

**INFORMATION ADMINISTRATION TECHNOLOGIES, ERGONOMICS AND
HEALTH: REGULATORY COMPLIANCE IN AN e-ENVIRONMENT**

by

Esna Amanda Strydom

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Doctor of Administration

in the subject

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University of South Africa

Supervisor: Professor E.J. Ferreira

Co-supervisor: Professor E.C. Hoffmann

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DECLARATION AND COPYRIGHT

“I hereby declare that the thesis submitted for the degree Doctor of Administration in Business Management, University of South Africa,

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is my own original work and has not previously been submitted to any other institution of higher education. I further declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references”.



SIGNATURE

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DEDICATION

“Sometimes I think the surest sign that intelligent life exists elsewhere in the universe is that none of it has tried to contact us” (Watterson, n.d.).

This study is dedicated to
my husband, Gerrie
and children, AV and Nica,
for their everlasting love and never-ending support.

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ABSTRACT

A new administrative scenario - the virtual office - emerged in organisations because of the influence of technological developments that drastically changed the traditional office scenario. The virtual office is a worksite that is situated outside of the traditional office, where people still do the work associated with a traditional office, whilst maintaining their status as full-time employees. Although telework has been practiced internationally for several decades, it is a new concept in South Africa with only a few large organisations embarking on telework.

The purpose of this study was to determine the extent to which organisations in trade and industry are aware of and comply with the required policies, regulations and legislation in terms of ergonomics, technology and health in the e-environment. The preferred kind of telework and information and communication technologies for the South African context was determined. The study investigated the prevalence and extent of health and wellness aspects that teleworkers could be exposed to in the e-environment. The role that ergonomics could play in the prevention of work-related musculoskeletal disorders that could lead to compensation claims and other legal actions was investigated. The elements that could ensure the successful implementation of a telework programme were identified and were presented as a conceptual telework framework.

Within the parameters of applied research, a descriptive quantitative research design has been followed. The mode of enquiry followed in this research was a quantitative, non-experimental, survey method. A baseline study has been conducted followed by an empirical study using two structured online questionnaires, one for managers of teleworkers and one for teleworking employees.

The findings indicated that although the policies, regulations and legislation existed, organisations did not diligently comply with it. The lack of training for the managers and teleworkers on the applicable policies and legislation caused concern. The application of ergonomic specifications on the use of equipment, furniture and services at the preferred home office, is mainly done to avoid ergonomic risk factors that may lead to the development of work-related musculoskeletal disorders. Although teleworkers suffered from disorders, there was a lack of knowledge on ergonomic interventions and on the processes to claim compensation. The need for an instrument that will assist organisations to implement telework successfully has been identified. Therefore, a conceptual telework framework that provides a structure of the elements that need to be in place to implement a telework programme successfully has been proposed.

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LIST OF ACRONYMS

EFQA	European Foundation Quality Award
EFQM	European Foundation Quality Model
MBNQA	Malcolm Baldrige National Quality Award
OPSA	Office Professionals South Africa
SAEA	South African Excellence Awards
SAEF	South African Excellence Foundation
SAEM	South African Excellence Model
SAQI	South African Quality Institute
SHARP	(The) Safety and Health Assessment and Research for Prevention
Unisa	University of South Africa

CHAPTER 1

BACKGROUND AND ORIENTATION

1.1 INTRODUCTION

1.2 RATIONALE

1.3 CONCEPTUALISATION

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1.14 SUMMARY

CHAPTER 1

BACKGROUND AND ORIENTATION

1.1 INTRODUCTION

This study has been initiated by the constant technology innovations that influence all spheres of life. The impact of technology can be seen in the globalised world, the local economies, business environments, organisations and on human beings' daily existence. Evidence of this impact can be seen in the transformation of the traditional ways in which organisations used to function.

According to Hoffmann (2011:32), a new administrative scenario - the virtual office - emerged in economies globally, because of the influence of information and communication technological developments that drastically changed the traditional office environment. The virtual office has been described as any alternative work site other than a traditional office, where incumbents can still do the work associated with a traditional office. Teleworkers are employees who can work at any alternative work site other than a corporate office whilst maintaining their current employment status with an employer.

Chapter 1 explains the structure of the study that consists of a baseline study and a main study. The baseline study will be discussed in detail in Chapter 3.3.3. The research methodology and design, research methods and procedures, the data collection techniques (including the study population, the sample and sampling techniques, the measuring instrument, validity and reliability) will be briefly mentioned in Chapter 1 and will be discussed in detail in Chapter 3.

1.2 RATIONALE

Although telework has been practised internationally for several decades, it is a relatively new concept in South Africa. It therefore necessitates an investigation into the extent that required policies, regulations and legislation in terms of ergonomics and technologies are practised in order to ensure compliance and avoid legal actions due to the possible contravention of health and wellness issues.

The United States Office of Personnel Management (2011a:4) defines telework as:

“[t]he term ‘telework’ or ‘teleworking’ refers to a work flexibility arrangement under which an employee performs the duties and responsibilities of such employee's position, and other authorized activities, from an approved work site other than the location from which the employee would otherwise work.”

According to the United States Office of Personnel Management (n.d.:2), the terms ‘telework’, ‘telecommuting’, ‘flexible workplace’, ‘remote work’, ‘virtual work’, and ‘mobile work’ are all used to refer to work done outside of the traditional on-site work environment. These terms are defined in different ways and used in different contexts to refer to anything from jobs that are completely ‘virtual’ or ‘mobile’, to arrangements that enable employees to work from home a few days per week or per month. Office of Personnel Management uses the term ‘telework’ for reporting purposes and for all other activities related to policy and legislation. United States Office of Personnel Management describes the term telework as “work arrangements in which an employee regularly performs officially assigned duties at home or other work sites geographically convenient to the residence of the employee” (United States Office of Personnel Management, n.d.:1).

An overview of the literature on the implementation of telework in the United States of America and the United Kingdom will influence the construction of this study. A number of the telework factors, as reported on, will be used as indicators to the type of data to be collected from the South African organisations that implemented telework.

Since 2001, the United States Office of Personnel Management (2011b:4-5) issued the annual Office of Personnel Management Telework Data Call (Call) in partnership with the General Services Administration, to track the extent of telework implementation in United States Federal agencies. The Call collected data from agencies, providing insights into participation rates and telework implementation strategies as captured in agency records. In the 2011 Report to Congress on the Status of Telework in the Federal Government, the report reflects steady progress in telework participation. The agency data indicates that 113 946 Federal employees (5.7% of the entire Federal population) teleworked in calendar year 2009; an increase of 11 046 employees as compared to calendar year 2008. This reflects an annual increase of 10.7% that clearly indicates the popularity and viability of the concept, also, in terms of telework legislation that has been passed by the United States

of America congress. Analysis of data provided by Federal agencies for the calendar year 2009 shows that in terms of telework participation, 67% of these employees teleworked on a regular basis (either 1-2 days a week, or 3 or more days per week); 71% of these agencies provide their employees with formal notifications of eligibility to telecommute. The methodologies used by agencies to track telework vary greatly. A total of 63% count telework agreements, 44% use a time and attendance system, and 34% use electronic means to track teleworkers. In terms of telework program implementation, agency responses demonstrated that 38% of agencies track the number of telework requests that are denied and 32% track the number of agreements that are terminated. Most terminations are based on the supervisor's decision rather than the employee's decision. The majority of agencies (72%) have integrated telework into their Continuity of Operations planning in order to counteract natural disasters and absenteeism. Few agencies purchase all the required equipment for teleworkers (18%) while over a third of agencies reported that they ask teleworkers to purchase their own equipment for telework (37%). A number of agencies (33) reported cost savings/benefits as a result of telework. Of these, the greatest benefit was in the area of productivity (39%), then human capital, such as recruitment and retention (37%), and realised savings on leave (34%). The most frequently cited barriers to telework continue to be office coverage (64%), organisational culture (49%), and management resistance (47%) (United States Office of Personnel Management, 2011b:4-5).

The 2012 Report to Congress on the Status of Telework in the Federal Government stated that telework agencies reported continued growth in telework participation and frequency during September and October 2011. The agency data indicate that 168 558 of a total number of 2 165 390 Federal employees teleworked in calendar year 2011; an increase of 54 612 employees as compared to calendar year 2009 (Unites states Office of Personnel Management, 2012:8).

The Safety and Health Assessment and Research for Prevention (SHARP) program (2007) examined workers' compensation data to demonstrate the impact of work-related musculoskeletal disorders in Washington State workplaces. The SHARP program researchers examined State Fund workers' compensation claims that were accepted between 1996 and 2004 for general and selected specific hand/wrist, elbow, shoulder, neck and back disorders. According to this report, work-related musculoskeletal disorders

account for 27% of all accepted State Fund workers' compensation claims. These claims are 40% of all compensable claims and work-related musculoskeletal disorders account for 44% of the cost of State Fund workers' compensation claims. The workers' compensation data for Washington State shows that work-related musculoskeletal disorders cost the State Fund an average of \$435 million each year (SHARP, 2007). This data suggests that there should be a serious attempt by employers to prevent disorders in the regular workplace and even more so in the telework environment.

In a follow up SHARP study on the prioritising of industries for prevention efforts, the Washington State Workers' Compensation Claims Data from 2002-2010 were analysed. This study examined which industry groups are at high risk for seven costly and common injury types and establishes a basis for efficient targeting of prevention resources. The seven groups identified were: work-related musculoskeletal disorders, fall from elevation, fall on same level, struck by or against, over-exertion, caught in, under or between, and motor vehicle related claims. Prioritising industries for prevention efforts based on a high rate and high count of workers' compensation claims highlights where these injuries are occurring and where the most benefit of prevention efforts could be gained. Results indicated that between 2002 and 2010, there were 267 581 compensable Washington State Funds claims, accounting for over 11 billion dollars in direct workers' compensation costs. For 262 industry groups that met inclusion criteria, there were 267 420 compensable claims, and 53 075 809 days of time loss (SHARP, 2013:5).

Leigh (2011) provides estimates of the national costs of occupational injury and illness among civilians in the United States for 2007. The number of fatal and non-fatal injuries in 2007 was estimated to be more than 5 600 and almost 8 559 000, respectively, at a cost of \$6 billion and \$186 billion. The number of fatal and non-fatal illnesses was estimated at more than 53 000 and nearly 427 000, respectively, with cost estimates of \$46 billion and \$12 billion. For injuries and diseases combined, medical cost estimates were \$67 billion (27% of the total), and indirect costs were almost \$183 billion (73%). Injuries comprised 77% of the total, and diseases accounted for 23%. The total estimated costs were approximately \$250 billion, compared with the inflation-adjusted cost of \$217 billion for 1992. Leigh concluded that the medical and indirect costs of occupational injuries and illnesses are sizable and at least as large as the cost of cancer. Workers' compensation covers less than 25% of these costs, as all members of society share the burden. The

contributions of work-related injuries and illnesses to the overall cost of medical care and ill health are greater than generally assumed.

D'information, a backgrounder document by Ontario, Ministry of Labour, Canada, (2008) reports that workplace ergonomic-related injuries develop because of the cumulative effects of repetitive, stressful or awkward movements of bones, joints, ligaments and other soft tissues. Ergonomics (the science of fitting the work to the worker) is considered as a key solution to injury prevention. Ontario Ministry of Labour (2009b) categorises these types of injuries/disorders in the following groups: Musculoskeletal Disorder (MSD); Repetitive Strain Injury (RSI); Cumulative Trauma Disorder (CTD) and Repetitive Motion Injury (RMI). Musculoskeletal disorder is not a medical diagnosis; it is an umbrella term for a group of injuries like back pain; muscle strain; tendonitis; carpal tunnel syndrome; rotator cuff syndrome; tennis elbow and shoulder pain.

1.3 CONCEPTUALISATION

From the literature, it becomes evident that the development of information administration technologies led to the development and growth of telework worldwide (Hoffmann, 2011:32). In a technical report issued by the SHARP program, it was stated that occupational injuries and illnesses are common, costly, and a burden to employees and employers. Resources for prevention (ergonomics) are limited, and there is a need for data to improve target research and prevention activities to maximise their impact (SHARP 2013:13).

The title of the study will be defined and conceptualised as follows:

INFORMATION ADMINISTRATION TECHNOLOGIES, ERGONOMICS AND HEALTH: REGULATORY COMPLIANCE IN AN e-ENVIRONMENT

1.3.1 Information administration technologies

The information administration function in organisations changed dramatically over the past few years due to the development of information and communication technologies. Tutor2u (2013), states that information and communication technologies cover any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. Information and communication technology is concerned with the storage,

retrieval, manipulation, transmission or receipt of digital data and with the manner in which these different products can work with each other.

1.3.2 e-Environment/Virtual office

Investopedia (2013) describes a virtual office as a business location that exists only in cyberspace. A virtual office setup provides the opportunity to business owners and employees to work from any location by using technology such as laptop computers, tablets, smart phones and internet access. A virtual office can provide significant savings and flexibility compared to renting traditional office space. Meetings can be conducted via teleconferencing, video conferencing and documents can be transmitted electronically. Some companies even provide virtual office services to give virtual offices the prestige associated with physical offices, such as an important-sounding address, a professional phone-answering service and rental of office space and conference rooms as needed. The business is not restricted to hiring employees that live locally; each employee can work from the location that is most convenient for him or her. The virtual office arrangement thus expands job options for employees and hiring options for businesses.

