concerning Participants

All participants were given an introduction page (ref Annexure A). This introduction page served two purposes. First was to explain the purpose and goals of the research instrument, a questionnaire. Second was to ask for the participants consent to be part of the study. Once they gave their consent, the participants received the questionnaire. All participation was voluntary, and no incentives were offered for participation.

In addition, the respondents received no harm. Sensitive questions were limited as far as possible and asked in a broad enough sense to reduce embarrassment. Furthermore, the confidentiality of the respondent was maintained by not keeping names on their response sheets. Therefore, there was no way of knowing which respondent completed which response sheet.

Most of the issues concerning this study were driven by the principle that the findings of the dissertation would be used to determine if a DVD technology used by EOs for the understanding of COP was effective. Hence, the study needed to be unbiased and accurate. The researcher's conduct also ensured confidentiality of candidates and privacy of responses during and after the research participation. No identifying information is revealed.

3.4 Research Instrument

The research instrument consisted of the intervention tool, the IMARK DVD-based technology, and a pre/post questionnaire (ref Annexure A and B).

The DVD-based program is an Information Management Resource Kit (IMARK) consisting of a series of e-learning modules with a set questionnaire after each module. Each module is used to assist EOs and DWs for the training of rural

communities in developing COP. The modules provide an overview of the opportunities and challenges of using information and communication technologies to enhance existing methods of collaboration and information sharing. It also covers the various tools and procedures for developing and facilitating COP. The IMARK DVD was spearheaded by the Food and Agricultural Organization (FAO) of the United Nations in collaboration with over 30 partner organizations. The focus of the DVD is to teach users the approaches, methods and tools used to build COP.

The questionnaire was developed using existing questions provided in the manufacturer's DVD. There was a careful selection of open and closed-ended questions, including a question for self-interpretation. One question was asked for self-reflection in the post-test only. The questions were taken from Unit 1 of the IMARK DVD, consisting of two lessons (e.g. lesson 1 and lesson 2).

A pilot study was conducted with professionals who are not EO, to ensure, that the instructions of the questionnaire were clear, and the questions were easy to follow. This process helped determine how much time was needed to complete the questionnaire (ref Annexure A) and changes were made accordingly.

3.4.1 The Questionnaire Design

After each module in the DVD, are questions for self-review. These questions became the basis of the pre- and post-test questionnaire (ref to Annexure A and B). The reliability of the instrument and uniformity of testing on the pre- and post-test questionnaires was ensured because of the use of existing questions provided in the DVD. As a result, face validity is assured.

Both groups completed the same questionnaire before and after the intervention (ref Annexure A and B). Both the control group and the experimental group received the same DVD intervention and questionnaires. Questions asked in the questionnaire were open-ended or closed-ended. In an open-ended question, the existing responses are not given, whilst in a closed-ended question, the answers are set, and the respondents choose the category that best describes their answer. Open-ended questions have the advantages of providing in-depth information and allowing the respondent to express themselves freely, resulting in a greater variety of information and eliminating investigator bias (Kumar & Phrommathed, 2005). Conversely,

closed-ended questions lack depth, can be biased, and can condition a response pattern. However, closed-ended questions help to ensure that the required information is obtained because ready-made categories are given within the questions. Closed-ended questions are also easier to analyse (Kumar & Phrommathed, 2005).

The questionnaire was divided into two sections: Section 1 and Section 2. Both sections consisted of multiple options questions. Both sections had questions where one or more answers could be correct. Section 1 asked questions relating to the respondents understanding of COP and included one question (1.7) that allowed for self-interpretation by means of a diagram. Section 2 asked the respondents why they think COP are beneficial and provides examples of typical applications.

For example, in Section 1: question 1.1 was a closed-ended question, asking the respondents to choose and appropriate answer for what they regarded as a community of practice from the list provided. Close-ended questions allowed for the selection of correct answers and could not be miss-interpreted; only the correct or incorrect answers could have been selected. Question 1.7 was an open-ended question and allowed for self-interpretation from the respondents. Respondents were provided with an opportunity to express their answers by means of their own interpretation without having to select from a pre-defined list.

In Section 2, question 2.1 was a closed ended question. However, this question provided three possible correct responses. The questionnaire provided a balance of questions testing the knowledge of the DVD material and an opportunity for free interpretation.

All questionnaires had clear instructions as to what is expected from each participant before commencing with the study. All related questions were grouped together, and all questions are one-directional and ambiguous. A copy of the research instrument is attached as Annexure B.

3.4.2 Issues of Reliability and Validity

Reliability and validity were ensured by the applied calculation of Cronbach alpha and Lawshe Content Validity Ratio. Both are quantitative calculation methods appropriate to the study.

For the research instruments in this study, Lawshe CVR = 0.8. The CVR value = 0.8 determines the number of experts required to agree an item is essential and meets the threshold required for validity testing. A CVR of 0.78 or higher with three or more experts could be considered evidence of good content validity. If an item does not reach this threshold, it would normally be deleted from the final instrument.

The Cronbach Alpha score of $= 0.9 > \alpha \geq 0.8$ indicates a reliability coefficient score above 70. A score between $= 0.9 > \alpha \geq 0.8$ is considered “good” in most social science research situations.

3.5 Participant Selection

Two groups were determined, a control group and an experimental group. The control sample was Honours students specializing in IKM. These students were already versed with ICT technology and understanding of COP and they were confident to work with DVD-based training material. The experimental group consisted of EO, who may or may not have been versed in ICT technology or

The sample group included:

- Control group: Honours IKM students—30 participants
- Experimental group: 42 participants
 - EO: Various industries (n=27)
 - EO: Agriculture (n=15)

The population tested in the questionnaire by no means represented the full population of people who are involved with extension services. However, most questions asked in the questionnaire pertained to understanding, usage and attitudes towards several types of COP. This approach of asking broad questions rather than a specific question was taken to reduce the chances of bias in their answers. Asking participants generalized questions should minimized the effect of bias. However, in a research environment, the researcher cannot avoid having data contaminated by bias in one way or another (Ormrod & Leedy, 2005). Thus, although every attempt had been made to reduce the influence of bias in the survey, it must be recognized that there will always be some element of bias in the findings.

This study used a non-probability sampling method. Purposive sampling is used when the survey population is from a known database. The survey population for this study was taken from a known database. Therefore, a probability sampling method would not be a suitable choice. Random sampling would offer the simplest sampling procedure with the least amount of bias. However, there were no overriding considerations, such as convenience, which would have precluded its choice.

The population was regarded as being relatively homogeneous. Therefore, a purposive sampling method was used as the sampling design in the survey.

This small sample size meant that a significant percentage of the total population was excluded from the survey. The survey population consisted of willing participants.

Not every questionnaire was completed and returned. To allow for these non-returns, 100 questionnaires were given with an expected return rate of 50%: 100 to the control group and 100 to the experimental group. In practice, 80 questionnaires were collected; however, not every question was completed. Therefore, the confidence interval changed. For example, the worst-case completion rate was 57 questionnaires whilst the best-case figure was 80, providing a 30% return rate. These differences in confidence level were not large and did not significantly affect the results.

3. 6 Data Procedures

3.6 1 Data Collection Techniques

Before any data was collected this study passed the Ethical Clearance process of the University of South Africa.

An indirect observation method was used to collect information from the participants. Each participant completed the same questionnaire before and after exposure to the DVD-based program.

On arrival, all respondents, control, and experimental groups, were provided a unique sample number. After they were seated, time was allocated to read the consent letter and initial an acceptance of participation. All participants were seated

in front of a desktop and ask to complete the pre-test first. On completion, they were each provided with the IMARK DVD and asked to work through the interactive modules on the IMARK DVD, making use of the desktop provided. On completion of the IMARK DVD participation, the post-test was provided to all respondents.

Data was collected from two groups:

- Control group: Data was collected from Honours third year Information and Knowledge Management students.
- Experimental group: Data was collected from varying EO who may or may not have had knowledge of COP.

Both groups received the same pre-/post-test questionnaire. Upon completion of the pre-test, both groups were provided with the same intervention tool (IMARK-DVD). After working through the intervention tool, both groups completed the post-test. Specialists studying IKM are expected to understand all concepts pertaining to information and communication technology. They are also expected to manage personnel in these environments. The research makes use of Honours IKM students as a control group for their stability in both their pre-post assessments responses because of their prior experience and expertise in the development of COP.

3.6.2 Data Analysis

In Chapter 1, the following research questions were listed:

R1: What is the performance level of the Extension Officers prior to their exposure to the use of the IMARK DVD technology?

R2: What is the performance level of the Extension Officers after their exposure to the use of the IMARK DVD technology?

R3: To what extent will the IMARK DVD technology affect the skills acquisition of COP amongst the Extension Officers?

R4: What are the main reasons listed for the usefulness of COP?

During the individual comparison of questions for each group the following findings were observed.

Note: Question 1.7 was not marked as this question asked the respondent to “Draw a simple diagram that would depict the correct meaning of a social network” In order to mark each candidate uniformly every diagram should look the same, as having to consider each diagram individually and on merit could skew the figures.