These two definitions support the assumption that information administration technologies enable the virtual office. For the purposes of this study, the terminologies e-environment, telework and virtual office will be used interchangeably. These terminologies are all referring to the same concept of an alternative work arrangements made possible by the use of information administration technologies.

1.3.3 Health and wellness/Musculoskeletal disorders

Musculoskeletal disorders can affect the body's muscles, joints, tendons, ligaments and nerves. Most work-related musculoskeletal disorders develop over time and are caused either by the work itself or by the employees' working environment. Typically, musculoskeletal disorders affect the back, neck, shoulders and upper limbs and less often, they affect the lower limbs (The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:2-3).

The description of work-related musculoskeletal disorders indicates that the development of these disorders is work- or environment related. To prevent the development of these disorders, ergonomics need to be in place as confirmed by the definition of ergonomics

below. For the purposes of this study, the terminologies health and wellness and work-related musculoskeletal disorders will be used interchangeably.

1.3.4 Ergonomics

Ergonomics is defined as:

“the study of capabilities and limitations of mental and physical work in different settings. Ergonomics applies anatomical, physiological, and psychological knowledge (called human factors) to work and work environments in order to reduce or eliminate factors that cause pain or discomfort. Ergonomic designs of tools and equipment have helped curtail the occurrence of musculoskeletal disorders and repetitive strain injuries such as carpal tunnel syndrome. Ergonomics is also called human engineering” (BusinessDictionary.com, 2013).

Once again, the above definition of ergonomics confirms the assumption that organisations need to have rules, regulations and policies in place to ensure the health and wellness of teleworkers. Regulatory compliance to the Occupational Health and Safety Act (OHSA) could lead to the prevention of costly compensation claims and other legal actions against the organisation.

1.3.5 Regulatory compliance

According to the South African Labour Guide, (n.d.), the Occupational Health and Safety Act, 1993, requires the employer to bring about and maintain, as far as reasonably practicable, a work environment that is safe and without risk to the health of the employees. This means that the employer must ensure that the workplace is free of hazardous substances, articles, equipment, and processes that may cause injury, damage or disease. In instances where this is not possible, the employer must inform employees of these dangers, how these may be prevented, how to work safely, and provide other protective measures for a safe workplace. It is however, not expected of the employer to take sole responsibility for health and safety. The Act is based on the principle that dangers in the workplace must be addressed by communication and cooperation between the employees and the employer. The employees and the employer must share the responsibility for health and safety in the workplace. Both parties must pro-actively identify dangers and develop control measures to make the workplace safe. In this way, the employer and the employees are involved in a system where health and safety

representatives may inspect the workplace regularly and then report to a health and safety committee, who in turn may submit recommendations to the employer. To ensure that this system works, every employee must know his or her rights and duties as contained in the Act.

Unless organisations implement health and safety strategies and policies, the use of information administration technologies could lead to disorders, absenteeism, stress, depression, lost workdays, low productivity, high employee turnover and costly legal claims.

The title therefore indicates that this study is expected to expound on health and wellness aspects that could result in compensation claims and other legal actions as the diffusion of virtual offices increases. The existence of, and compliance with policies, procedures, regulations and legislation with regard to ergonomics in e-work environments in South Africa will be determined.

1.4 PROBLEM STATEMENT

The virtual office (telework) emerged in enterprises because of the influence of technological developments that drastically changed the traditional office scenario. These information administration technologies have made it easier to work anytime, anywhere, and anyplace. Although telework has been practiced internationally for several decades, it is a relatively new concept in South Africa that necessitates an investigation into five aspects. Firstly, the extent to which organisations in trade and industry are aware of and comply with the required policies, regulations and legislation in terms of ergonomics and technology in the e-environment. Secondly, the kind of telework preferred for the South African context, how they are managed and the profile of the teleworker. Thirdly, the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers. Fourthly, the implementation and compliance with organisational policies/procedures and government legislation. Lastly, the elements that could ensure the successful implementation of a telework programme to be presented as a telework framework.

The problem pertains to the incorrect usage (non-compliance with ergonomics) of technological advances by the teleworker, resulting in exposure to risk factors that often

lead to work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints. The costs resulting from employees being on sick leave, as well as possible compensation claims may cause organisations to struggle with reduced productivity and unnecessary financial losses. These can be prevented if organisations comply with the required health, safety and ergonomics policies, procedures, regulations and legislation.

The diffusion of virtual offices in South Africa is unknown and the extent of health and wellness aspects that could lead to actions against employers needs to be determined. Furthermore, the existence of policies and regulations and compliance with legislation that could serve as guidelines for teleworkers to perform optimally and effectively in e-environments, needs to be established.

1.5 OBJECTIVES

The following research questions lead to the formulation of the primary and secondary objectives that have been set for this study:

- What are the different types of virtual offices, how are they managed and what is the profile of the teleworkers (demographic information - gender, age and industry sectors)?
- What are the technology applications (equipment), furniture and services required and what are the ergonomic specifications applicable to these in the e-environment?
- What types of occupational risk factors exist that could cause work-related musculoskeletal disorders in the e-environment?
- What types of work-related musculoskeletal disorders exist and what are the consequences for organisations and employees?
- Are the necessary organisational policies/procedures and government legislation implemented and how are regulatory compliance ensured in an e-environment?
- What are the elements that need to be in place to implement a telework programme successfully?

The study will focus on the following primary and secondary objectives:

1.5.1 Primary objective

The primary objective is to investigate the extent that ergonomic policies, guidelines and regulations applicable to information administration technologies are effective and adhered to in the contemporary e-environment that is also referred to as virtual offices and telework. The occurrence of health and wellness aspects due to non-compliance with ergonomics and the regulatory Acts needs to be determined.

1.5.2 Secondary objectives

The secondary objectives are:

- 1.5.2.1 To determine the preferred kind of telework for the South African context and to determine the profile of the teleworker.
- 1.5.2.2 To investigate the prevalence and extent of work-related musculoskeletal disorders that could result in compensation claims and other legal actions against employers.
- 1.5.2.3 To determine the extent of implementation and compliance with organisational policies/procedures and government legislation.
- 1.5.2.4 To determine the elements that could ensure the successful implementation of a telework programme to be presented as a conceptual telework framework.

1.6 IMPORTANCE AND VALUE OF THE RESEARCH PROJECT

Office work is rapidly changing as new developments in information administration technologies make jobs easier. However, it can also present new challenges for both management and employees. The core importance of this study is to establish the extent that organisations in trade and industry are aware of and comply with the required policies, regulations and legislation in terms of ergonomics in the e-environment. This study aims to identify the work-related upper limb disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints that are not caused by acute trauma, but rather by a lack of applying the correct ergonomics principles. Thus, the focus of this project is the health and wellness aspects that could result in compensation claims and other legal actions against employers especially in the e-environment. The results obtained from this research project could make a valuable contribution with regard to labour regulations. The intention is to develop a framework of what elements should be in place to implement and maintain telework successfully in South African organisations.

1.7 VARIABLES OF THE PROJECT

Keywords in the title of this study identify the variables of this project as follows:

Information administration technologies, ergonomics and health: regulatory compliance in an e-environment.

- Independent variables:
The e-environment (telework);
Regulatory compliance (Occupational Health and Safety Act; Compensation for Occupational Injuries and Diseases Act and organisation policies, regulations and legislation).
- Dependant variables:
Information administration technologies;
Ergonomics;
Health and wellness aspects (work-related musculoskeletal disorders) leading to compensation claims and legal action.

1.8 GEOGRAPHICAL AND DEMOGRAPHICAL DEMARCATION

For the baseline investigation, medical practitioners in Pretoria, province of Gauteng, South Africa, will be targeted for completing a questionnaire based on judgement and convenience sampling. The main investigation will include four organisations in the province of Gauteng, South Africa namely ABSA, Grundfos, Telkom and University of South Africa (Unisa). These four organisations, known to be teleworking, will be contacted and invited to participate in this research. The managers/line-managers/supervisors of teleworkers and the teleworkers will be targeted to complete an online questionnaire. A professional body, Office Professionals South Africa (OPSA), will be requested to assist with the distribution of the questionnaire links. This will be done by means of their weekly publication, Terrific Tuesday, that is mailed electronically to 18 000 - 20 000 subscribers. These subscribers represent a wide base of potential teleworkers spread amongst the various industry sectors in South Africa. The inclusion of OPSA will provide an indication of the diffusion of telework in other industry sectors. This study covers both local and international demographics in order to substantiate the literature review. An online literature review of international entities involved in telework initiatives revealed several countries with which a benchmarking partnership could be established. After a thorough comparison (including New Zealand, Australia, Canada, the Netherlands, United States of America, Sweden and United Kingdom), the United States of America has been identified

as the country where South African organisations can adopt resources and knowledge. Looking at the official telework websites of these countries, the conclusion reached is that the United States of America's website, Telework.gov (2014), provides an extensive body of resources and information for organisations and individuals revolving around telework initiatives. These resources include a number of valuable implementation templates that can be used by industry in order to streamline operational processes.

1.9 RESEARCH METHODOLOGY

The holistic research framework (*cf.* Figure 1.1) indicates compulsory and optional methods and techniques to be employed according to the nature of an individual research project. The steps coloured in blue are compulsory, whilst the steps selected for this study are coloured in green. Within the parameters of applied research, a descriptive (what is going on) quantitative and deductive research design will be followed. The selected research design and methodology will be discussed in detail in Chapter 3.

A standard classification of research divides projects into applied and basic research. Applied research is a study that has been designed to apply its findings to solve a specific, existing problem. It is the application of existing knowledge to improve management practices and policies (Collis & Hussey, 2008:7).

According to McMillan and Schumacher (2014:2; 5), descriptive research refers to research that describes an existing or past phenomenon in quantitative terms with descriptive statistical procedures that describe something. A quantitative research paradigm gathers data and analyse it numerically. McMillan and Schumacher (2014:4-5; 152) further maintain that non-probability sampling is a procedure in which the probability of selecting elements from the population is not known and a population as a group of individuals from which a sample is drawn and to which results can be generalised. A purposive sampling procedure allows the selection of a small group or individuals who are likely to be knowledgeable or informative about the phenomenon under investigation, selecting cases without needing or desiring to generalise to all such cases. In quantitative studies, the emphasis is more on relying on the judgment of a researcher to select a sample that is representative of the population or that includes subjects with required characteristics (McMillan & Schumacher, 2014:152).

As suggested in the presented research framework, a literature review will be done to provide direction for the title and research questions. The literature will be used deductively as a framework for the research questions. The literature review will also guide the baseline study to determine if work-related disorders, the costs involved and workdays lost, are indeed a problem worth investigating. The literature review will be reported on in Chapter 2. It will focus on the variables in the title of this study, i.e.

- information administration technologies enabling the virtual office (telework);
- health and wellness aspects (work-related musculoskeletal disorders);
- ergonomics; and
- regulatory compliance.

The empirical study will consist of a baseline investigation and a main study. For the baseline study, convenience and judgment sampling will be used to select the medical practitioners. The medical town where all the medical practitioners have their consulting rooms will be selected because it is convenient. For the main empirical study, the non-probability technique, purposive sampling, will be employed to select the four organisations that will be contacted to complete the online survey.

The mode of enquiry followed in this research will be a quantitative, non-experimental, criterion group, survey design. The data collection techniques will be web-based questionnaires and communication will be by e-mail and telephone.

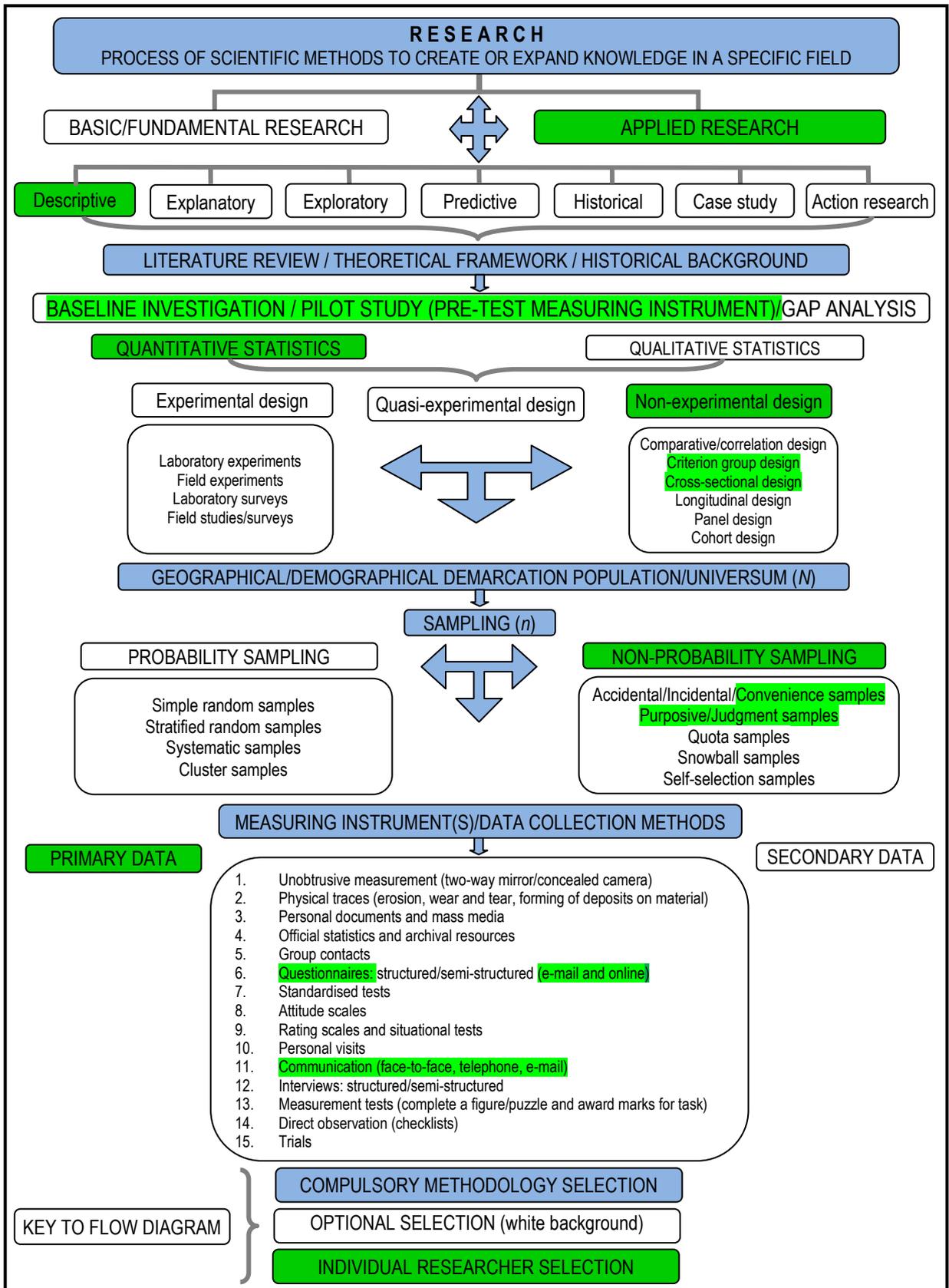


FIGURE 1.1: HOLISTIC RESEARCH FRAMEWORK

(Adapted from Hoffmann, 2008; Welman, Kruger & Mitchell, 2005)

1.10 CONTINGENCY ANALYSIS

A limited amount of literature (especially textbooks), articles, statistics or references regarding telework in South Africa is available. This necessitates the extensive use of reliable sources available on the Internet, electronic databases and reports on previous studies conducted internationally. The Internet sources for this study originate from reliable sources such as government institutions and professional bodies.

1.11 ETHICAL CONSIDERATIONS

Babbie (2008:125) describes the ethics of a research design as follows: “Designing a research project needs to include serious considerations of the ethical dimensions. If your study requires the participation of human subjects, you must determine that the likely benefits of the research will do justice to the time and effort you’ll ask of them.” Babbie (2008:66) maintains that in dictionaries and in common usage, ethics refer to morality and both deal with matters of right and wrong. The most important ethical agreements that Babbie (2008:67-81) and McMillan and Schumacher (2014:134) summarise as applicable to this study include maximising potential benefits, minimising potential risk, voluntary participation, no harm to participants (informed consent), anonymity and confidentiality.

As far as ethical principles, guidelines and standards are concerned, McMillan and Schumacher (2014:129-134) advise that researchers should avoid any risk of harming people, the environment, or property; not use deception on participants; obtain informed consent from all involved in the study; preserve privacy and confidentiality whenever possible. Researchers should take special precautions when involving populations that may not be considered to understand the purpose of the study; not offer big rewards or enforce binding contracts for the study (especially when people are somehow reliant on the reward). Furthermore, researchers should not plagiarise the work of others; not skew their conclusions based on funding; and not commit science fraud, falsify research or otherwise conduct scientific misconduct.

Application for ethical approval for this study has been made and obtained from Unisa (*cf.* Annexure D and E). This process and requirements will be discussed in Chapter 3.

1.12 THE PROCEDURE, SECURITY AND DURATION OF DATA STORAGE

The records related to the main study will be retained and managed as required by Unisa, in the following manner:

The original data will be reviewed by professionals responsible for making sure that the research is done properly, including a statistician, the supervisors and members of the Unisa Research Ethics Review Committee. Hard copies of data will be stored for a period of five years in a locked filing cabinet for future research or academic purposes. Electronic information will be stored on a password-protected computer. After five years, all hard copies of the data will be shredded. Due to the possibility of a follow-up study, electronic copies will be kept on an external memory device in a safe at a private premise. All electronic copies will be permanently deleted from the hard drive of the computer after five years. Future use of the stored data will be subject to a further Research Ethics Review and approval if applicable.

1.13 STRUCTURE OF THE STUDY

A brief summary of the contents of each chapter is provided below:

1.13.1 Chapter 1: Background and orientation

Chapter 1 provides the background and orientation for this study. This chapter provides a problem statement, lists the primary and secondary objectives and indicates the importance and value of the research project. This chapter defines the dependent and independent variables of the project and the demographical and geographical demarcation. It offers a holistic research framework, presents a contingency analysis and describes the proposed structure of the study. Additionally, this chapter indicates the ethical considerations, the procedure, security and duration of data storage. It concludes with a summary.

1.13.2 Chapter 2: Literature review

Chapter 2 concentrates on providing an in-depth theoretical background to the research problem, based on the available literature. This chapter includes a detailed discussion of information administration technologies, the virtual office, telework and e-environment. It covers all the health and wellness aspects and musculoskeletal disorders. Chapter 2 elaborates on ergonomic requirements and the regulatory compliance that needs to be in place. Chapter 2 includes a discussion of the South African Excellence Model and concludes with a summary.

1.13.3 Chapter 3: Research methodology and design

Chapter 3 covers the quantitative format for the entire study consisting of an introduction that indicates the context, the purpose, objectives, theoretical perspective, delimitations and limitations of the study. The methodology that includes a framework of the research design, sample and population selections is discussed in detail. This chapter indicates the instruments used to collect data on the variables, the analysis of data, and application of ethics. Chapter 3 contains a discussion of the baseline study. It concludes with a summary.

1.13.4 Chapter 4: Empirical study results

Chapter 4 consists of an introduction, the statistical results are outlined, and inferential observations and interpretations are provided. These form the basis for designing the telework framework outlined in the planning of Chapter 5. It concludes with a summary.

1.13.5 Chapter 5: Conclusions and recommendations

This chapter has an introduction and further consists of the conclusions and recommendations. It refers to the limitations and recommends proposals for further research. It describes the design of the telework framework based on the findings identified and discussed in Chapter 4. The chapter concludes with a conclusion.

1.14 SUMMARY

This first chapter provides the foundation for the thesis. Not only does it introduce the research problem statement, objectives and questions, but it also emphasises the significance and value of the study. The title is placed into context by defining the concepts used. The holistic research framework indicates the methodology followed that will be discussed in Chapter 3. The layout of the chapters for this thesis is provided.

Chapter 2 is dedicated to the literature review on the key concepts of this study. It will provide the theoretical background on which the investigation will be based. The literature review will include the following sections that logically follow one another:

- Information administration technologies that enable the e-environment (virtual office);
- health and wellness aspects (work-related musculoskeletal disorders);
- ergonomics applicable;

- regulatory compliance: Occupational Health and Safety Act of 1993 (Act 85 of 1993), the Compensation for Occupational and Disease Act (No 130 of 1993) and Circular Instruction 180 regarding the compensation of work-related upper limb disorders in terms of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993); and
- the South African Excellence Model (SAEM) that will be adapted for the proposed conceptual telework framework.

CHAPTER 2

LITERATURE REVIEW

2.1

**INFORMATION ADMINISTRATION TECHNOLOGIES ENABLING
THE VIRTUAL OFFICE/TELEWORK**

2.2

**HEALTH AND WELLNESS ASPECTS/MUSCULOSKELETAL
DISORDERS**

2.3

ERGONOMICS

2.4

REGULATORY COMPLIANCE

2.5

SUMMARY

CHAPTER 2

LITERATURE REVIEW

INTRODUCTION

Chapter 1 provided the background and orientation for this study. It provided a problem statement, the primary and secondary objectives and indicates the importance and value of the research project. It offered a holistic research framework, indicated the ethical considerations, the procedure, security and duration of data storage. Chapter 2 provides a theoretical background to this research. This chapter consists of four sections that will examine and describe the core variables of the study. The first section will elaborate on the various information administration technologies that enable the e-environment also called the virtual office or telework. The second section will focus on the health and wellness of the teleworkers that could be caused by the incorrect use of technology. The third section will elaborate on the application of ergonomics that can prevent work-related musculoskeletal disorders if applied correctly. The fourth section will focus on the regulatory compliance of organisations and the e-environment. The existence of policies, regulations and legislation and the compliance to these will be investigated. The conceptual telework framework that could ensure the successful implementation of a telework programme will also be discussed. The literature review informed the development of the questionnaires used in the main empirical study.

2.1 INFORMATION ADMINISTRATION TECHNOLOGIES ENABLING THE VIRTUAL OFFICE/TELEWORK

Information administration technology developed dramatically over the past few decades. Electronic information and communication technologies have created a situation with far-reaching implications on human resources in all professions. It has created a situation where space is no longer important, as evidenced by global collaborations and individuals telecommuting to perform their work. The influence of technological developments therefore drastically changed the traditional office environment and led to a new administrative phenomenon referred to as the “virtual office”. The virtual office, also referred to as e-work or telework, has been described as any alternative worksite outside the traditional office, where incumbents can still perform the work associated with a traditional office (Hoffmann, 2011:32).

Information and communication technology (ICT) advances include:

- asymmetric data networks (ASDN);
 - blogs;
 - broadband;
 - cell phones;
 - digital networks: local area networks (LAN), wide area networks (WAN);
 - electronic databases;
 - electronic diaries;
 - electronic dictionaries;
 - electronic scanning devices as opposed to keyboard use;
 - electronic whiteboards;
 - e-mail;
 - fax machines;
 - integrated service delivery networks (ISDN);
 - Internet;
 - intranet;
 - laptop, palmtop and notebook computer;
 - mass storage devices;
 - metropolitan area networks (MAN);
 - personal/desktop computer (PC);
 - portable translators;
 - remote microphones;
 - Skype;
 - Smartphones;
 - social knowledge networks;
 - tablets;
 - teleconferencing;
 - telephones;
 - various standard and customised computer software packages;
 - video conferencing;
 - video phones;
 - virtual private networks (VPN);
 - voice mail (mailing per satellite);
 - voice over Internet protocol (VoIP);
 - wireless fidelities and modems;
- (Hoffmann, 2011:23).

Gil Gordon, regarded as an expert in the implementation of telecommuting and virtual-office strategies, has published the monthly newsletter “Telecommuting Review” since 1984. He conducted the annual Telecommute conference since 1992, and his Web site <www.gilgordon.com>, has become known as the leading worldwide resource for telecommuting information up to 2007. Gordon’s viewpoints summarise the concept of workplace flexibility due to the implementation of technology in the business and information environments. Gordon (1998) maintains that there has been overwhelming changes in what people do, who those people are, and where they do their work. The most profound change refers to the work location itself. This results from the explosion of hardware, software and telecommunications technologies that are shaking up the

workplace of the last 300 years. It is the first time in the history of the workplace that activity can be separated from the location.

Another viewpoint on the telework concept comes from John Berry, the Director of the United States Office of Personnel Management. His support for telework is based on accountability and obtaining results. In the Telework Report to Congress Berry wrote that telework must be implemented with a focus on accountability. Presenteeism, the practice of sitting at a desk without working, can be just as problematic as absenteeism. For telework to be successful the focus should be on the results. Those employees that cannot perform and cannot improve cannot hide behind their desks. It is up to management to give employees clear direction and support and then trust employees to deliver (United States Office of Personnel Management, 2011b:3).

President Barack Obama supported Berry's viewpoint on obtaining results. Speaking at the March 31, 2010 White House Forum on Workplace Flexibility, President Barack Obama said that workplace flexibility is about attracting and retaining top talent in the workforce and empowering employees to do their jobs. The success depends on the results obtained and not by how many meetings are attended, or how much face-time employees log (United States Office of Personnel Management, 2011b:3).

In emphasising the integral role of telework in achieving flexible, resilient workplaces, President Barack Obama declared:

“... work is what you do, not where you do it” (United States Office of Personnel Management, 2011b:7).

This flexibility is reflected in the definition of telework as given by United States General Service Administration (2012):

“Teleworking, sometimes called telecommuting or flexiplace, is an innovative business solution that enables employees to do productive work away from the traditional office. Modern technological advances have made it easier to work anytime, anywhere, and anyplace”

2.1.1 Virtual office/Telework defined

According to the United States Office of Personnel Management (n.d.:2), the terms “telework,” “telecommuting,” “flexible workplace,” “remote work,” “virtual work,” and “mobile work” are all used to refer to work done outside of the traditional on-site work environment. These terms are defined in different ways and used in different contexts to refer to anything from jobs that are completely “virtual” or “mobile,” to arrangements that enable employees to work from home a few days per week or per month.

According to the United States General Service Administration (2013) a virtual office is a work environment in which employees work from different locations using a computer network (instead of a single building or other single physical location). As opposed to a single location site (facility) where employees are housed, the virtual office is typically a collaborative communications medium, such as a computer network, where employees gather electronically to collaborate and/or carry out other work activities. The actual physical locations of the employees working in a virtual office can be temporary or permanent and can be nearly anywhere, such as their homes, satellite offices, hotel rooms, corporate offices (shared work space), airports, airplanes, or motorcar.