On completion of the post-test, respondents were asked to write a short reflection on:

- What is your experience regarding the completion of two sets of questions before and after viewing the DVD?
- What is your review regarding the application of a DVD to learn how to share knowledge/ information?

(Refer to Annexure C and D for additional information).

The paired T-Test was performed to determine whether there was significance in terms of the findings for the experiment group pre and post-test scores with the data assumptions following a normal distribution. Paired data is data that consists of the same person’s pre-test and post-test results e.g. everyone does test A, and then everyone does test B (Rietveld & van Hout, 2017).

A paired t - test was calculated:

- Null hypothesis (H0): There is no significant difference between the experimental group pre- and post-test scores.
- Alternative (H1): There is not no significant difference between the experimental group pre- and post-test scores.

H0: $\mu_1 - \mu_2 = 0$

H1: $\mu_2 > \mu_1$ (alternative)

The calculation results yielded p-value: 0.917. The p-value is statistically significant and shows that the null hypothesis can be rejected. The researcher could therefore conclude that there is not no significant difference between the experimental group's pre- and post-tests scores.

3.7 Limitations/Delimitations of This Research

- One limitation was the relatively small sample size; however, follow-up research can be performed on a more representative sample size of various groups.
- A delimiting factor was that samples were only be taken from certain areas within South Africa, which may not have provided the same result when testing EO and IKM students elsewhere in South Africa or abroad.
- Computer proficiency levels of EO were unknown with a bigger uncertainty in other areas of South Africa or abroad.

3.8 Conclusion

The objective in this dissertation was to gain a broad overview of the effectiveness of using a DVD-based training program to teach EOs about COP. A questionnaire was used to collect data from IKM Honours students and EOs. The research instrument is statistically valid and reliable. T-tests were calculated, and the scores showed that the null hypothesis can be rejected.

Chapter 4: Research Findings and Discussions

4.1 Introduction

Chapter 4 provides a description of the research findings and analysis of the data. This information is explained under the following sub-headings:

- Statistical Finding per Group
- Tabulated Group Responses
- Data Analysis via inductive statistical calculations
- Summary of the Findings

4.2 Findings

This section looks at how the data was, analysed and compares each question and group.

4.2.1 Statistical Findings per Group

The following tables show the statistical responses of each question per group. Each correct answer was counted as one mark. For example, question 1.2 had two correct answers which would be two marks, and question 2.2 had seven correct answers which would be seven marks. Respondents could achieve the full marks, part mark or zero. The Experimental group showed an overall improvement in their post-test results, while the Control group's post-test results had marginal changes. Each group showed a significant dip in the post-test of questions 1.5 and 1.6. Both groups struggled more with Section 1 as opposed to Section 2 where the pre- and post-test were more uniformly answered.

On completion of the post-test both groups were asked to express their experiences regarding their participation in the study, and their review regarding the application of a DVD to learn how to share knowledge and/or information. Of the respondents from both the Experimental and the Control groups, 49 respondents agreed that their understanding of COP after viewing the DVD improved, and the post-test questionnaire was easier to follow and complete. Additional responses highlighted the benefit of this simple technology for use in rural environment and the ease of

applying this methodology in other fields. Typical application suggestion included having this blended form of learning incorporated for students particularly in rural environments since it is simple and easy to use. In developing COPs for the transfer and exchange of knowledge within learning communities, schools, and rural environments, both groups agreed that the DVD was helpful, informative, and provided insight into the development of COP and uses.

4.2.2a Tabulated Experimental Group Responses

The initial focus group was Agricultural Extension Officers (AEOs); however, there were challenges in the communication and access to enough AEOs for the participation in the research. Hence, a pilot group of 15 AEOs were tested, and the results were then added to the experimental group. The Experimental group consisted of different types of EO (e.g., AEOs, TEOs - engineers and technicians) who work in various industrial environments and companies. These candidates must attend yearly continuing development programmes (CPD) and earn the required credits. These programmes help them learn the relevant and updated technical products on the market. However, they may have little or no understanding or experience in developing COPs. The work and nature of EOs cover many fields of expertise, but the building blocks required for the development of communities of practice would remain the same for all EOs. The combination of the different EOs did not skew or change the test results. The Experimental group showed a slight overall improvement on their understanding of COPs after the interaction of the DVD. (See Annexure G)

4.2.2b Tabulated Control Group Responses

All questions were uniformly answered with marginal improvements when comparing the pre- and post-test. This improvement provides an indication of the knowledge and proficiency of the Control group's background and an indication that this group of participants was well suited for testing as the Control. (See Annexure H)

4.2.2c Inductive Statistical Calculations

Inductive statistics were used to establish the degree of certainty. Considering the importance and significant of these calculations on the probability: The size of the population (n), the average (\bar{x}) and the standard deviation (s) of the sample.

The choice of a statistic is determined by the nature and distribution of information. Therefore, a paired t-test was performed to determine whether there was significance in terms of the findings for the Experimental group's pre- and post-test scores, with the data assumptions following a normal distribution. Paired data is data that consists of the same person's pre-test and post-test results e.g. everyone does test A, and then everyone does test B (Rietveld & van Hout, 2017).

Before the calculations were performed hypothesis, statements were established:

- Null hypothesis (H_0): There is no significant difference between the Experimental group's pre- and post-test scores.
- Alternative (H_1): There is not no significant difference between the Experimental group's pre- and post-test scores.
- $H_0: \mu_1 - \mu_2 = 0$

$H_1: \mu_2 > \mu_1$ (alternative)

Thus, a paired t-test was calculated.

Before the probability value could be calculated, the t-statistic and sample size had to be determined. Online statistical calculations were performed and then applied to calculate the p-value. Figure 4.3.1a and Figure 4.3.1b show these calculations.

P-value Experimental Group

Test Statistic:

-1.391140371

Sample Size:

42

Test Type:

Right-tail ($H_a: \mu > H_0$)

Significance Level, α :

Compute p-value

Figure 2: Calculation of Experimental Group's p-Value

The calculation results yielded p-value=0.917. The p-value is statistically significant and shows that the null hypothesis can be rejected with 95% certainty. The researcher could therefore conclude that there is a significant difference between the Experimental group's pre- and post-tests score.

This result was also found true in the Control group with a slightly better p-value of 0.958 which is a difference in improvement between the Control group and Experimental group of 0.041 with a 95% certainty.

P-value Control Group

Test Statistic:

-1.728453606

Sample Size:

30

Test Type:

Significance Level, α :

5%

Compute p-value

Figure 3: Calculation of Control Group's p-Value

4.3 Summary of the Findings

Based on the calculations, it can be determined that the DVD technology used by EO as an intervention tool for the understanding of COP was effective. In addition, the Control group was also proven as the best suitability as the control group participants, based on their slight and balanced improvement as compared to their pre and post-test.

The respondent's independent responses at the end of the post-test also indicated their confidence in understanding COPs after their exposure to the DVD intervention technology.

4.4 Analysis of the Findings

This section analyses the individual questions for both the Control and Experimental groups with a cross analysis of both groups. Refer to Annexure C and D.

4.4.1 Data Analysis of the Control group

Even though the Control group had a slight dip in question 1.1 it was not significant enough for concern. However, the Control group seemed to have difficulty with answering questions 1.5 and 1.6 in both their pre- and post-test. (Refer to Annexure C)

- Question 1.5 is written in the negative form and resulted in large variances between their pre- and post-test answer. In this question, the Control group had to identify “Which one is **Not** a reason why people join online communities?”
- Question 1.6 is a multiple pair question. One point was given for the correct paired answer. The Control group may have found pairing the correct answers challenging.
- All other questions were uniformly answered with a small marginal improvement in the post-test.

On completion the post-test respondents were asked to write a short personal reflection on:

- Your experience regarding the completion of two sets of questions before and after viewing the DVD
- What is your review regarding the application of a DVD to learn how to share knowledge/ information?

The Control group expressed a better and more confident understanding of COP after viewing the DVD. Although some may have had prior knowledge of COP, the interaction with the DVD strengthened their knowledge and skills set based on their post-written reflections.

My experience with the completion of the two sets of questions is that before viewing the dvd, I was not too sure about some of the questions but after the dvd, I was clear on a few more questions.... (S1)

Before viewing the DVD I was not clear about specific answers but after viewing the DVD everything was clear. (S2)

Before viewing the DVD some of the questions were not clear... After viewing the DVD, it was easy to answer questions. (S3)

Well not all of us are familiar with the term, and we tend to build our own definitions based on our understanding.....I personally believe this form of learning is effective... Thumbs up for this methodology. (S4)

The Control group's answers varied slightly, before and after interaction of the DVD. These participants found that the interaction with the DVD allowed for a realization of the importance and benefits of online COP. In addition, this group acknowledged the ease of knowledge sharing, particularly for far reaching groups. They also expressed the importance of blending and face-to-face contact, to ensure an unintentional isolation of individuals or groups. This group expressed the benefits of this simple method of knowledge transfer particularly in rural environments, where technology use is challenging and infrastructure poor.