The official definition of “telework” adopted by the United States Office of Personnel Management (2011a:5) can be found in the Telework Enhancement Act of 2010 (the Act):

“[t]he term ‘telework’ or ‘teleworking’ refers to a work flexibility arrangement under which an employee performs the duties and responsibilities of such employee’s position, and other authorized activities, from an approved worksite other than the location from which the employee would otherwise work.”

In practice, “telework” is a work arrangement that allows an employee to perform work, during any part of regular, paid hours, at an approved alternative worksite (e.g. home, telework centre, etc.). This definition of telework includes what is generally referred to as remote work but does not include any part of work done while on official travel or mobile work (United States Office of Personnel Management, 2011a:5; Telework Exchange, 2009).

Telework arrangements in the United States Federal Government are most often part-time rather than full-time, although full-time telework does exist. United States Office of Personnel Management has the following telework categories:

- 3 or more days per pay period (denotes a bi-weekly pay period);
- 1 or 2 days per pay period;
- once per month;
- on an occasional, episodic, or short-term basis (i.e. situational telework such as ad-hoc or unscheduled telework) (United States Office of Personnel Management, 2011a:5).

As defined by United States Office of Personnel Management (n.d.:2), telework is not:

- Work extension: Many employees take work home with them. This is remote work, but it is not considered telework within the scope of the United States legislation.
- Mobile work: Some employees who, by the nature of their jobs, are generally off-site, and may even use their home as their “home base.” As their work requires this setup and they travel much of the time, they are not considered teleworkers. This is different from “hoteling” arrangements, in which frequent teleworkers use shared space when they are on-site.

The United States General Service Administration (2013) defines telework and telecommuting as synonymous terms meaning the act of performing all or a portion of work functions at an alternative worksite, such as working from home or a telework centre, in order to reduce or eliminate an employee’s commute. To be considered as telework for federal purposes, telework must occur at least one day per week on a regular and recurring basis and does not include:

- situational telework (unscheduled, project-oriented, non-recurring, and/or irregular telework and/or any teleworking that occurs less frequently than once a week on a recurring basis) or
- full-time mobile work arrangements.

There have been numerous debates, articles and academic papers on the subject of the difference between “telecommuting” and “telework”. Gordon’s (2007) viewpoint is that the term “telework” tends to be used more in Europe and some other countries, while

“telecommuting” is used more in the United States. He maintains that a group of people prefer the word “telework” because it’s a more accurate description of the concept - the “tele” prefix means “distance”, so “telework” means “work at a distance.” The telework advocates also believe that “telecommuting” has too strong a connotation about the commuting aspect, and that “telework” is a broader and more inclusive terms. He further argues that the underlying concept is the same: decentralising the office, and using different ways of bringing the work to the employees.

Jala International (2013) confirms the ongoing debate by maintaining that there is still a fair amount of confusion as to what teleworking and telecommuting are. They define the two concepts as follows:

- “Teleworking refers to any form of substitution of information technologies (such as telecommunications and/or computers) for normal work-related travel; moving the work to the workers instead of moving the workers to work.”
- “Telecommuting refers to periodic work out of the principal office, one or more days per week, either at home, a client’s site, or in a telework centre; the partial or total substitution of information technologies for the travelling to work. The emphasis here is on the reduction or elimination of the daily travelling to and from the workplace. Telecommuting is a form of teleworking.”

2.1.2 Alternative Workplace Arrangements

The United States General Service Administration (2013) defines an alternative workplace arrangement as a work arrangement that combines non-traditional work practices, settings/ locations, and/or technologies, to achieve workplace progress. Alternative workplace arrangements are established to improve workplace factors such as:

- individual, organisational, facility, and/or operating cost performance;
- space utilisation efficiency, effectiveness, and flexibility;
- quality of worklife;
- disaster preparedness and recovery;
- sustainable development.

Alternative workplace arrangements implementation involves careful scrutiny of the issues related to the people, process, and place intersections that make up the workplaces. These alternative workplaces/arrangements are grouped and defined below:

2.1.2.1 Home office/Working at Home (WAH)/Small Office Home Office (SOHO)/ Cocooning

This is office space that forms part of a domestic environment that is privately owned or leased and where business operations can be performed - either on a full-time basis using this space as the only environment where an employee performs a job, or on a part-time basis, working less than a full-time schedule in the home environment. The employee is reachable by telephone, computer or fax facility and stays in regular contact with the corporate office (Hoffmann, 2011:37).

2.1.2.2 Mobile office/Non-territorial office/Unassigned office/Alternative workspace/ workplace/worksite

These virtual offices are not limited to a specific geographical area. It may be operated from a car, briefcase, aeroplane, caravans, pre-fabricated buildings or structures on construction sites. These types of virtual offices should have the necessary computer and telecommunications connections and could be staffed by administrative personnel (Hoffmann, 2011:38).

2.1.2.3 Telecentre/Telecottage/Televillage/Telecommuting centre/Telebusiness centre/ Community technology centre/Interactive (service) delivery centres

These centres are facilities that provide workstations and other office facilities/services that employees from several organisations utilise (typically on a fee for use/service basis) and the employees use the facility as a geographically convenient alternative worksite (United States General Service Administration, 2013).

2.1.2.4 Flexitime/Flexiwork/Flexiplace

Flexitime is an alternative work arrangement that offers flexibility in determining when, where and how a job is performed, while varying the starting and stopping time of the standard workday, as long as a standard number of hours are worked within a 24-hour period. Teleworkers are usually required to be available during a 'core time', that is usually in the middle of the day. Flexiplace is "any location other than an employee's normal duty station". The job may be performed in a car, in an aeroplane, at a client's site or any place where the environment is conducive to perform the job. The most important factor is that the work is done irrespective of the location where it is performed (Hoffmann, 2011:37).

2.1.2.5 Hot-desking/Free Address/Touchdown workstation

Hot-desking is an alternative work arrangement in which employees work in one facility (Facility A) part of the time and at one or more alternative worksites for the rest of the time. When working in Facility A, these employees use non-dedicated, non-permanent workspaces assigned on a first come, first served basis (United States General Service Administration, 2013).

2.1.2.6 Hoteling

Hoteling is one of the most significant trends in facilities management for professional service firms such as accountants, and consultants. It is one of a collection of cutting edge strategies under the banner of ‘alternative workplaces’. In most of these strategies, assigned private offices are rare and in many there are significantly fewer offices than employees. Hoteling refers to a process where a shared pool of offices (non-dedicated/non-permanent workspaces) are reserved and assigned on an as-needed basis (Facility Innovations, 2009b; United States General Service Administration, 2013).

The specific broader initiatives with hoteling might include any of the following:

- greater mobility and productivity;
- enabling telecommuting;
- flexible use of satellite offices;
- quicker creation of client or project specific work teams in close proximity;
- improved wide area networking;
- a more compact and efficient office;
- an improved central files system and
- flexi-time (Facility Innovations, 2009a).

2.1.2.7 Desk sharing

Desk sharing is work arrangement in which two or more employees share the same workstation in a typically pre-arranged manner that allows each of the employees to have sole access to the specified workstation on given days while the others involved in the sharing arrangement work elsewhere. The challenge for desk sharing is the need to come to an agreement on a mutually satisfying schedule for use of the workstation as well as the need to work with the desk habits of others (United States General Service Administration, 2013).

2.1.2.8 Just in time

Just in time (JIT) refers to time-sensitive operations where timing of inputs and outputs is increasingly critical. A more rapid pace of activities leads to increased pressure on incumbents to use time more effectively. Just in time employment tends to locate employees closer to their worksites (Hoffmann, 2011:38).

2.1.2.9 Continuation of (organisation) operations centres/Disaster recovery centres

Organisations with effective telework programs can continue all or most critical operations during emergency situations such as transportation disruptions, severe weather conditions, and other disasters. This helps organisations by keeping work on schedule, and also allows them to continue providing services to their customers (United States General Service Administration, 2013).

In 2011, the WorldatWork group published a survey on scheduled workplace flexibility. More than one-third of organisations surveyed offer full-time telework for at least some employees, and more than half allow telework on a monthly or weekly basis. Although telework locations vary, 70% of participating organisations that offer at least one type of telework programs, indicated that employees routinely work from home. Organisations with telework programs are also more likely to feature telework programs when attracting talent, which indicates that organisations use these programs to distinguish themselves as employers-of-choice.

2.1.3 Benefits of telework

In a paper, developed collaboratively by the United States General Services Administration and the Telework Exchange, on the key benefits of having a telework program in place it was stated that telework may improve performance management by leading managers to measure performance primarily by results. Managers and teleworkers agree on which projects need to be completed and when, removing the need to constantly prove busyness at a desk. This contrasts with the traditional office setting where there is more of a tendency for a manager to be impressed by those who spend long hours in the office. Such employees may indeed be hard-working, but staying behind a desk for a long period of time is not, in itself, evidence of high productivity. As a result the concept of work becomes more defined by accomplishing tasks, rather than maintaining a 9-to-5 schedule (United States General Service Administration, n.d.:6).

According to the United States General Service Administration (n.d.:1) telework yields multiple benefits to the Federal Government, other public sector organisations, the private sector, the individual employee and the community. It is becoming increasingly prevalent in the modern workforce because its proven results and reliability are shown to significantly improve life holistically. The United States General Service Administration (n.d.:2-14) lists the following benefits resulting from the implementation of telework:

2.1.3.1 Improved emergency responsiveness and continuity of operations

A workforce that is capable of teleworking on a regular basis is also capable of leveraging its decentralised work settings to maintain continuity of operations in the face of a natural disaster, terrorist attack, or other emergency situation.

2.1.3.2 Reduction of energy consumption and the associated carbon footprint

Telework contributes to a greener environment by diminishing vehicle carbon emissions as a result of the reduced number of employees who travel to work. As an added benefit, less time spent on the road also means less traffic congestion for those who choose to travel (United States General Service Administration, n.d.:3; Hoffmann, 2011:142).

2.1.3.3 Improved performance and productivity

The job performance of teleworkers has been documented to either exceed or remain on par with that of employees in a traditional workplace arrangement. The current research consensus is that telework either improves job performance or maintains existing levels. Frequent teleworkers reported that they performed work, not easily accomplished with frequent interruptions, faster while at the home office, lost no time due to traffic congestion or to the stresses associated with travelling, and used fewer sick leave because staff generally use health care providers located close to home (United States General Service Administration, n.d.:4).

There are quite a number of reasons why telework has the ability to increase productivity. Teleworkers typically find working at home to be more pleasant and less stressful, and people who enjoy their work and/or are less stressed are likely to be more productive. Also, certain tasks are easier to perform in specific environments. If an employee must read a mountain of reports, a quiet room at home is preferred to a busy office with

distractions and frequent interruptions. Another reason accounting for improved and/or maintaining telework productivity may be that it allows employees the flexibility to schedule their work periods according to their natural productivity peaks thus optimising output. If a manager tells a teleworker to complete a report by 5pm Friday, the teleworker can arrange his schedule any way he likes, so long as he meets his deadline (United States General Service Administration, n.d.:6; Hoffmann, 2011:140).

2.1.3.4 Greater flexibility, morale, and decreased stress

Telework increases personal freedom and flexibility, thereby improving morale and decreasing stress. Having more time to spend in a qualitative way rather than in rush hour travelling reduces stress and improves morale. One of the most consistent and common findings regarding telework benefits is reduced work-related stress. This reduction is due to decreased traffic headaches, a better work-life balance, more personal control over time and environment, and consequently, an increase in overall flexibility. Telework also allows employees to be the determinants of their own schedule, as long as the number of hours worked or tasks completed is being met (United States General Service Administration, n.d.:7; Hoffmann, 2011:137).

2.1.3.5 Improved recruitment, retention, and staffing

Telework provides a valuable tool for recruiting new employees. Job seekers often choose employers that offer telework because working from home, or at an alternate location, and avoiding traffic congestion is important to them. Telework also acts as a retention incentive for valued employees to stay with a company instead of opting for retirement or employment elsewhere. Valued employees may place a high premium on the ability to better balance their work and personal lives through telework. Telework increases the pool of employees available to work on projects. Work teams can be created representing the best skills and experience for a particular project, regardless of geography and time zones. Telework technology allows these individuals to collaborate on projects without the need to travel for in-person meetings - yet they can work together very effectively using conference calls, web conferencing, email, and other available tools (Telework.gov, n.d.).

2.1.3.6 Improved accommodations for persons with disabilities

Telework improves accommodation for persons with disabilities who may prefer to work from the comfort of their home or are unable to work outside the home. While not all

persons with disabilities need, or want, to work from home, telework is an option many may consider to reduce mobility and/or other impairment difficulties (United States General Service Administration, n.d.:9 & Hoffmann, 2011:135).

2.1.3.7 Flexible dependent care

Telework permits more time for employees to care for their loved ones. As stated in the benefit discussing greater flexibility, morale, and decreased stress, teleworking allows more work-related personal freedom and flexibility. This flexibility in turn allows for improved employee capability to care for loved ones. Essentially, those with children or ailing parents may use telework to increase their options for providing care for their loved ones while maintaining effective levels of work performance. This allows a person to be both employee and caretaker, removing the stress of leaving a dependent under the guidance of someone else, alone unattended, or with a caregiver who may only be present for a couple hours. Through telework, both the employer and the employee, who recently came into a care giving role or who may already have had dependent care responsibilities, benefit from the reduced stress experienced by the care giving employee. As telework allows such employees to perform their work and simultaneously have a comforting proximity to their dependents, they have lower stress levels and dependent care costs, resulting in telework being a win-win situation for employer, caregiver, and dependent (United States General Service Administration, n.d.:10 & Hoffmann, 2011:135-136).

2.1.3.8 Office space and operating cost savings

Telework can enable reduced demand for office space as well as reduced facility operating costs. Another benefit of telework is that it can result in reduced demand and associated costs for office space, technology costs, and costs in other organisation operations (United States General Service Administration, n.d.:10).

2.1.3.9 Optimal use of technological advances

Telework facilitate the optimal use of existing and cutting-edge workplace technology. This is an ironic twist since it is widely held that technology enables telework. However, telework is responsible for enabling the use of technology because most advances in workplace technology are suited for mobility and telecommunications required by telework. The equipment is lighter, more portable, more virtual and more responsive. The benefit of promoting the use of current technology is two-fold, as the use of technology

requires on-the-job-training that keeps the workforce adept and sharp in the use of workplace technology. The optimal use of technology ultimately increases return on technology investments, increases employee productivity through streamlined asset functionality, increases workforce mobility and flexibility, improves capability in emergency situations, and maintains an up-to-date technologically-capable workforce (United States General Service Administration, n.d.:11).

Alternative work styles, mobile working, and telework are all new ways of work made possible by new and mobile technologies. Roberson and Vink (2012:5089-5090) investigated and compared national data, case studies and reported experiences of the United States of America and the Netherlands to provide a better understanding of the issues of this new way of work and to see if they are culturally specific. Their findings indicated that although the definition of new ways of work differed (depending on how the organisation designs, implements and manages them), several common elements and themes were observed. Changes in the physical work environments at both the home and office settings were noted along with the need for having information and communication technology support for team meetings and other communication. Work-life balance and related work stress are emerging issues along with creating and sustaining a culturally friendly atmosphere towards flexible work styles. Management and leadership styles as well as how employees interact with their managers and co-workers are also changing along with the modality of the interaction as more communication is taking place by using information and communication technologies. When adopting new ways of work, the organisation's cultural characteristics and the alignment of work style with corporate goals are essential for the success of these programs. When "New Ways of Work" programs are developed accordingly, safe and healthy workplaces are created.

2.1.4 Key technology components required to telework

Telework Exchange (2009:1) confirms that technology enable telework. However, the telework technology requirements will vary as there is no "one-size fits all" approach. Telework Exchange lists the following requirements: a computer, associated peripheral equipment (e.g. printer, copier, scanner, facsimile), phone, Internet connectivity, secure network access (e.g. Virtual Private Networks) and technical support. There are also Smartphones to increase mobility, Voice over Internet Protocol, Web-based collaboration

solutions, as well as visual collaboration solutions to enhance work environments and bring distributed teams closer together.

Telework Exchange (2009:2-4) provides an overview of the proven technology products and services required for teleworkers as discussed below:

2.1.4.1 Collaboration tools

Collaboration tools facilitate information-sharing for individuals in remote locations through an interactive forum. These tools allow communication in real-time regardless of physical locations and can provide an opportunity for document-sharing, brainstorming, and face-to-face interaction. Collaboration tools can minimise both the financial and lost-productivity costs of travelling. Unified communication tools combine telephony, messaging, and conferencing, enabling an all in one, easy-to-use service for teleworkers. Examples include:

- data conferencing;
- e-mail, phone, and fax;
- instant messaging;
- presence technology/dashboard collaboration;
- software collaboration;
- telepresence;
- visual and video conferencing; and
- web collaboration.

2.1.4.2 Internet service provider

Internet service providers (ISPs) connect remote employees to the Internet, e-mail, and company network. High-speed broadband is the preferred Internet service to use while teleworking. Wireless Internet is a significant contributor to employees' productivity and can be used securely.

2.1.4.3 Internet telephony

Internet telephony allows teleworkers to use the Internet for their voice, video, fax, and unified communications needs. Voice over Internet Protocol enables voice calls using a broadband Internet connection instead of an analog phone line. Teleworkers can take their

office phone numbers and voice services to any remote location with high-speed Internet access. Tightly-integrated, secure voice and data solutions provide the same telephony features that are available to workers in the office regardless of physical location.

2.1.4.4 Laptop

Laptops serve as the primary workstations as they can be easily transported to and from the alternative workspace and the main worksite. Docking stations incorporate the benefits of laptop flexibility with the functionality of a desktop, providing the user with the best of both worlds - portability and a full-size keyboard, monitor, and mouse.

2.1.4.5 Mobile Phone/Smartphone/Personal data assistants

Mobile phones, Smartphone and Personal data assistants allow teleworkers instant communication anytime, anywhere. Smartphones and Personal data assistants can integrate data applications such as Internet and e-mail with voice communication. These handheld devices can also deliver text messaging, camera and video recording functionality.

2.1.4.6 Network infrastructure

Network infrastructure refers to the equipment and connections that make up a network. Investments must be made in the network infrastructure to prepare it for remote access. Teleworkers can use virtual private networks or similar remote access solutions to access the network securely. These solutions establish secure firewalls, encryption, and tunnelling that connect the teleworkers' computers to the organisation's network. Teleworkers can transmit data across the Internet without unauthorised users reading or modifying the traffic. Virtual desktop infrastructure provides the computer and associated software for teleworkers to access the network remotely. These servers enable teleworkers to access, retrieve, file, and print as though they were connected to the internal office local area network.

2.1.4.7 Printer/Scanner/Fax/Multi-functional device

Printers, scanners, fax machines, and multifunctional devices are common peripheral office equipment for the remote teleworker. Multifunctional devices combine printer, scanner, and fax functions into one device and provide teleworkers the ability to send, receive, and print information.

2.1.4.8 Video conferencing

Video conferencing allows remote users to connect using real-time, interactive voice, video, and data collaboration technologies. The face-to-face capability allows teleworkers to stay visually connected to their managers and colleagues. The data collaboration capabilities enable teleworkers to share documents, computer displayed information, and whiteboards as if they were in the same room. Video conferencing can improve retention rates, increase productivity, and reduce costs and carbon emissions while enhancing the quality of communications between managers and dispersed team members (Telework Exchange, 2009:2-4).

Late 20th-century technology revolutionised the workplace, and the 21st-century workplace is evolving even further. Computers, remote connectivity, voice and electronic communications, paperless work processes, and other innovations make information and work increasingly mobile (United States Office of Personnel Management, n.d.:1).

It is important to realise that not all people are eligible to telework. Some employees' positions require their physical presence at work (e.g. personal assistants) and they could therefore not be allowed to telework. The type of work being done is also important. According to Sutton (2006) knowledge work is work performed by humans to generate useful information and knowledge. Knowledge workers access and use data, personal knowledge, organisational knowledge and external knowledge to do this work and employ mental modes and apply significant concentration and attention. Davenport (2013:10) maintains that knowledge workers have high degrees of expertise, education or experience and the primary purpose of their jobs involves the creation, distribution or application of knowledge. In 1959, Peter Drucker coined the term knowledge worker. He described a knowledge worker as someone who works primarily with information or one who develops and uses knowledge in the workplace. A knowledge worker is a person who has been schooled to use knowledge, theory and concept rather than physical force or manual skill. The importance of a knowledge worker is confirmed when we think about the concept of knowledge. Knowledge cannot exist without a person. It is always embodied in a person, carried by a person, created, augmented or improved by a person, applied by a person, taught and passed on by a person and used or misused by a person (Sutton, 2006). However, although Telework Exchange (2009:1) confirms that technology enables

telework, a knowledge worker is just as important to telework. Without knowledge workers, these machines, no matter how advanced and sophisticated, are unproductive.

From this section it is clear that without the proper enabling technology, the virtual office and telework would not be possible. Modern technological advances have indeed made it easier to work anytime, anywhere, and at anyplace (United States General Service Administration, 2012).

However, without proper training on the correct usage of the technologies available at the alternative worksites, the very same technologies can become a nightmare. If teleworkers do not apply the correct ergonomic principles while teleworking, it may lead to work-related musculoskeletal disorders. Musculoskeletal disorders are physical conditions that are quite often work-related, especially with regard to the use of information and communication technologies. In the next session the health and wellness aspects will be investigated.

2.2 HEALTH AND WELLNESS ASPECTS/MUSCULOSKELETAL DISORDERS

In the previous section, the various business and information administrative technologies that enable the e-environment were discussed. This section will investigate the health and wellness aspects (musculoskeletal disorders) that employees may encounter during the execution of workplace activities. The ergonomic risk factors that cause the musculoskeletal disorders will be identified and discussed. The classification of work-related disorders according to the effect on specific tissue will also be dealt with in this section.

Repetitive strain injury affects the muscles, tendons, nerves and other soft tissues of the body. The term repetitive strain injury is commonly used to refer to pain and discomfort in the hands and arms amongst keyboard users but any part of the body that is subjected to overuse, compounded by poor posture, twisting, cold, vibration or stress, is vulnerable to developing a repetitive strain injury-type condition. Tension in the shoulders, stiffness in the neck and upper back pain with associated headaches can develop from a strain of the muscles that attach onto the spine and a shortening of the muscles attaching onto the anterior chest wall. Maintaining a poor posture for many years can lead to an exaggerated back curve that can, in turn, lead to disc inflammation in the back and even compress the rib cage. Tendon or muscle inflammation around the shoulder joint can also result in thoracic outlet syndrome (compression of the nerves and/or blood vessel in up to four specific regions of the neck and shoulder) (Repetitive Strain Injury Awareness, 2007e & 2007m).

Repetitive Strain Injury Awareness, based in the United Kingdom, maintains that there is clear evidence that repetitive strain injury conditions are strongly work-related and the causes have been found in the design of work systems. Repetitive Strain Injury Awareness (2007v) refers to major research projects conducted by the European Agency for Safety and Health at Work. The Agency's Europe-wide campaign to lift the burden of work-related musculoskeletal disorders is a clear indication of the serious nature of the problem and the importance of identifying future needs and priorities. An European survey indicated that 30% of employees complain of backache; 17% complain of muscular pains in their arms and legs and 45% report working in painful or tiring positions. The figure of 17% who reported muscular pain amounts to 25 million employees.

Zungu and Ndaba (2009) investigated the prevalence of self-reported musculoskeletal disorders among office workers in a private hospital in South Africa. The aim was to assess the association between the physical demands of the work and musculoskeletal disorders. Self-reported musculoskeletal problems were prevalent among office workers in this setting with the most commonly affected regions being the back, followed by the neck, wrists and shoulders. Furthermore, the prevalence of musculoskeletal disorders was associated with the physical demands of the work particularly between repetitive motions of upper limbs, and wrist extension when using the keyboard and forceful movements. The implementation of ergonomically sound interventions in the workplace has the potential of reducing backache and other related musculoskeletal disorders. Therefore, office-specific ergonomic programmes should be considered as a method of choice to prevent the occurrence of work-related musculoskeletal disorders.

The technical report issued by the SHARP program indicated that there is very limited published research on occupational injury and illness surveillances by industry. There is limited data that characterises the severity of occupational injuries and illnesses related to direct workers compensation costs and work days lost (SHARP, 2013:13). The lack of published research is also evident in South Africa. The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:8) indicate that no statistics are available for South Africa regarding the impact of work-related upper limb disorders on health care and the economy. Therefore, an investigation of health and wellness aspects that are work-related should be useful to the South African business community. It would not only provide the knowledge on the kinds of musculoskeletal disorders, but also which ergonomic measures to implement in order to limit the occurrence of injuries. The section that follows will focus on the work-related health and wellness aspects.

2.2.1 The history of Repetitive Strain Injuries/Work-Related Upper Limb Disorders

Work-related upper limb disorders are not a new phenomenon. They were identified as long ago as 1713 by Ramazzini, an Italian doctor, generally regarded as the father of occupational medicine, who recognised that serious disease could be caused by “violent and irregular motions and unnatural postures of the body”. Ramazzini described symptoms of work-related upper limb disorder in scribes and clerks, noting that the “incessant driving of the pen over paper causes intense fatigue of the hand and the whole arm because of the

continuous strain of the muscles and tendons”. In the 19th century, the condition was recorded amongst artists, musicians, seamstresses, milkmaids and smiths (The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:8).

Repetitive Strain Injury Awareness (2007o) confirms that upper limb pain and dysfunction, caused by work of a repetitive nature, is not a new phenomenon and states that it has been well documented for 300 years in jobs such as clerical work and telegraphy. However, from the late 1970’s countries as diverse as Australia, Russia, Japan, Finland, the United States and the United Kingdom reported dramatic increases in musculoskeletal conditions. This period was significant since it represent the widespread replacement of typewriters with computers and a consequent increase in the automation of work. Many employees spend long periods in a fixed position, performing a range of tasks without moving from their workstations and using only a limited range of movement to operate their keyboards. This trend has continued over the last 20 years with rapid technological advance and the rise of the service industries.