The DVD provides a great/nice framework which is simple and straight forward and therefore enhances one's understanding. (S2)

A DVD can be regarded as one of the methods to be used to share, exchange information and knowledge. (S3)

My view regarding the application of the DVD is that, it's a fairly good method to learn how to share knowledge... the content being shared in an effective and efficient manner. (S6)

Its fast and convenient for the user to be able to learn at their own pace. (S13)

This analysis provides an indication of the knowledge and proficiency of the Control group's background and suitability for testing as a Control, due to the slight and more accurate improvement in the post-test. This slight improvement is also a good indication of sharpened knowledge of the subject matter content of COP and can be read from the quotations of the participants included.

4.4.2 Data Analysis of the Experimental Group

The Experimental group had challenges with questions 1.1, 1.3, 1.5, 1.6, and 2.3. Question 1.5 is in the negative form. Question 1.6 is a multiple pair question; one point was given for the correct paired answered. Question 2.3 is a multiple answer question, (Refer to Annexure D)

- In question 1.1, the respondents needed to explain “What is regarded as a community of practice?”
- In question 1.3, the respondents had to explain “Having an online community in Extension work would be beneficial because.”
- Question 1.5 is written in the negative form and an oversight on the “Which one is **Not** a reason why people join online communities?” The Experimental group struggled with the negative form of the question, resulting in a negative variance in the post-test.
- In question 1.6, The Experimental group had to “Pair the correct online communities with the examples” The Experimental group scored lower on this question in the post-test. This is a multiple answer question, and only one point was allocated per question. This result could be because of the scoring method of one point for each correct pair and/or found pairing the correct answers challenging.
- In question 2.3, the respondents had to identify “Which of the following are the most accurate definitions for the term “Knowledge Networks””. The negative or lower score of the response was initially weak prior the interaction with the DVD and improved with the post-test.

On completion of the post-test, respondents were asked to write a short personal reflection on:

- Your experience regarding the completion of two sets of questions before and after viewing the DVD.
- What is your review regarding the application of a DVD to learn how to share knowledge/ information?

The Experimental group expressed a better understanding of COP after the interaction with the DVD. This understanding was made clear from their written reflection after the post-test.

I learnt a lot from this DVD about COP, before I view a dvd I find it very difficult to understand some concepts but after the DVD it was simple to approach those questions. (S1)

Before viewing the DVD the adding of responses was more or less guess work and then after viewing the DVD it was more about what I learnt in the DVD. (S3)

Before unaware of COP never understood the meaning unaware of different types of communities...After better understanding of communities importance and its beneficial. (S7)

This group found the post-test to be insightful and helpful with knowledge transfer and simplistic ideas.

The application of the DVD helps a lot to learn about unknown information and it also increased my knowledge and my skills. (S1)

The DVD is easy to use and must be used by many. (S3)

DVD very helpful in information and increases in-depth information about a topic. (S34)

Informative and better understood...very interactive to test your understanding before moving on to a new topic. (S38)

Computer-based learning such as a DVD is self-paced, interactive, and can provide the learner with feedback on progress, tests, and evaluation forms (Leeuwis, 2013).

The Experimental group enjoyed the audio and video aspects, and they suggested the addition of some animation. These aspects provided a visual/sound on concepts that were initially difficult to understand and express in the pre-test:

Good idea would suggest sound and animation for better understanding and to keep your attention. (S9)

Good idea would suggest sound and animation for better understanding and to keep your attention. (S9)

I think it's a good graphical and clear way of transferring info, to gain more knowledge in its simplest form, plus being able to read for yourself plus maybe have some video & audio only enhances ... the retaining of info. (S15)

They gained knowledge and insight to links to internet communities, and this group enjoyed the simplistic method used and the versatility of older technology more readily found in rural areas. Rural education, research and extension should form part of policies and practice to ensure the interaction of different actors along the value chain (Ajani, 2014).

The DVD is very informative, on the latest technology in communication, exchanging viewing and uplifting illiteracy to: establishing business ties...infiltrate remote villages, settlements, giving the people, the best possible chance to, advance in modern technology.... (S2)

I think the DVD is great because its easy to use and load. Even if your computer is old.... (S3)

The use of technology to develop rural communities has proven to be effective ... it will facilitate the transfer of knowledge and allow certain communities to grow. (S14)

Community networks need to be created to suit the culture, language, and society of target groups. With the development of local databases and local content the needs of the thousands of rural and urban communities can be addressed with the use of ICT (Wilkins, 2014).

Good idea would suggest sound and animation for better understanding and to keep your attention. (S9)

I think it's a good graphical and clear way of transferring info, to gain more knowledge in its simplest form. (S15)

Programs can be in various forms such as text, multimedia, graphics, and video and can provide simulation, tests, and other interactive learning tasks. DVD-based training is one of the most simplistic and effective forms of training requiring little technology or computer proficiency on the part of the user (Munasinghe, 2014). This technology provides an opportunity to make use of ICT to create linkages between

formal and non-formal sectors for curriculum review, agricultural research, and extension. Unfortunately, most of the projects have been and are not being set for their intended purpose or community (Wilkins, 2014).

4.4.3 Cross Tabulated Data Analysis of the Control and Experimental Groups

The Experimental group had slight fluctuation in the test, the fluctuations ranged from a positive fluctuation to negative fluctuations in the post-questions. This change also occurred with the Control group. Questions 1.4 showed a strong improvement in the Experimental group after the post-test. This change could be the result of a better understanding after exposure to the DVD. The pass rate of the students applying the CBT method increased from 42% to 75%. This student profile has not changed significantly since 1996, and the inability of many students to understand and speak English was again highlighted. The compact disc (CD) that accompanied the prescribed book, contained video clips and presentations on each chapter and this may have been the contributing factor to the higher success rate (O'Malley, 2012). Overall, the post-test for both groups showed a greater improvement, but the Control group improved more than the Experimental group. The Control group has stronger technological skills set as fourth year Honours students in IKM. The Control group's background could be practiced with familiarity of technology and perhaps a background understanding of COP. Almost all university graduates whatever the profession are expected to have an acceptable level of proficiency in ICT systems (Aydin, 2013)

4.5 Discussion

The discussion looks at how the research questions asked had been addressed by both the Control and Experimental groups. Also, it explains how this research gained a better insight to questions asked about the use of the intervention tool and its topic.

The questions asked in the research as follows below:

R1: What is the performance level of the Extension Officers prior to their exposure to the use of the IMARK DVD technology?

R2: What is the performance level of the Extension Officers after their exposure to the use of the IMARK DVD technology?

R3: To what extent will the IMARK DVD technology affect the skills acquisition of COP amongst the Extension Officers?

R4: What are the main reasons listed for the usefulness of COP?

What is the performance level of the Extension Officers prior to their exposure to the use of the IMARK DVD technology and after their exposure to the use of the IMARK DVD technology? The Control group's consistency with the answering of question before and after the exposure to the DVD-based technology provided a sound platform for comparison. Although there were variances in some of the questions, the variance from the pre- or post-test was not significant enough in order to be taken into consideration. The Experimental group performance indicated a positive and increased response to questions after their interaction with the DVD.

To what extent will the IMARK DVD technology affect the skills acquisition of COP amongst the Extension Officers? The Control group's feedback to the use of the DVD based technology, promoted the use of this effective efficiency and simplistic type of technology. This technology is well suited for areas with poor infrastructure and limited exposure to technology. The Experimental group's feedback to the use of the DVD based technology was lower than the Control group. However, the responses received were positive and clearly indicated a better understanding or clarity of questions after the exposure. Rural communities will have to learn specialized skills to ensure efficient farming and must become better educated because of mass media. This reality created an even bigger demand for specialized and well trained EOs. Extension services will have to adapt to the changing rural population and their specific requirements, acquiring and developing skills suited to a different type of client who will be educated and concerned with market trends, commercialization, and effective farming practices. This forces the need to a participatory approach of information and technical solutions sharing (Simpson, 2014).

What are the main reasons listed for the usefulness of COP? Suggestions of reinforcement after exposure via a blended mix of face-to-face and more technology interaction and practice were provided. In addition, the better understanding of exposure and dissemination of information to a larger community was made possible via the use of such simplistic technology. The relevance of COP for EOs is not a new

concept, these knowledge-based network structures have always existed either formally or informally. In recent years, these network structures have been deployed in many leading organizations and have now also moved into private sectors (Krishnaveni, 2012). Strategically, COP's function is to provide a service and cross boundary between formal organizations and communities to increase the knowledge, skills and professional trust of practitioners who serve in these organizations (Krishnaveni, 2012). COP can provide a seamless crossover between local, national, and international communities as a result of the world-wide interlinked ICT technologies available. The application of ICT used by EO requires specific information to provide solutions for different environments and to achieve sustainable improvement efforts (Leeuwis, 2013). EOs have access to relevant information databases that can be updated and disseminated to target groups within COP. ICT is relevant in rural areas as it reduces cost of acquiring information is easy to use and can provide a faster means of obtaining information (Maumbe, 2013). Duties of EO broadened, and their training requirements became more professional as a result of technology demand and environmental changes (Simpson, 2014). EOs must often provide innovative ideas to convince emerging farmers of the value of using modern technologies. In rural environments sometimes the exposure to technological changes and adaption is slow. Hence EOs must provide an awareness of and develop of their communities' skills in order to better understand the application and benefits of new technologies (Sikwela & Mushunje, 2013).