Repetitive Strain Injury Awareness (2007v) provides a list of so-called “Type 1 repetitive strain injuries” conditions that are often grouped under the repetitive strain injury umbrella. These specific pathological conditions can be diagnosed using standard clinical techniques of examination and was listed in 1991 in an article in *The Lancet*. These 22 listed conditions included:

- adhesive capsulitis (frozen shoulder);
- epicondylitis (tennis/golfer’s elbow);
- bursitis;
- ganglion cyst;
- carpal tunnel syndrome;
- peritendinitis;
- cervical spondylosis;
- rotator cuff syndrome;
- cramp of the hand (writers’ cramp);
- tendinitis;
- cubital tunnel syndrome;
- tenosynovitis;
- De Quervain’s syndrome;
- trigger finger/thumb;
- Dupuytren’s contracture; and
- vibration-induced white finger.

Repetitive Strain Injury Awareness (2007n & 2007v) identified a second repetitive strain injury condition that is called “Type 2 repetitive strain injuries” that refers to non-specific

pain syndrome. Non-specific pain syndrome refers to a significant proportion of persons with upper limb pain and dysfunction but who do not show signs that are easily recognised and can be observed or easily reproduced on examination. These people may have pain that is not focussed on one area and their pain may move from one site to another. For example, while there may be tenderness of the ligaments around joints, there will be no visible joint swelling. Examination often identifies very little, if anything, in the way of objective abnormalities, yet patients may complain of ever-worsening symptoms. This condition, also known as neuropathic arm pain or “diffuse-repetitive strain injuries,” is not recognised as an industrial disease.

2.2.2 The many names for Repetitive Stress Injuries

Adams (2010) maintains that repetitive strain injury is an all-inclusive term. It covers a lot of injuries and disorders that have a huge range of symptoms. According to Adams (2010), these terms can be interchanged. He provides the following definitions:

- A *Repetitive Stress Injury* is simply an injury caused by physically stressing a body part repetitively. The stress can be major or minor, but it is the continuous stressing that eventually causes the injury.
- A *Repetitive Stress Disorder* is the same as a repetitive stress injury except for a word change. Some people feel more comfortable classifying these conditions as disorders. In this way, an injury is something that is broken, whereas a disorder is something worse than normal.
- A *Repetitive Strain Injury* is an injury caused by physically straining a body part repetitively. Again, some people simply feel more comfortable classifying this type of action as a strain. Stress would be known as the mental fatigue and strain would mean physically overexerting a body part.
- A *Repetitive Strain Disorder* follows the pattern above.
- A *Repetitive Motion Injury* is an injury caused by performing the same motion repeatedly. This term becomes a little more descriptive and it has a narrower focus. Not all repetitive strain injuries are caused solely by repetitive motion.
- A *Repetitive Motion Disorder* (RMD) is another injury or disorder alternative.
- A *Repetitive Injury* is an injury caused by repetition. It does not matter if it is stress, strain, or motion.
- *Overuse Syndrome* (OS) is a condition where a person has overused something to the point of injury. This is a little broader than the typical definition for repetitive

stress injury. Although repetition usually plays a key role in its development, overuse does not have to occur through a repetitive action.

- A *Cumulative Trauma Disorder* is a disorder (injury) that occurs through the build up of trauma over time. The trauma can be acute (happening in an isolated event) or repetitive. It is the weakening of the body part through repeated trauma that finally causes it to break down.
- A *Musculoskeletal Disorder* is a condition that affects the muscles or bones. Since most repetitive stress injuries can lead to body deformation if left uncorrected, musculoskeletal disorders fit right in. However, since there are a number of repetitive strain injuries that do not affect muscles or bones, it does not describe the entirety of what are discussed above.

For the purpose of this study, the following three terms will be used interchangeably:

- The Health and Safety Executive in the United Kingdom, Department of Labour, uses the term “Upper Limb Disorders” that are often also called “Repetitive Strain Injuries” (Health and Safety Executive, 2003:2).
- The United States of America, Department of Labor uses the term “Musculoskeletal Disorders” (Occupational Safety and Health Administration, 2013).
- The South African Department of Labour uses the term “Work-Related Upper Limb Disorders” (The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:8).

These three terms will be used as collective, all-inclusive terms in the discussions to follow. The term work-related musculoskeletal disorders are the preferred term, as it includes disorders of the lower limbs as well.

2.2.3 Repetitive Strain Injury (Upper Limb Disorder), Work-Related

Musculoskeletal Disorders and Work-Related Upper Limb Disorders defined

- Health and Safety Executive (2003:3) in the United Kingdom maintains that repetitive strain injury and upper limb disorder refer to the same conditions, although the term repetitive strain injury is used to refer to pain in the arm when working with computers. The term upper limbs disorder covers a range of over 20 medical conditions. Health and Safety Executive prefers to use the general term

upper limbs disorder because problems might not be due to strain and there may not be any signs of injury.

According to Repetitive Strain Injury Awareness (2007x), (an information resource for those interested in musculoskeletal disorders), “repetitive strain injury” is the name given to a group of injuries affecting the muscles, tendons, and nerves primarily of the neck and upper limbs. It is an umbrella term and is known as “work-related upper limb disorder.”

- According to Miller (2001:1) the Occupational Safety and Health Administration in the United States defines work-related musculoskeletal disorders as injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels, and spinal discs. They do not include injuries resulting from slips, trips, falls, or similar accidents. Examples of musculoskeletal disorders include carpal tunnel, tendinitis, sciatica, herniated disc, and low back pain. Miller (2001:1) states that musculoskeletal disorders are not the same as sprains, strains and other injuries caused by sudden trauma, a few days of overuse or localised fatigue. Musculoskeletal disorders involve a long latency period, months, or years and the symptoms continue even after a few days of rest. Full recovery may in some extreme cases, take years.
- In South Africa, Circular Instruction 180 regarding compensation for work-related upper limb disorders (Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993), as Amended) defines work-related upper limb disorders as a collective term for a group of occupational diseases that comprise musculoskeletal disorders caused by exposure in the workplace affecting the muscles, tendons, nerves, blood vessels, joints and bursae of the hand, wrist, arm and shoulder. These are syndromes associated with characteristic symptoms and physical signs (The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:3). Table 2.2.1 provides a summary of some definitive diagnoses of work-related upper limb disorders*.

**TABLE 2.2.1: DEFINITIVE DIAGNOSES OF
WORK-RELATED UPPER LIMB DISORDERS**

(The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:3)

Shoulder conditions	Elbow conditions	Forearm, wrist, hand and finger conditions
<ul style="list-style-type: none"> • Fractures around the shoulder joint • Levator scapulae syndrome • Pectoralis major strains • Rotator cuff syndrome (Impingement syndrome, bicipital tendinosis, infraspinatus tendinosis, partial tear of the rotator cuff, subacromial bursitis, subdeltoid bursitis, subscapularis tendinosis, supraspinatus tendinosis) • Rupture of the long head of the biceps 	<ul style="list-style-type: none"> • Cubital tunnel syndrome • Lateral humeral epicondylitis (tennis elbow) • Medial numeral epicondylitis (golfer’s elbow) • Olecranon bursitis (beat elbow) 	<ul style="list-style-type: none"> • Anterior and posterior interosseous syndrome • Carpal tunnel syndrome • De Quervain’s tenosynovitis • Guyon’s (ulnar) tunnel syndrome • Intersection syndrome • Pronator teres syndrome • Radial tunnel syndrome • Tendinosis/Tenosynovitis of extensor/flexor tendons • Trigger finger/thumb • White finger (Raynaud’s syndrome, vibration syndrome)
<i>(*those marked in bold are the more common conditions)</i>		

**2.2.4 Ergonomic risk factors leading to work-related musculoskeletal disorders/
work-related upper limb disorders**

Werth and Babski-Reeves (2012:1258) conducted a study to assess posture when using three computers (laptop, netbook and slate type computers) on two work surfaces (desk and sofa). They indicated that mobile computers are becoming increasingly popular since it allows employees (teleworkers) to perform computing activities in non-traditional work environments. However, little research exists that quantifies ergonomic exposures (risk factors) associated with using mobile computing devices, particularly in non-traditional environments or for newer, compact mobile computers (e.g., slate computers). Wrist and neck flexion/extension and wrist radial/ulnar deviation were measured using electrogoniometers. The results of this study indicate that there is a difference in posture based on different types of workstations. When working at the non-traditional work station

(i.e., sofa), postures were found to be degraded. Ergonomic exposures are heightened when using compact and slate type computers, particularly when used in non-traditional work settings. Potential for injury or illness development may be increased with prolonged usage of such computing devices in non-desk settings.

According to the Occupational Safety and Health Administration (2013), common examples of ergonomic risk factors are found in jobs requiring:

- repetitive, forceful, or prolonged exertions of the hands;
- frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and
- prolonged awkward postures.
- Vibration and cold may add risk to these work conditions.

Jobs or working conditions presenting multiple risk factors will have a higher probability of causing a musculoskeletal disorder problem. The level of risk depends on the intensity, frequency, and duration of the exposure to these conditions and the individual's capacity to meet the force of other job demands that might be involved.

Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act, (No. 130 of 1993) states that an employee will be entitled to compensation if it is proven, to the satisfaction of the Director General that the employee has contracted a disease mentioned in Schedule 3. Such a disease must have arisen out of and in the course of the employee's employment. Schedule 3 states that musculoskeletal conditions caused by specific work activities or a work environment where particular risk factors are present will be regarded as an occupational disease. Examples of such activities or environment risk factors include:

- rapid or repetitive motion;
- movements requiring force exertion;
- excessive mechanical force concentration;
- awkward or non-neutral postures (movements at extremes of reach, static muscle loading, awkwardly sustained postures, contact stress);
- cold environment or handling chilled or frozen products;
- vibration;
- gender (females are more at risk);
- age (older employees are more at risk);
- abnormal body mass index;

- prolonged duration of exposure;
- poor work organisation (low level of control over work rate, no breaks, etc.); and
- psychosocial stress at work and fatigue (The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:4).

Miller (2001:6) maintains that research is still far from complete on exactly what causes work-related musculoskeletal disorders. Organisations with musculoskeletal disorder problems find that musculoskeletal disorders may occur in one department but not in another, even when both departments have similar furniture, job activities, and electronic equipment. It seems that musculoskeletal disorders are caused by a complex set of conditions having to do with job activities, individual physiology, the work environment, technology, management, and sociology, as well as non-work activities and environments.

As they are understood, risk factors for musculoskeletal disorders can be split into the following three general groups:

2.2.4.1 Ergonomic stresses

According to Miller (2001:6), ergonomic stress factors involve the interaction between the body and the physical environment. According to Health and Safety Executive (2003:5-6) work-related musculoskeletal disorders are caused or aggravated by exposure to the following conditions:

- *Repeating an action.* The same muscles are used repeatedly. The more a task is repeated, the greater the risk. The speed at which the job becomes 'risky' depends on the task itself. Movement of the whole arm at low speed may be just as risky as small but quick movements.
- *Uncomfortable working positions.* These include moving the arm to an extreme position, for example working above head height, working with a very bent elbow, or holding something in the same place for a long period.
- *Using force.* This includes handling heavy objects, carrying out quick movement or having to overcome friction, such as undoing a bolt.
- *Carrying out a task for a long period.* The risk of injury generally increases with the length of time that a task is carried out. Carrying out a task for a short period is unlikely to cause an injury, except where the task requires a lot of effort.

- *Poor working environment.* Working in cold temperatures or handling cold items; dim light, shadow or glare that causes an employee to adopt an awkward position to see better. Vibration can also increase the risk of upper limbs disorder.
- *Underlying effects of the work and conditions.* This includes a lack of control over the work and its speed, excessive demands, fears over losing a job, and lack of status.
- *Employee's individual differences.* Individuals are different in terms of their body size, age, ability (particularly in the case of new or pregnant employees), health, and disabilities. Some employees are more affected by certain risks. Some may differ in their attitude towards safe working practices and in reporting any symptoms.

2.2.4.2 Psychosocial stresses

Miller (2001:10) indicates that psychosocial stresses refer to the effects of the organisational or social environment on the employee. Psychosocial factors include fear of losing a job; lack of job control (including workload and pace); lack of social support; and computer breakdowns.

Psychosocial factors cause two types of stress:

- *Emotional stress:* depression, frustration, anxiety, lack of fulfilment and insecurity.
- *Physical factors:* fatigue, increased heart rates, sweating and sleeplessness.

Miller (2001:10) states that with psychosocial stress an employer has a responsibility to recognise when a problem exists and the employee has the responsibility to communicate his/her needs and help solve the problem.

2.2.4.3 Physiological predisposition

Miller (2001:10) describes physiological predisposition as musculoskeletal disorder risk factors that arise from the individual employee's physiology. The causes of musculoskeletal disorders are complex and not completely predictable. Many people with ergonomic risk factors do not develop musculoskeletal disorders; others get musculoskeletal disorders for no obvious external reason. There is also evidence that employees who start a new job are more prone to developing musculoskeletal disorders. One possible reason for this is that employees are not physically conditioned for the particular activities that the new job requires. Some research has also found an apparent

correlation between certain physical conditions and musculoskeletal disorders. Some of these physical conditions are:

- vitamin B-6 deficiency;
- diabetes;
- obesity;
- rheumatoid arthritis;
- taking oral contraceptives;
- gynaecological surgery; and
- small or square wrists

Risk increases as the frequency, duration, or intensity of these exposures increases, or multiple risk factors occur at the same time. Fewer injuries and less severe injuries would occur by reducing the number and frequency of exposures (Miller, 2001:10).