This study addressed the effectiveness of using a DVD-based technology as an intervention tool on training EOs on COP. It showed an increase in the EOs understanding of COP, after the interaction with the intervention tool,

This technology has proven to be simplistic, relevant, inexpensive, and efficient enough to be used in areas with limited technology exposure and infrastructure. The basic understanding and use of ICT technology would be imperative for the effective transfer of knowledge programmes and as such should be implemented without delay. South Africa and the African continent face challenges that far surmount just the issues of ICT technology. With an insufficient number of trained EOs, a bigger void will be created with the immergence of the fourth Industrial Revolution.

The Department of Agriculture employs approximately 32 EOs, and many have neither the technical nor the social skills to support emerging black farmers, even though they are required to spend most of their time supporting emerging farmers. It is highly unlikely that such a small number of people who are poorly and, in some cases, inappropriately trained will be able to assist approximately 80 land reform groups (Sikwela, 2013). Extension services have become an important mechanism for the delivery of information and advice to improve technologies for rural communities. Today, there is stronger social dimension to the profession (Simpson, 2014). The need for well trained and professionally competent EO's has increased. EOs must adapt to dynamic environmental and technological changes. There is an almost critical shortage of technical manpower in a varying number of fields, including extension (Sikwela & Mushunje, 2013).

Of the EOs, 64% reported a negative status in the use of acquired technologies. One of the most crucial factors revealed by the study for the non-adoption of acquired technologies is the lack in resources (Dhital, 2016). The advantages of this technology could be harnessed by organisations worldwide for the benefit of humanity and extension services (Desai, 2013). Scientists can no longer just spend their time developing modern technologies. Instead, they must also ensure that these technologies are widely used (Dercon, 2014).

Most of the issues concerning this study were driven by the principle that the findings of the dissertation would be used to determine if a DVD technology used by EOs as an intervention tool for the understanding of COPs was effective. Hence, the research needed to be as unbiased and accurate as possible. There would be no reason to determine the effectiveness of the DVD technology as the intervention tool if it were found that respondents did not require an understanding of COP or were not familiar with this type of technology. Likewise, there would be financial reasons to implement an effective DVD-based technology if the respondents wanted this technology. Almost of the all the respondents [n=49] from both the Experimental and the Control groups agreed that their understanding of COP after viewing the DVD improved, and the questionnaire was easier to follow and complete. Additional responses highlighted the benefit of this simple technology for use in rural environment and the ease of applying this methodology in other fields. Typical

application suggestion included having this blended form of learning incorporated for students, particularly in rural environments due the simplicity and ease use. Developing COP will help with the transfer and exchange of knowledge within learning communities, schools, and rural environments. Both groups agreed that the DVD was helpful and informative, and it provided insight into the development of COP and uses.

CHAPTER 5: Recommendations and Conclusions

5.1 Introduction

Chapter 5 provides the conclusion and recommendation for a further study into the creation or the development of a COP network for EO from varying background.

5.2 Recommendations

The IMARK DVD proved to be an effective tool for the transfer of information. This simplistic tool is well suited for environments with limited infrastructure, funding, and access. In today's world of technology advancements, it is easy to overlook training tools that do not fit the trend of latest technology. However, it is at this point that such interventions could narrow the gap of a technology void for vulnerable societies. The IMARK DVD design could roll-out non-profit programs establishing satellite campuses for the purpose of technology training. With the drive towards technology growth, it is imperative that simplistic technologies are used to address basic gaps of understanding providing the stepping stones towards technology advancements.

5.3 Conclusions

The 2020 UN Millennium Development Goals Strategy (MDGS) vision is to make use of EOs to deliver information and training to various communities with the focus on the development of self-sustainability, food security and poverty alleviation. In essence, EOs are used to address gaps between service policies and actual output by citizens (Sachs, 2012). The importance of collaboration and information sharing of EOs, in order to achieve these goals, must include training and the emergence of the development of COPs as a mechanism to collaborate and to share knowledge

and/or information. It is against this backdrop that this research was undertaken with the IMARK DVD based technology used as the intervention tool.

While not addressing or availing them of all that is available and advantageous for teachers and EOs, the IMARK DVD-based training provided them with a cost-effective and efficient path to technological training (Munasinghe, 2014). The technology is simplistic and easily available. Also, it has shown to be an effective tool for informing EOs on COPs. With greater knowledge of forming COPs, this group of EOs can return to their rural areas and implement this DVD tool. They now have the skills to reach out to other EOs within Gauteng Province and outside of the province. Together, all EOs in the extension services can work together to tackle the issues, so they can compete at the national and international levels. As the American basketball player Michael Jordan stated, "Get the fundamentals down and the level of everything else you do will rise." The IMARK DVD-based technology allows EOs to master the fundamentals of COP.

5.4 Areas for Further Study

There are recommendations for further study. One recommendation is to study the design or the development of a COP network, for EOs from varying backgrounds. Data could provide a common platform for dissemination of information. This platform could provide insight to challenges and success within specifically far-reaching areas of rural environments.

Agreeing with Merchant (2014), while this field has covered a range of issues and interesting findings, more studies need to be completed, especially concerning the impact of technology-based training amongst diverse cultures, genders, and the impact on learning environments.

References

- Ajani, E. (2014). Promoting the use of information and communication technologies (ICTs) for agricultural transformation in Sub-Saharan Africa: Implications for policy. *Journal of Agricultural & Food Information*, 15(1), 42-53.
- Alkhalid, F. F. (2020). *The effect of optimizers in fingerprint classification model utilizing deep learning*. Indonesian Journal of Electrical Engineering and Computer Science, 20(2), 1098-1102.
- Atkinson, D. (2008). The need for agricultural extension services for municipal commonage farmers. *South African Journal of Agricultural Extension*, 36(1), 190-202.
- Aydin, S. (2013). Teachers' perceptions about the use of computers in EFL teaching and learning: The case of turkey. *Computer Assisted Language Learning*, 26(3), 214-233.
- Bhavnani, S. K., Peck, F. A., & Reif, F. (2008). Strategy-based instruction: Lessons learned in teaching the effective and efficient use of computer applications. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 15(1), 2.
- Chetty, L., & Mearns, M. (2012). Using communities of practice towards the next level of knowledge-management maturity: Original research. *South African Journal of Information Management*, 14(1), 1-9.
- Davids, I., & Cloete, F. (2012). Improving the community development workers programme in South Africa. *Dimensions of Local Governance*, 20(1), 90-109.
- Davis, K. (2008). Extension in sub-saharan Africa: Overview and assessment of past and current models and future prospects. *Journal of International Agricultural and Extension Education*, 15(3), 15-28.

- Dercon, S., & Gollin, D. (2014). Agriculture in African development: Theories and strategies. *Annual Review of Resource Economics*, 6(1), 471-492.
- Desai, V., & Potter, R. B. (2013). *The companion to development studies*. UK: Routledge.
- Dhital, P. R., & Joshi, N. R. (2016). Factors affecting adoption of recommended cauliflower production technology in Nepal. *Turkish Journal of Agriculture-Food Science and Technology*, 4(5), 378-383.
- Dimitrov, D. M., & Rumrill Jr, P. D. (2003). Pretest-posttest designs and measurement of change. *Work*, 20(2), 159-165.
- Food and agriculture organization of the United Nations [FAO]. (2013). *The state of food and agriculture*. Retrieved from Batho Pele: <http://localgovernmentaction.org.dedi6.cpt3.host-h.net/content/batho-pele-principles>
- Gandhi, R., Veeraraghavan, R., & Toyama, K. (2009). Digital Green: Participatory video and mediated instruction for agricultural extension. *Information and International Development*, 5(1), 1-15
- Gannon-Leary, P., & Fontainha, E. (2008). Communities of practice: Benefits, barriers and success factors. *e-Learning Papers*, 5. Retrieved from <https://mpra.ub.uni-muenchen.de/8708/>
- Garforth, C. (2010) *Adapting to new challenges: extension theory and practice for the 21st century*. Keynote paper presentation at the International Conference on Agricultural Extension (Agrex 10), 26-28 October 2010, Universiti Putra Malaysia. Retrieved from <http://centaur.reading.ac.uk/20026/>
- Gonçalves, T. D. S., & Crenitte, P. A. P. (2011). Development of a CD-ROM on written language for the continuing education of elementary school teachers. *Journal of Applied Oral Science*, 19(6), 560-566.

- Hitayezu, P., Zegeye, E. W., & Ortmann, G. F. (2014). Some aspects of agricultural vulnerability to climate change in the KwaZulu-Natal midlands, South Africa: A systematic review. *Journal of Human Ecology, 48*(3), 347-356.
- Holsapple, C. (Ed.). (2013). *Handbook on knowledge management 1: Knowledge matters* (Vol. 1). City, County: Springer Science & Business Media.
- Han, M., & Lee, E. (2018). Effectiveness of mobile health application use to improve health behavior changes: a systematic review of randomized controlled trials. *Healthcare informatics research, 24*(3), 207-226.
- International food policy research institute [IFPRI] (2012). *2012 Global food policy report*. Washington DC: Author.
- Krishnaveni, R., & Sujatha, R. (2012). Communities of practice: An influencing factor for effective knowledge transfer in organizations. *IUP Journal of Knowledge Management, 10*(1), 26.
- Kumar Agarwal, N., & Anwarul Islam, M. (2014). Knowledge management implementation in a library: Mapping tools and technologies to phases of the KM cycle. *Vine, 44*(3), 322-344.
- Kumar, S., & Phrommathed, P. (2005). *Research methodology*. Berlin, Germany: Springer.
- Kumar, S. A. (2010). Knowledge management and new generation of libraries information services: A concepts. *International Journal of Library and Information Science, 1*(2), 24-30.
- Le, H. D., Smith, C., & Herbohn, J. (2014). What drives the success of reforestation projects in tropical developing countries? The case of the Philippines. *Global Environmental Change, 24*, 334-348.
- Leeuwis, C. (2013). *Communication for rural innovation: Rethinking agricultural extension*. Oxford, UK: Blackwell, Ltd.

- Lemma, F. (2009). *The role of ICT on agricultural knowledge management in Ethiopia: a case study on Woreda knowledge centers in Bure, Goma, Alaba and Alamata* (Doctoral dissertation, Unity University).
- Lemma, T., Sehai, E., & Hoekstra, D. (2011). *Knowledge centers in the pilot learning Woradas of improving productivity and market success project: Utilization, relevance*. International Livestock Research Institute. Retrieved from <https://core.ac.uk/download/pdf/132636836.pdf>
- Lengnick-Hall, M. L., Gaunt, P., & Kulkarni, M. (2008). Overlooked and underutilized, people with disabilities are an untapped resource. *Human Resource Management, 47*(2), 255-273.
- Lesame, Z., & Seti, V. (2014). Technology access centres and community development: The case of the Eastern Cape Province in South Africa. *Mediterranean Journal of Social Sciences, 5*(10), 303.
- Mafetsa, S. M. (2012). *Stakeholder perceptions on the role and effectiveness of networking forums in promoting partnerships and integrated service delivery between government and non-profit sector organisations: The case of Nelmapius Forum in the North Rand Region Pretoria* (Doctoral dissertation, Wits University, South Africa). Retrieved from <http://wiredspace.wits.ac.za>
- Matthews-Njoku, E. C., Asiabaka, C., & Adesope, O. (2006). Extension agents' technical knowledge requirements for effective extension work. *International Journal of Agriculture and Rural Development, 7*(1), 121-124.
- Maumbe, B. M., & Okello, J. J. (2013). Uses of information and communication technology (ICT) in agriculture and rural development in sub-Saharan Africa: Experiences from South Africa and Kenya. In B. M. Maumbe (Ed.) *Technology, Sustainability, and Rural Development in Africa* (pp. 113-134). WV, USA: IGI Global.
- McConnell, T. J., Parker, J. M., Eberhardt, J., Koehler, M. J., & Lundeberg, M. A. (2013). Virtual professional learning communities: Teachers' perceptions of

virtual versus face-to-face professional development. *Journal of Science Education and Technology*, 22(3), 267-277.

Meena, M. S., Singh, K. M., & Singh, R. (2012). ICT-enabled extension in agriculture sector: Opportunities and challenges in climate change situation. In K. M. Singh & M. S. Meena (Eds.) *ICTs for agricultural development under changing climate*. New Delhi, India: Narendra Publishing House.

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*, 70, 29-40.

Moser, C. (2012). *Gender planning and development: Theory, practice and training*. London, UK: Routledge.

Mouton, J. (2001). *How to succeed in your master's and doctoral studies: A South African guide and resource book*. Cape Town: Van Schaik.

Mtshali, S. M. (2000). Monitoring and evaluation of women's rural development extension services in South Africa. *Development Southern Africa*, 17(1), 65-73.

Munasinghe, M. (2014). *Computers and informatics in developing countries*. Oxford, UK: Butterworth-Heinemann.

O'Malley, C. (2012). *Computer supported collaborative learning*. NY, USA: Springer Science & Business Media.

Organisation for Economic Co-operation and Development (OECD). (2016). *The Statesman's Yearbook: The Politics, Cultures and Economies of the World 2017*. London, UK: Palgrave Macmillan.

Ormrod, J. E., & Leedy, P. (2005). *Practical research: Planning and design*. Upper Saddle River, NJ, USA: Prentice Hall.

- Peñarroja, V., Sánchez, J., Gamero, N., Orengo, V., & Zornoza, A. M. (2019). *The influence of organisational facilitating conditions and technology acceptance factors on the effectiveness of virtual communities of practice*. *Behaviour & Information Technology*, 38(8), 845-857.
- Planchon, J., Vacher, A., Comblet, J., Rabatel, E., Darses, F., Mignon, A., & Pasquier, P. (2018). *Serious game training improves performance in combat life-saving interventions*. *Injury*, 49(1), 86-92.
doi:<https://doi.org/10.1016/j.injury.2017.10.025>
- Rao, M. (2012). *Knowledge management tools and techniques*. Oxfordshire, UK: Routledge.
- Rennie, F., & Morrison, T. (2013). *E-learning and social networking handbook: Resources for higher education*. Oxfordshire, UK: Routledge.
- Rietveld, T., & van Hout, R. (2017). The paired t-test and beyond: Recommendations for testing the central tendencies of two paired samples in research on speech, language and hearing pathology. *Journal of Communication Disorders*, 69, 44-57.
- Sachs, J. D. (2012). From millennium development goals to sustainable development goals. *The Lancet*, 379(9832), 2206-2211.
- Salama, H. E. E. D. A. (2019). *Improving Agricultural Extension Services through Knowledge Management Practices in the Delta Region of Egypt: An Applied Study of Knowledge Management Model*. *Asian Journal of Agricultural Extension, Economics & Sociology*, 1-14.
- Saunders, M. N. (2011). *Research methods for business students* (5th ed.). India: Pearson Education.
- Serrat, O. (2008). Building communities of practice. Retrieved from https://www.researchgate.net/publication/254583096_Building_Communities_of_Practice

- Sikwela, M., & Mushunje, A. (2013). The impact of farmer support programmes on household income and sustainability in smallholder production: A case study of the Eastern Cape and KwaZulu Natal farmers, South Africa. *African Journal of Agricultural Research*, 8(21), 2502-2511.
- Simpson, B. M., & Burpee, G. (2014). Adaptation under the “New Normal” of climate change: The future of agricultural extension and advisory services. *Modernizing Extension and Advisory Services*. United States Agency for International Development (USAID) project. Retrieved from sciencedirect.com/science/article/abs/pii/S002199241630199x
- Spicer-Sutton, J., Lampley, J., & Good, D. W. (2014). Self-assessment and student improvement in an introductory computer course at the community college level. *Journal of Learning in Higher Education*, 10(1), 59-65.
- Tseng, F., & Kuo, F. (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. *Computers & Education*, 72, 37-47.
- Tshandu, Z., & Karuki, S. (2010). Public administration and service delivery reforms: A post-1994 South African case. *South African Journal of International Affairs*, 17(2), 189-208.
- Wilkins, K. G., Tufte, T., & Obregon, R. (2014). *The handbook of development communication and social change*. Hoboken, NJ, USA: John Wiley & Sons.
- World Health Organization [WHO] (2006). *The world health report 2006: Working together for health*. Geneva, Switzerland: Author.

Annexures

Letter of Informed Consent

Title: THE EFFECT OF AN INFORMATION MANAGEMENT RESOURCE KIT (IMARK) DVD-BASED TECHNOLOGY ON TRAINING TECHNICAL EXTENSION OFFICERS.

**Department of Agriculture, Animal Health and Human Ecology
University of South Africa**

Investigator: *Mrs AA Straussner*

Supervisors: *Prof HI Atagana and Prof B Seo*

1. The main purpose of this study is:

To evaluate the effectiveness of a DVD- based program for the continuous training of agricultural extension officers. The overall study design will require that I participate in a pre-test and a post-test as part of control sample for the data collection of the research project indicated above.

2. Confidentiality:

I understand that the information provided by this study may be used to research purpose, including publications in research journals. All individual information will be coded and at no time will my personal identity be revealed.

3. Voluntary Participation:

The purpose of the study has been explained to me. I understand that participation in this study is voluntary and refusal to participate will involve no penalty or loss of benefits which I am otherwise entitled. I may terminate my participation at any time I choose, without penalty. I understand that I may withdraw from participation at any point in the study with no penalty.

4. Benefits of Participation:

The benefits of participating in this study are to further research only. The University of South Africa will not receive any money to conduct this study.

My participation will contribute to further understanding of continuous training of agricultural extension officers using a DVD- based programme.

5. Remuneration:

I understand that I will not receive money or any other reward for participation.

In acknowledgement of informed consent please place your initials here:

_____ **Date :** _____

Pre-test Control Sample number

INSTRUCTIONS:

Please mark your selected answers with an X. In some questions only one option might be correct, but some questions could have more than one option being correct.