According to the Washington State Department of Labor and Industries (2002:6-9) ergonomists have examined a number of jobs where there have been a high incidence of work-related musculoskeletal disorders, and have found some common elements present in each of these jobs that are associated with these injuries. These elements are called “risk factors”, because exposure to these increases the possibility that an employee will become injured.

The Workers Compensation Board in Alberta (2007:7) has grouped the risk factors into physical, psychological, organisational and environmental factors that will be discussed in the section to follow.

2.2.4.4 Physical factors

Physical factors such as force, posture and frequency or period of work are associated with the likelihood of developing work-related musculoskeletal disorders. The reason for this is that it places strain on the joints and muscles. The Workers Compensation Board in Alberta (2007:7) argues that physical factors have the most direct influence on the development of work-related musculoskeletal disorders.

The following are examples of physical risk factors that are found in computer and office work, some or all of that may be present at the same time:

- Force

Many office tasks require a moderate amount of force to be applied by very small muscles. This force may cause fatigue, swelling, muscle strains and ligament strains (Washington State Department of Labor and Industries, 2002:8).

Ontario Ministry of Labor (2009d) defines force as the amount of effort exerted by the muscles. All tasks require employees to use their muscles to exert some level of force. However, when a task requires them to exert a level of force that is too high for any particular muscle, it can damage the muscle or the related tendons, joints and other soft tissue. This damage can occur from a single movement or action that requires the muscles to generate a very high level of force. However, more commonly, the damage results when muscles generate moderate to high levels of force repeatedly for a long period, and/or while the body is in an awkward posture. The activities that often involve high force requirements include lifting, lowering, carrying, pushing or pulling, gripping and manipulating objects. Some tasks result in high force loads on different parts of the body, for example, lifting a heavy load that is far from the body increases the load on the lower back. This can potentially damage both the spinal discs and the vertebrae. Another source of force on the body comes from working with hand tools that have hard or sharp edges, e.g. resting the forearms on the hard edge of a desk, can also potentially cause damage to tendons, muscles, blood vessels and nerves under the skin. This is often referred to as contact stress.

The following parameters are important to understand the impact of force:

- weight of objects;
- how long a forceful effort has to be exerted;
- how many times in a given period it has to be exerted; and
- the posture that the body is in.

The Government of Newfoundland and Labrador (2009:5) describes forceful exertions as the effort that an employee must exert to counteract a load. This load may be experienced in the body through tension (such as muscle tension), pressure (such as increased pressure in the carpal canal), or irritation (such as irritation of a peripheral nerve). The greater the magnitude/intensity of the force, the greater is the risk of causing a work-related musculoskeletal injury. This type of force can

typically be exerted when performing manual tasks (e.g. lifting, pushing, pulling, etc.) however; it can also be encountered in the use of poor or awkward postures or forceful gripping and other physical tasks.

The Washington State Department of Labor and Industries (2002:8, except where otherwise indicated) provided the following computer and office work examples where force is used:

Computer work:

- “Dragging and dropping” with the mouse;
- gripping the sides of the mouse tightly;
- “pounding” on the keyboard; and
- squeezing the mouse and forcefully pushing down with the finger when clicking (Workers Compensation Board, Alberta, 2007:7).

Office work:

- Grasping thick folders or manuals;
- stapling or stamping by hand;
- opening 2-ring binders;
- lifting heavy manuals with one hand;
- attaching high tension paper clips to thick bundles of paper (Martin, no date); and
- gripping a pen or pencil and pressing down heavily on paper while writing (Workers Compensation Board, Alberta, 2007:7).

- Posture

The Government of Newfoundland and Labrador (2009:6) maintains that “postures” refer to the position of body parts during any activity. Most joints are in a “neutral” posture when they are being used near the middle of their full range of motion. An “awkward posture” refers to a posture that is not neutral such as overhead reaching. The more awkward the posture, the further from neutral that a joint moves, the more strain is put on the muscles, tendons and ligaments around the joint.

Postures to avoid include:

- twisting the torso;
- shoulder abduction or flexion;

- flexion or extension of the wrist;
- ulnar deviation of the wrist;
- squatting, stooping and bending;
- flexion or extension of the neck; and
- rotation or side bending of the neck.

Ontario Ministry of Labour (2009c) maintains that posture is another name for the position of various parts of the body during any activity. For most joints, a good or “neutral” posture means that the joints are being used near the middle of their full range of motion. The farther a joint moves towards either end of its range of motion, or the farther away from the neutral posture, the more awkward or poor the posture becomes and the more strain is put on the muscles, tendons and ligaments around the joint. For example, when arms are fully stretched out, the elbow and shoulder joints are at the end of their range of motion. If the employee pulls or lifts repeatedly in this position, there is a higher risk of injury. With fixed or awkward postures, it is important to consider the following:

- how long employees need to hold a specific posture (fixed posture);
- how many times an awkward posture is used in a given period of time; and
- the amount of force being exerted when an awkward posture is used.

According to the Washington State Department of Labor and Industries (2002:6) examples of awkward postures are:

Computer work:

- Capturing data with bent wrists;
- turning the head to the side to view the monitor;
- reaching up and over the keyboard to use the mouse; and
- leaning over to capture data from papers laying flat on the desktop.

Office work:

- Slouching or leaning forward in the chair;
- cradling the phone between the ear and the shoulder;
- elevating the arms when writing on a work surface that is too high;
- bending at the waist to load copy machines; and
- tucking one leg underneath and sitting on it while working at a desk (Workers Compensation Board, Alberta, 2007:7).

- Repetition

Ontario Ministry of Labour (2009e) maintains that the risk of developing a musculoskeletal disorder increases when the same parts of the body are used repeatedly, with few breaks to rest. Highly repetitive tasks can lead to fatigue, tissue damage and, eventually, pain and discomfort. The musculoskeletal disorder risk increases if the repetitive action also requires high force and/or an awkward posture.

The musculoskeletal disorder risk associated with repetition increases as

- the number or speed of actions increases;
- the muscles being used have to exert higher levels of force;
- the joint of the body moves farther away from the neutral position; and
- the length of time the task is done without a break increases.

The Workers Compensation Board in Alberta (2007:7) maintains that even if an employee does not use excessive force and, even if the employee maintains a good posture while working, the simple repetition of tasks and movements for long periods can cause a work-related musculoskeletal disorder.

Examples given by the Washington State Department of Labor and Industries (2002:6) of repetition are:

Computer work:

- Capturing data on a keyboard for several hours;
- moving and clicking the mouse; and
- looking back and forth between the monitor and source documents.

Office work:

- Flipping through files and paperwork;
- using a calculator;
- stapling and punching holes in paperwork by hand; and
- writing by hand.

The Government of Newfoundland and Labrador (2009:6) maintains that awkward body postures, repetitive and forceful tasks that are held or performed for long periods can cause muscles to tire quickly and to become prone to injury. “Period”,

time taken to perform a task or holding a posture should be considered in combination with each of the previous three risk factors. For example:

- For how long is the employee using force? (e.g. to grasp or hold an object)
- For how long is the employee performing a repetitive task?
- For how long does the employee work in an awkward posture?

- Static loading or sustained exertions

One of the risk factors that have increased in the computerised office is static loading, where the muscles must hold the body in a single position for a long period. This lack of movement reduces circulation and causes muscle tension that can contribute to or aggravate an injury. Sustained exertions are a type of static loading where force is applied continuously for long periods (Washington State Department of Labor and Industries, 2002:6).

According to Triano and Selby (2006), the healthy body can only tolerate staying in one position for about 20 minutes. That is why sitting at a desk in an office chair becomes uncomfortable after a short time. Standing in one place for extended periods tends to cause back pain. Holding the same position slowly diminishes elasticity in the soft tissues (muscles, ligaments and tendons in the back). Consequently, stress builds up and causes back discomfort and/or leg discomfort. The solution is to change positions frequently, to stand up or sit down, or stretch or to take a short walk. After returning to the standing or sitting posture, use an alternate posture for just a few moments and some of the required tissue elasticity to protect the joints will return.

According to the Washington State Department of Labor and Industries (2002:6), examples of static loading are:

Computer work:

- Holding the hands in place above the keyboard or mouse;
- looking down at documents placed flat on the desk;
- holding down the shift key; and
- keeping the head still while reading from the monitor.

Office work:

- Sitting upright without back support;

- holding the handset while talking on the telephone;
 - sitting still for long periods of time; and
 - holding boxes in the hands while carrying these for long distances.
- Mechanical/Local contact stress

The Government of Newfoundland and Labrador (2009:7), defines local contact stresses as physical contact between body tissues and objects in the work environment such as tools, machinery, and products. Local contact stress, when applicable, usually involves the knee, shoulder, elbow, wrist, or hand. Point pressure may also occur at the sides of fingers. Excessive, repeated or prolonged pressure over these areas may inhibit nerve function and/or blood flow.

According to the Washington State Department of Labor and Industries (2002:8), a hard or sharp surface or object pressing into the soft tissues (the tendons, nerves and blood vessels) can cause damage that can result in serious injury over time. For example:

Computer work

- Resting wrists on the desk edge while capturing data or using the mouse;
- leaning the elbows on hard chair armrests or work surfaces; and
- capturing data with palms resting on the hard lip of a keyboard tray.

Office work

- Using rubber stamps with handles that press into the palm of the hand;
- using scissors with hard, metal handles; and
- sitting in a chair that places pressure on the backs of the thighs.

According to the Washington State Department of Labor and Industries (2002:9), a longer period of exposure to any of the above risk factors, results in a greater potential for injury. Complaints of discomfort and reports of injury are higher for employees who spend six or more hours a day doing repetitive data entry compared to those who only spend an average of two hours per day repetitively capturing data. In addition, common tasks such as using the mouse and stapling by hand show up more than once. Combinations of risk factors associated with one task further increase the likelihood of work-related musculoskeletal disorders. For example, repetitive arm motions when using the mouse are much more likely to result in shoulder injury if the mouse is beyond the keyboard, forcing the

employee to elevate their arms and work in an awkward posture. Environmental factors (lighting, temperature, noise) and organisational factors (job design, work schedules) can also increase the risk of injury, as well as cause other problems that affect employee performance.

2.2.4.5 Psychological or Organisational factors

Workers Compensation Board in Alberta (2007:8-9) maintains that stress is an indirect cause of work-related musculoskeletal disorders because it is not the stress that causes injury but it is the body's physical reaction to stress that can cause or aggravate an injury. It is therefore important to identify the causes of stress in order to focus on reducing the factors causing stress. Examples of stressors at work are:

- Cognitive (mental) effort
Employees can develop stress when they are overloaded with work. If an employee experiences a lack of time or resources, the employee stresses about his/her ability to perform the task well. Decreasing workload and minimising the need for overtime can alleviate stress.
- Psychosocial
An employee's perception of how well co-employees interact with him/her, how work is organised and how often the employee is supervised can be sources of stress. Lack of job clarity and general job dissatisfaction can also cause stress.
- Organisational
Varying work schedules, such as shift work, can affect an employee's sleep and eating patterns, as well as the employee's family and other social interaction. Stress and poor health habits can increase the likelihood of injury at the office. Employees doing overtime are exposed to longer hours of repetitive tasks that may also increase the chance of injury.

Shaver (2010) provided the following categories of stressors that can be found in the workplace:

- Physical stressors: noise, heat, cold, vibrations, dirt, chemical and toxic substances.
- Task-related stressors: time pressure, work overload, work complexity, monotonous work and disruptions.
- Work-schedule stressors: night work, shift work, long hours and overtime.

- Social stressors: interpersonal conflicts, harassment and bullying.
- Role stressors: ambiguity and conflict.
- Career-related stressors: job insecurity and poor career opportunities.
- Organisational stressors: mergers, downsizing, re-organisation and technology implementation.
- Traumatic stressors: disasters, major accidents and dangerous activities.

According to Shaver (2010), these stress reactions can lead to a variety of organisational problems including:

- absenteeism;
- decreased employee performance;
- increased turnover rate;
- increased health care costs;
- temporary or permanent disability and
- work-place violence.

2.2.4.6 Environmental factors

The Workers Compensation Board in Alberta (2007:9) lists some environmental factors that may contribute to developing work-related musculoskeletal disorders while others simply reduce productivity. Examples include:

- **Lighting**
Office work is not known to cause permanent vision or eye problems, but sometimes employees can experience eyestrain due to poor lighting.
- **Temperature**
Cold temperatures can constrict blood vessels and reduce sensitivity and coordination of body parts.
- **Noise**
Office noise would probably not cause hearing damage, but limiting office noise can facilitate concentration, prevent stress and annoyance.

2.2.4.7 Factors outside of work

The phrase “work-related” in work-related musculoskeletal disorders implies that workplace factors may not always be the sole or primary cause of the injury. Other factors that have been associated with work-related musculoskeletal disorders include:

- poor physical condition;
- lack of flexibility;
- recreational activities that involve the risk factors described previously;
- computer use at home;
- predisposing medical conditions (previous joint injury, some forms of diabetes, pregnancy). Many predisposing medical conditions increase the risk of work-related musculoskeletal disorders by causing swelling in the joints, such as fluid retention during pregnancy. It is important that any such medical conditions be properly diagnosed and treated (Washington State Department of Labor and Industries, 2002:9).