1.1 What is regarded as an online community?

a. A group of people that share a common interest using the internet	
b. A group of people sharing a common interest in physical contact with one another	
c. Community members that all have e-mail addresses	

1.2 What special characteristics of the internet make online communities possible?

a. Two-way communication flow	
b. One-way communication flow from a sender to a receiver	
c. Broadcasting of communication from a community leader to community members	

1.3 Having an online community in extension work would be beneficial because...

a. ...it would allow poor people in rural areas to have computers and internet access.	
b. ...it would allow people to share ideas and get feedback instead of working alone	
c. ... it would foster relationships with people outside our physical communities	
d. ... it allows members of the community that have the rights answers to respond to others	

1.4 The characteristics of an online community would **not** include:

a. a shared interest or purpose	
b. Strengthened social relationships	
c. simple exchanges of e-mail between divisions	

1.5 Which one is NOT a reason why people join online communities?

a. to have support	
b. to develop professionally	
c. to exchange information and ideas	
d. to receive personalised e-mail	
e. to learn from each other	
f. to build networks	

1.6 Pair the following types of online communities with the correct example. Place the number of the examples next to the appropriate type of online community in the table below.

EXAMPLES OF ONLINE COMMUNITIES

6. An online community that supports the Liverpool Football Club
--

7. An online group of specialists that produce and market sustainable rice
8. An online training and resource kit that support the effective management of agricultural information
9. An online group with the strong task and work orientated subject focus
10. An online group that focus on task and deliverables within affixed time frame

TYPES OF ONLINE COMMUNITIES

a. E-Learning community	
b. Community of interest	
c. Online events and meetings	
d. Community of practice	
e. Distributed Team	

1.7 Draw a simple diagram that would depict the correct meaning of social network.

--

2.1 Place a X next to each of the aspects listed that you would regard as being reasons why belonging to an online community is useful.

a. Puts us in touch with groups of people we would not have met otherwise	
b. Help us find people we need in our work	
c. Be a driving force to lobby for computers and access for poor communities	
d. It can be used to market and buy online products	
e. Supports easy access to information from diverse people	
f. Offer new perspective that can assist us in problem solving and innovation	
g. Forms the foundation for virtual collaboration, meetings and communication	

2.2 Which of these industries would you say online communities can be beneficial? Mark all of those that you deem appropriate.

a. Agriculture and agriculture extension	
b. Natural resource management	
c. Engineering	
d. Computer programming and design	
e. Rural development projects	
f. Libraries and information centres	

g. Health services	
h. Primary and secondary education	

2.3 Which one of the following would be the most accurate definition for the term “knowledge networks”?

a. Communities that exchange their perception on a certain topic	
b. Communities that correspond about a shared interest	
c. Communities that build and share knowledge with each other.	

2.4 When using online communities, which of the following activities would you say should a person be involved in? Mark all those that you deem appropriate.

a. Actively contribute to the community by posting responses	
b. Only monitor the community communication and only draw from the information you need	
c. Be an observer of the correspondence and criticise the community when needed	
d. Mobilise people towards issues of policy change	
e. When contributing to a community impose a single view on the members	
f. Create and deploy advocacy actions to influence policy and practice	
g. Identify, inform and educate people about issues	
h. Measure success on actions and revise future actions	
i. Take ideas from contributing members and implement the as your own	

Please write a short reflection on:

- **Your experience regarding the completion of two sets of questions before and after viewing the DVD**

What is your review regarding the application of a DVD to learn how to share knowledge/ information?

Annexure B

Post-Test Questionnaire

INSTRUCTIONS:

Please mark your selected answers with an X. In some questions only one option might be correct, but some questions could have more than one option being correct.

1.8 What is regarded as an online community?

d. A group of people that share a common interest using the internet	
e. A group of people sharing a common interest in physical contact with one another	
f. Community members that all have e-mail addresses	

1.9 What special characteristics of the internet make online communities possible?

d. Two-way communication flow	
e. One-way communication flow from a sender to a receiver	
f. Broadcasting of communication from a community leader to community members	

1.10 Having an online community in extension work would be beneficial because...

e. ...it would allow poor people in rural areas to have computers and internet access.	
f. ...it would allow people to share ideas and get feedback instead of working alone	
g. ... it would foster relationships with people outside our physical communities	
h. ... it allows members of the community that have the right answers to respond to others	

1.11 The characteristics of an online community would **not** include:

d. a shared interest or purpose	
e. Strengthened social relationships	
f. simple exchanges of e-mail between divisions	

1.12 Which one is NOT a reason why people join online communities?

g. to have support	
h. to develop professionally	
i. to exchange information and ideas	
j. to receive personalised e-mail	
k. to learn from each other	
l. to build networks	

1.13 Pair the following types of online communities with the correct example. Place the number of the examples next to the appropriate type of online community in the table below.

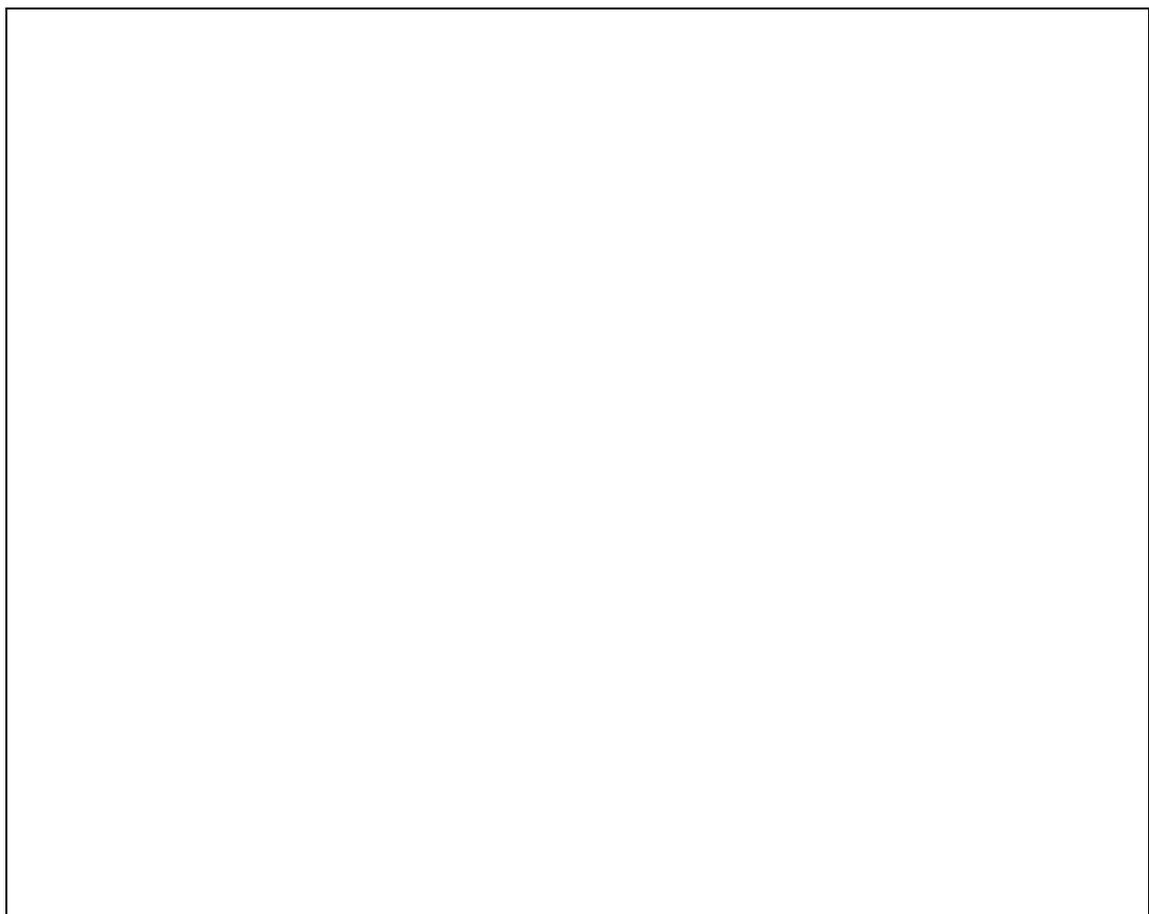
EXAMPLES OF ONLINE COMMUNITIES

6. An online community that supports the Liverpool Football Club
7. An online group of specialists that produce and market sustainable rice
8. An online training and resource kit that support the effective management of agricultural information
9. An online group with the strong task and work orientated subject focus
10. An online group that focus on task and deliverables within affixed time frame

TYPES OF ONLINE COMMUNITIES

f. E-Learning community	
g. Community of interest	
h. Online events and meetings	
i. Community of practice	
j. Distributed Team	

1.14 Draw a simple diagram that would depict the correct meaning of social network.



2.5 Place a X next to each of the aspects listed that you would regard as being reasons why belonging to an online community is useful.

h. Puts us in touch with groups of people we would not have met otherwise	
i. Help us find people we need in our work	
j. Be a driving force to lobby for computers and access for poor communities	
k. It can be used to market and buy online products	
l. Supports easy access to information from diverse people	
m. Offer new perspective that can assist us in problem solving and innovation	
n. Forms the foundation for virtual collaboration, meetings and communication	

2.6 Which of these industries would you say online communities can be beneficial? Mark all of those that you deem appropriate.

i. Agriculture and agriculture extension	
j. Natural resource management	
k. Engineering	
l. Computer programming and design	
m. Rural development projects	
n. Libraries and information centres	
o. Health services	
p. Primary and secondary education	

2.7 Which one of the following would be the most accurate definition for the term 'knowledge networks'?

d. Communities that exchange their perception on a certain topic	
e. Communities that correspond about a shared interest	
f. Communities that build and share knowledge with each other.	

2.8 When using online communities, which of the following activities would you say should a person be involved in? Mark all those that you deem appropriate.

j. Actively contribute to the community by posting responses	
k. Only monitor the community communication and only draw from the information you need	
l. Be an observer of the correspondence and criticise the community when needed	
m. Mobilise people towards issues of policy change	
n. When contributing to a community impose a single view on the members	
o. Create and deploy advocacy actions to influence policy and practice	
p. Identify, inform and educate people about issues	
q. Measure success on actions and revise future actions	
r. Take ideas from contributing members and implement the as your own	

Please write a short reflection on:

- **Your experience regarding the completion of two sets of questions before and after viewing the DVD**
- **What is your review regarding the application of a DVD to learn how to share knowledge/ information?**

Annexure C

Data Analysis: Control Group

DATA ANALYSIS - CONTROL GROUP																						
PRE/P OST - TEST	* Q 1. 1	Q 1. 1	* Q 1. 2	Q 1. 2	* Q 1. 3	Q 1. 3	* Q 1. 4	Q 1. 4	* Q 1. 5	Q 1. 5	* Q 1. 6	Q 1. 6	* Q 1. 7	Q 1. 7	* Q 2. 1	Q 2. 1	* Q 2. 2	Q 2. 2	* Q 2. 3	Q 2. 3	* Q 2. 4	Q 2. 4
C1	1	1	1	1	1	2	1	1	0	0	1	0	x	x	3	2	7	7	0	1	3	4
C2	1	1	1	1	2	2	1	1	0	0	0	0	x	x	2	3	5	5	1	1	3	3
C3	1	1	1	1	1	1	0	0	0	0	0	1	x	x	4	3	4	5	1	1	4	4
C4	1	1	1	1	1	2	1	1	0	0	1	1	x	x	5	5	7	7	1	1	4	4
C5	1	0	1	0	1	1	1	1	0	1	0	0	x	x	3	0	1	1	1	0	3	1
C6	1	1	1	1	1	1	1	1	0	0	0	0	x	x	3	4	4	7	1	1	2	4
C7	1	1	1	1	1	1	1	1	0	0	0	0	x	x	3	5	6	5	1	1	3	3
C8	1	1	1	1	1	0	1	1	0	0	1	0	x	x	5	4	7	3	1	1	4	3
C9	1	1	1	1	1	2	1	1	0	0	0	0	x	x	2	5	7	7	1	1	2	4
C10	1	1	1	1	1	2	1	1	0	0	0	0	x	x	3	3	5	5	1	1	2	2
C11	1	1	1	1	1	1	1	1	0	0	0	0	x	x	3	4	5	4	1	1	3	3
C12	1	1	1	1	1	1	1	1	0	0	0	0	x	x	4	3	5	5	1	1	2	3
C13	0	1	1	1	0	2	1	1	0	0	0	0	x	x	0	4	0	7	0	1	0	3
C14	1	1	1	1	1	2	1	1	0	0	0	0	x	x	5	5	2	5	1	1	2	4
C15	1	1	1	1	0	2	1	1	0	0	0	0	x	x	5	5	6	5	1	1	4	4
C16	1	1	2	2	2	2	1	1	0	0	3	0	x	x	5	5	4	7	1	1	4	4
C17	1	1	1	1	1	1	0	1	0	0	0	0	x	x	5	5	7	7	1	1	4	3
C18	1	1	0	1	1	1	0	1	0	0	1	0	x	x	5	5	4	7	1	1	2	3
C19	1	1	1	1	1	2	1	1	0	0	1	1	x	x	2	5	2	3	1	1	3	3
C20	1	1	1	1	1	1	1	1	0	0	1	0	x	x	4	5	6	4	1	1	2	2
C21	1	1	1	1	1	2	1	1	0	0	0	0	x	x	5	5	7	4	1	1	2	3
C22	1	1	1	1	1	0	1	1	0	1	1	1	x	x	1	1	5	4	1	1	3	3
C23	1	1	1	1	2	2	1	1	0	0	1	0	x	x	4	5	6	4	1	1	3	4
C24	1	1	1	1	1	1	0	1	1	0	0	3	x	x	3	5	3	4	1	1	3	3
C25	1	1	1	1	1	1	1	1	0	0	3	2	x	x	5	5	5	5	1	1	3	4
C26	1	1	1	1	1	1	1	1	0	0	1	0	x	x	1	4	5	2	1	1	3	2
C27	1	1	1	1	1	1	1	1	0	0	1	0	x	x	2	2	7	7	1	1	3	4
C28	1	1	1	1	2	2	0	1	0	0	0	0	x	x	5	5	7	7	1	1	3	4
C29	1	1	1	1	1	1	1	1	0	0	2	0	x	x	5	5	7	7	1	1	3	4
C30	1	1	1	1	2	2	1	1	0	0	1	0	x	x	5	5	3	6	1	1	3	3
TOTAL	29	2 9	30	3 0	33	4 2	25	9	1	2	19	9	0	0	10 7	2 2	14 9	5 6	28	9	85	8
NOTE:																						
* Pre																						
NOTE:																						
Post																						

Annexure D

Data Analysis: Experimental Group

DATA ANALYSIS - EXPERIMENTAL GROUP																						
PRE/POST-T-TEST	* Q 1. 1	* Q 1. 2	* Q 1. 3	* Q 1. 4	* Q 1. 5	* Q 1. 6	* Q 1. 7	* Q 1. 8	* Q 1. 9	* Q 1. 10	* Q 1. 11	* Q 1. 12	* Q 1. 13	* Q 1. 14	* Q 2. 1	* Q 2. 2	* Q 2. 3	* Q 2. 4	* Q 2. 5	* Q 2. 6		
E1	1	1	1	1	1	1	0	0	0	3	1	x	x	4	4	7	7	1	1	4	3	
E2	1	1	1	1	1	0	0	1	0	0	2	0	x	x	1	1	7	7	1	1	1	4
E3	1	1	1	2	2	2	1	1	0	0	0	0	x	x	1	5	1	7	1	1	0	4
E4	1	1	0	1	0	1	1	1	0	0	0	0	x	x	1	4	7	7	1	1	3	3
E5	1	1	1	1	1	1	0	0	0	0	3	3	x	x	2	4	6	7	1	1	2	4
E6	1	1	0	1	1	2	0	1	0	0	3	3	x	x	5	5	3	2	1	1	2	2
E7	1	1	1	1	1	1	1	1	0	0	0	0	x	x	5	5	7	6	1	1	6	4
E8	1	1	1	1	1	0	0	1	0	0	2	1	x	x	1	3	6	5	1	1	1	3
E9	1	1	1	1	1	2	1	1	0	0	1	1	x	x	3	5	5	7	1	1	3	4
E10	1	1	1	1	1	1	0	1	0	0	1	0	x	x	5	5	4	7	1	1	2	2
E11	1	1	1	0	1	1	0	0	1	1	1	1	x	x	2	5	4	7	1	1	1	3
E12	0	1	0	1	1	1	0	1	1	0	3	1	x	x	3	4	3	3	1	1	3	3
E13	1	1	1	1	1	2	1	0	0	0	1	1	x	x	4	4	7	6	1	1	3	4
E14	1	1	1	1	1	2	0	0	0	0	1	0	x	x	3	3	7	7	1	1	2	4
E15	1	1	0	1	2	1	0	1	0	0	0	0	x	x	5	5	7	7	1	1	1	4
E16	1	1	1	1	1	2	0	1	0	0	2	0	x	x	4	5	4	6	1	1	3	3
E17	1	1	1	1	1	1	0	0	0	0	0	3	x	x	4	5	7	7	1	0	4	3
E18	1	0	1	1	0	0	0	0	0	0	3	0	x	x	2	5	4	4	1	0	1	1
E19	1	1	1	1	2	1	1	1	1	0	5	0	x	x	3	5	5	5	1	1	4	3
E20	0	1	1	1	1	0	1	1	1	1	0	2	x	x	3	5	6	6	1	1	3	3
E21	1	1	2	1	0	1	0	0	0	0	0	1	x	x	3	4	6	4	1	1	3	3
E22	0	1	1	1	1	0	1	0	1	0	1	2	x	x	1	1	3	5	1	1	2	2
E23	1	1	1	1	1	0	0	1	0	0	0	0	x	x	3	3	5	6	1	1	1	1
E24	1	1	0	1	0	0	1	0	0	0	3	0	x	x	2	4	4	6	1	1	3	3
E25	1	0	1	1	1	2	0	1	0	0	1	1	x	x	3	5	2	7	1	1	1	1
E26	1	1	0	0	0	1	1	1	0	0	0	1	x	x	5	3	4	4	1	1	3	3
E27	1	D N C	1	D N C	0	D N C	0	D N C	0	D N C	0	D N C	D N C	D N C	3	D N C	5	D N C	1	D N C	2	D N C
P28	1	1	0	2	1	1	0	1	1	0	1	2	x	x	3	4	5	4	1	1	4	1
P29	1	1	1	1	1	1	1	1	0	0	2	1	x	x	5	3	7	7	0	0	3	2
P30	1	1	1	1	1	1	1	1	0	0	1	1	x	x	5	4	7	7	1	1	3	4
P31	1	1	1	1	0	0	1	1	0	0	1	1	x	x	3	5	5	7	1	0	2	3
P32	1	1	1	2	1	2	0	0	1	0	3	1	x	x	3	5	4	5	1	0	3	2
P33	1	1	1	1	2	2	0	1	0	0	0	0	x	x	4	5	4	6	0	1	2	3
P34	1	1	1	1	1	2	1	1	0	0	0	0	x	x	5	5	7	7	1	1	3	4
P35	1	1	1	1	2	1	1	1	0	0	0	0	x	x	4	4	5	4	1	0	4	3
P36	1	1	1	1	1	1	1	1	0	0	0	0	x	x	5	5	7	7	0	1	4	2
P37	1	1	1	2	1	2	0	1	0	0	1	1	x	x	4	5	6	5	1	1	2	4

P38	1	1	1	1	2	2	1	1	0	0	0	0	x	x	5	5	7	6	1	1	4	4
P39	1	1	1	1	1	2	0	1	0	0	0	1	x	x	3	5	3	4	0	1	1	3
P40	1	1	1	2	0	1	1	0	1	0	3	3	x	x	4	3	6	4	1	1	4	2
P41	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
P42	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
TOTAL	3	3	3	4	3	4	1	2			4	3			1	1	2	2			1	1
NOTE: *	7	7	4	2	8	4	9	7	8	2	8	3	0	0	4	5	9	5	6	3	3	4
NOTE: Pre																						
NOTE: Post																						
NOTE: Did not complete																						

Annexure E

From: Copyright <Copyright@fao.org>
Sent: Thursday, 15 November 2018 4:43 PM
To: a.straussner@hotmail.com
Subject: RE: IMARK :Building Electronic Communities (COP)

Dear Astrid,

Permission for this request to reproduce FAO copyright material is granted at no charge, including the right to publish, reproduce, publicly display and distribute the whole or any part of the material in this and all revisions and any subsequent editions of your work; in any ancillary aids that may be prepared to accompany your work, including promotion and publicity uses; and in all forms of media now known or later developed.

Please note that:

- FAO remains the copyright holder of the material, and retains the right to reproduce, translate, publish, and disseminate the whole or any part of it in print and electronic formats, and to grant others the right to do the same, as well as to incorporate material derived from the material in any subsequent work.
- **The use of the official emblem or other logos of FAO is prohibited without express and prior written approval by FAO.**
- The material must not be used in any way that implies FAO's endorsement of any companies, services or products.

Due acknowledgement shall be made to FAO, with the source document cited and Web URL provided if applicable as follows:

Source: Food and Agriculture Organization of the United Nations, [year], [authors], [title of publication], [URL]. Reproduced with permission

Annexure F

13551437

DPT OF AGRIC

12:49:32 09-10-2009

2/2



DEPARTMENT OF AGRICULTURE
AND RURAL DEVELOPMENT

Diamond Corner Building, 68 Eloff & Market Street, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 355-1971/68

Fax: (011) 355-1000

Email: etebele.sebitloane@gauteng.gov.za

Website: <http://www.gpg.gov.za>

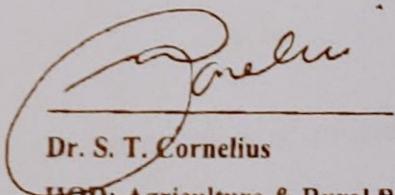
Mrs. A. Straussner
P. O. Box 3939
EDENVALE
1610

USE OF EXTENSION OFFICERS TO TEST DVD MANAGEMENT
RESOURCE KIT.

Your request through e-mails to use our extension officers to test an Information Management Resource Kit DVD has reference.

I wish you well in your endeavour.

Yours faithfully,



Dr. S. T. Cornelius

HOD: Agriculture & Rural Development

ISTE-SUB RESEARCH ETHICS REVIEW COMMITTEE

Date: 10/12/2014

Dear Ms. Astrid Angel Straussner,

Decision: Ethics Approval

Ref #: 2014_CGS/ISTE_017
Name of applicant
(student/researcher): Ms.
Astrid Angel Straussner
Student #: **08802866**
Staff #:

**Name: Ms. Astrid Angel Straussner, 212, Eiston Avenue, Western ext, Benoni 1501
a.straussner@hotmail.com 0828254354**

Proposal: The effect of an Information Management Resource kit (IMARK) DVD-based program on training Technical Extension Officers.

Qualification: Postgraduate degree (MSc) research

Thank you for the application for research ethics clearance by the *ISTE SUB* Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the study

The application documents were reviewed in compliance with the Unisa Policy on Research Ethics by the Committee/Chairperson of ISTE SUB RERC on 10 September, 2014. The decision will be tabled at the next RERC meeting for ratification.

The proposed research may now commence with the proviso that:

- 1) The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics, which can be found at the following website:*

http://www.unisa.ac.za/cmsys/staff/contents/departments/res_policies/docs/Policy_Research%20Ethics_rev%20app%20Council_22.06.2012.pdf. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the ISTE Sub Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those

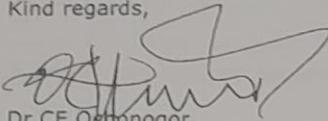
changes affect any of the study-related risks for the research participants.

2) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

Note:

The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the IST Sub RERC.

Kind regards,



Dr CE Oehonogor

Title & Name of the chairperson

Signature

Title & Name of the Executive dean

Institute for Science and Technology Education (ISTE)
College of Graduate Studies
Robert Sobukwe Building, Office: 4th Floor, Room 419
418 Nana Sita Street(Old Skinner Street), Pretoria
Tel: 012 337 6189 Fax: 0865968489
Email: ochonec@unisa.ac.za

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150

Annexure G

Experimental Group Responses According to Questions Asked in the Questionnaire

Section	Question number	Questions	No. of Responses	
			Pre	Post
1	1.1	What is regarded as a community of practice?	31	28
	1.2	What special characteristics of the internet make online communities possible?	27	30
	1.3	Having an online community in Extension work would be beneficial because.	23	21
	1.4	The characteristics of an online community would Not include:	17	21
	1.5	Which one is Not a reason why people join online communities?	10	6
	1.6	Pair the correct online communities with the examples	5	4
	1.7	Draw a simple diagram that would depict the correct meaning of a social network	-	-
2	2.1	Place an (x) next to each aspect you consider reasons why belonging to an online community is useful	32	34
	2.2	Which of these industries could benefit from online communities	32	34
	2.3	Which of the following are the most accurate definitions for the term "Knowledge Networks"	32	30
	2.4	When using online communities, which of the following activities would you say should a person be involved in? Mark all of those that you deem appropriate.	34	34

Annexure H

Control Group Responses According to Questions Asked in the Questionnaire

Section	Question number	Questions	No of Responses	
			Pre	Post
1	1.1	What is regarded as a community of practice?	30	29
	1.2	What special characteristics of the internet make online communities possible?	29	29
	1.3	Having an online community in Extension work would be beneficial because.	28	28
	1.4	The characteristics of an online community would Not include:	27	29
	1.5	Which one is Not a reason why people join online communities?	2	1
	1.6	Pair the correct online communities with the examples	16	6
	1.7	Draw a simple diagram that would depict the correct meaning of a social network	-	-
2	2.1	Place an (x) next to each aspect you consider reasons why belonging to an online community is useful	29	30
	2.2	Which of these industries could benefit from online communities	29	30
	2.3	Which of the following are the most accurate definitions for the term "Knowledge Networks"	28	29
	2.4	When using online communities, which of the following activities would you say should a person be involved in? Mark all of those that you deem appropriate.	29	30

}

Letter of English Language Editing

Comp Ed II, Inc., 1226 S. Blue Island Ave. Suite 202,
Chicago, IL 60608, USA

1-773-972-3052 (telephone), 1-312-243-0394 (fax)

Right-tail (Ha: $\mu > H_0$)

To Whom It May Concern:

Compute p-value s to certify that the accompanying thesis submitted in fulfillment
requirement of the Masters of Science titled: *The Effect of an
Information Management Kit (IMARK) DVD-Based Technology on Training
Technical Extension Officers on Communities of Practice* by Mrs. Astrid
Straussner, has been edited and is of suitably high standard in terms of
language, syntax, grammar, mechanics, and presentation.

Please be aware that we are a service in the United States. Any
miscellaneous issues with spacing and formatting may be the result of
electronic transference from the United States to South Africa and/or
differences in texting programs (i.e. Microsoft Word SA vs. Microsoft Word
US).

Sincerely yours,



20 Nov 2020

Byung-In Seo, Ph.D.
Literacy and English Language Specialist