Ranney (2011) summarised it well by stating: “Work can cause pain.” He maintains that any strong effort exerted over a long time usually causes some degree of pain, or at least discomfort. Usually the tissues strengthen with mild overuse, but too much overuse, causes injury. Certain conditions at work (risk factors) increase the risk of an individual developing a chronic work-related musculoskeletal injury. All potential health effects depend on the length of exposure to the conditions, the magnitude or size of the stressor, and the variation of the exposure. All contributing factors up until the point when it becomes necessary to create an injury report are illustrated in Figure 2.2.1.

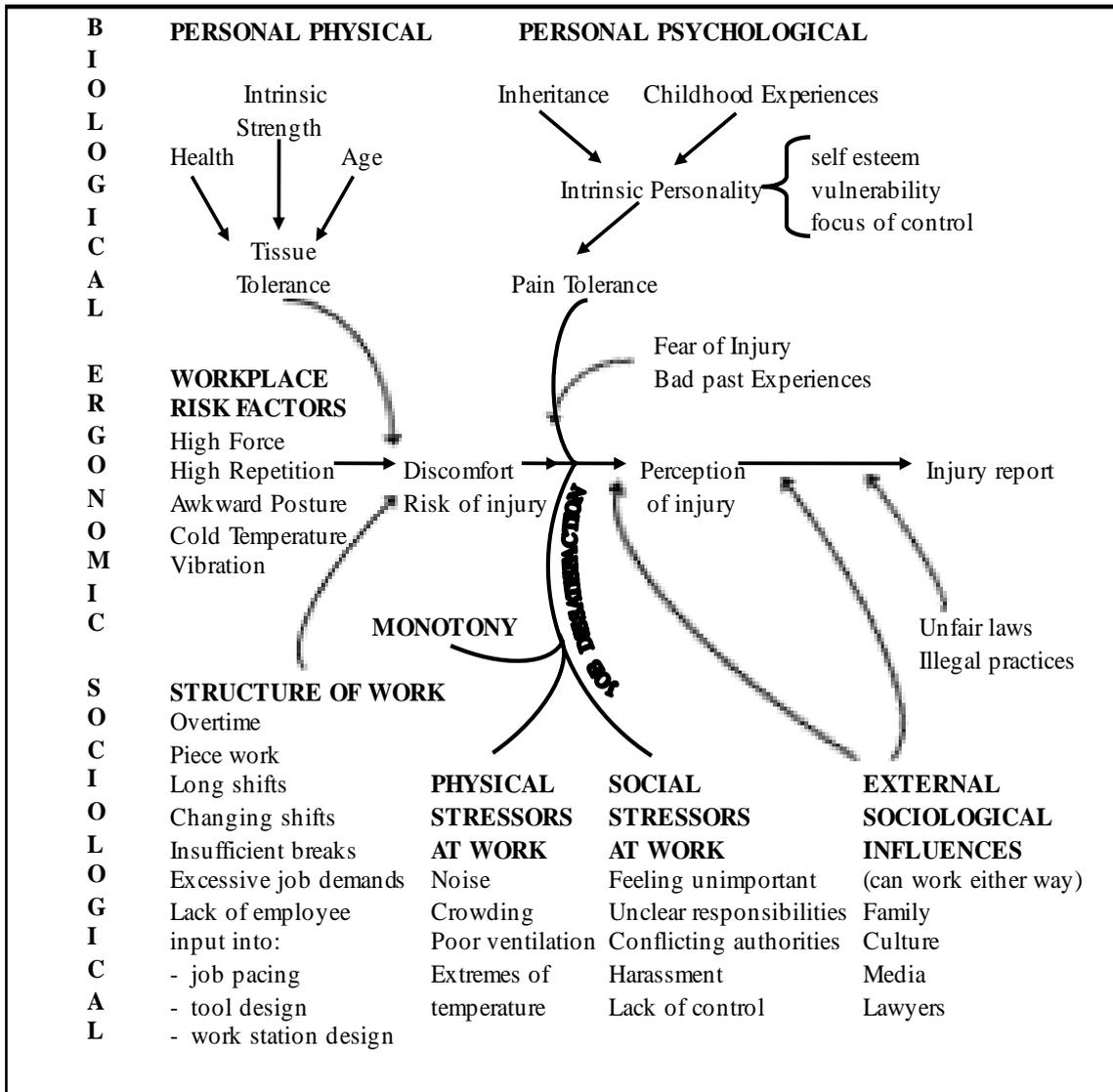


FIGURE 2.2.1: CONTRIBUTING FACTORS TO CREATE AN INJURY REPORT
 (Ranney, 2011)

2.2.5 Clinical signs/symptoms and development of work-related upper limb disorder

The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:4-5) states that although clinical signs will vary according to the type of work-related upper limb disorder, common signs include the following:

- muscle spasm;
- muscle weakness;
- reduction in range of movement;
- tender trigger points in muscles;
- tenderness;
- burning sensation;
- fatigability;
- loss of grip strength;
- loss of normal sensation;
- stiffness and cramps;

- pain;
- paraesthesia (tingling);
- sensation of cold; and
- swelling crepitus (crackling sound in subcutaneous tissue).

EasyDSE (2006b) identified the following symptoms in addition to the above symptoms:

- pins and needles;
- ganglion; and
- joint restriction/loss of movement.

2.2.6 Classification of work-related upper limb disorders according to the effect on specific tissue

The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:2) classify work-related upper limb disorders into the following problem groups:

- nerve-related disorders;
- tendon-related disorders;
- bursa-related disorders;
- circulatory (blood vessel) disorders; and
- other (muscle and joint-related disorders).

Figure 2.2.2 provides an overview of the most common work-related musculoskeletal disorders affecting the nerves, tendons, bursae, muscles and blood vessels and spinal discs.

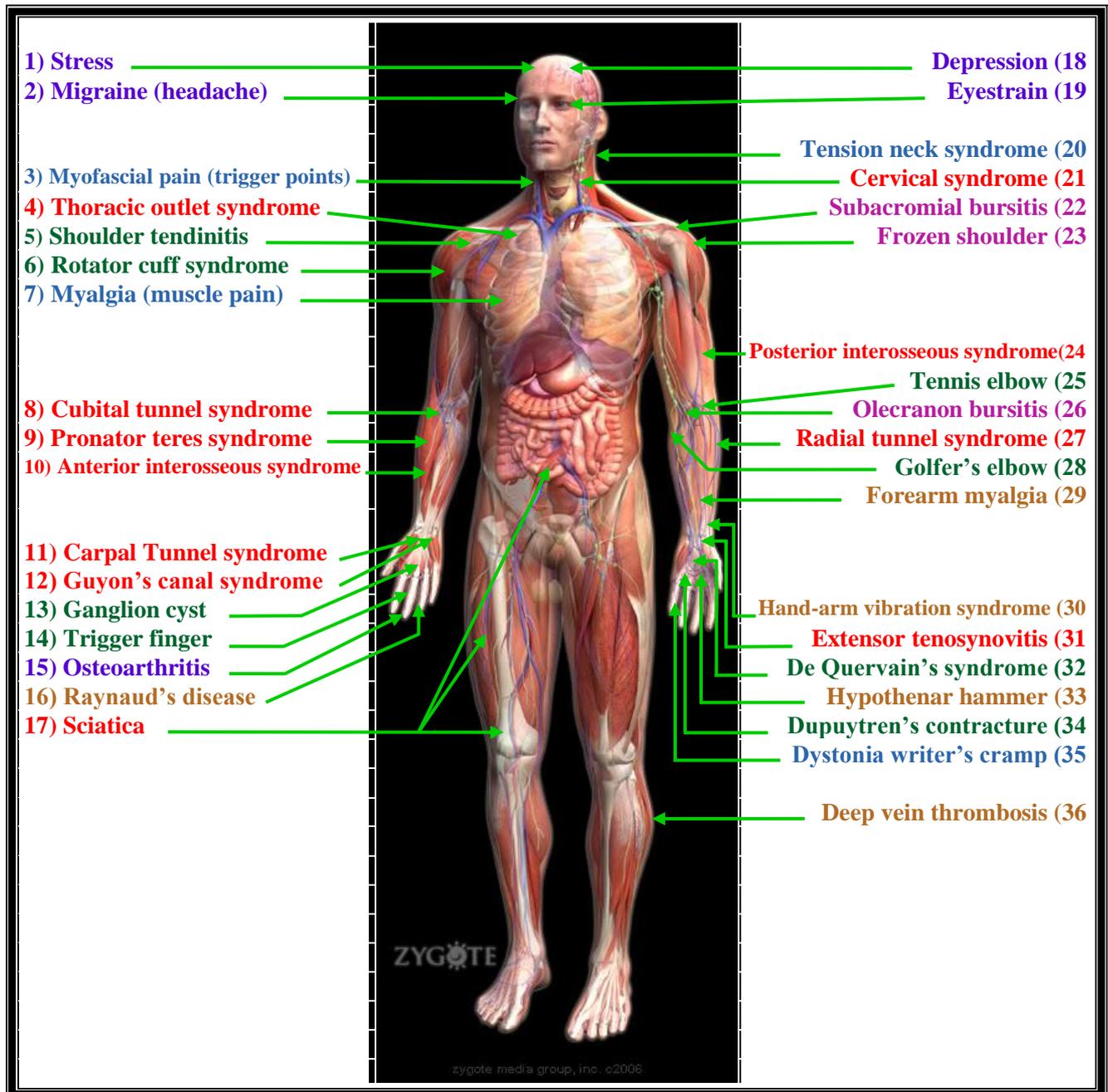


FIGURE 2.2.2: WORK-RELATED MUSCULOSKELETAL DISORDERS

(Image: Zygote media group, Inc, 2006)

(Strydom, 2013)

Table 2.2.2 provides a summary of the work-related musculoskeletal disorders as illustrated in Figure 2.2.41.

**TABLE 2.2.2: WORK-RELATED MUSCULOSKELETAL DISORDERS
SUMMARISED**

Nerve-related disorders	4, 8, 9, 10, 11, 12, 17, 21, 24, 27, 31
Tendon-related disorders	5, 6, 13, 14, 25, 28, 32, 34
Bursa-related disorders	22, 23, 26
Circulatory disorders	16, 30, 33, 36
Muscle-related disorders	3, 7, 20, 29, 35,
Other	1, 2, 15, 18, 19

The majority of these work-related musculoskeletal disorders will be discussed in the next section according to the identified problem groups.

2.2.6.1 Nerve-related disorders

Nerves supply the organs, muscles and other body tissues with information from the brain in the form of electrical impulses. At various places along the nerve pathways to the upper limbs, nerves can be trapped. Possible sites of nerve entrapment, due to tendon or muscle inflammation, include the wrist, arms, neck, and shoulder. It is even possible for nerves to be compressed in more than one location at the same time, a “double-crush” (Repetitive Strain Injury Awareness, 2007f).

- **Carpal tunnel syndrome**
 Mayo Clinic (2011c) maintains that carpal tunnel syndrome is a condition born from amongst others; long hours spent working on a computer keyboard. Bound by bones and ligaments, the carpal tunnel is a narrow passageway located on the palm side of the wrist. This tunnel protects a main nerve to the hand and nine tendons that bend the fingers. Pressure placed on the nerve produces the numbness, pain and, eventually, hand weakness that characterise carpal tunnel syndrome. According to Mayo Clinic (2011b) and Repetitive Strain Injuries Awareness, (2007b) the cause of carpal tunnel syndrome is pressure on the median nerve. The median nerve is a mixed nerve, meaning it has a sensory function and provides nerve signals to move the muscles (motor function). Pressure on the nerve can stem from anything that reduces the space for it in the carpal tunnel. Possible causes of carpal tunnel syndrome include other health conditions such as rheumatoid arthritis, diabetes, thyroid disorders, menopause and fluid retention due

to pregnancy. Another cause may be pressure within the carpal tunnel due to the repetitive flexing and extending of the tendons in the hands and wrists, particularly when done forcefully and for prolonged periods without rest.

- Guyon's tunnel syndrome

eOrthopod (2011) defines Guyon's tunnel syndrome as a common nerve compression affecting the ulnar nerve as it passes through a tunnel in the wrist called Guyon's canal. According to eOrthopod (2011), Guyon's canal syndrome is caused by overuse of the wrist from heavy gripping, twisting, and repeated wrist and hand motions. A traumatic wrist injury may cause swelling and extra pressure on the ulnar nerve within the canal. Working with the hand bent down and outward can squeeze the nerve inside Guyon's canal; and lastly pressure of the ulnar nerve can cause Guyon's canal syndrome.

- Cubital tunnel syndrome

According to Repetitive Strain Injury Awareness (2007d) and Thomas (2009), cubital tunnel syndrome (also called cell phone elbow) occurs when the ulnar nerve is obstructed during its path along the cubital tunnel; the bony bump on the inside of the elbow. Symptoms include numbness, tingling, or aching in the forearm and hand, a pain similar to hitting the "funny bone." Symptoms include a loss of muscle strength, coordination and mobility that can make writing and typing difficult. In chronic, untreated cases, the ring finger and pinky can become clawed.

The Picky (2010) maintains that cell phone elbow syndrome shows that we are absolutely in a wired era with the increased use of cell phones. With prolonged cellular telephone use, cell phone users may notice the numbness, aching, burning, or tingling in the ulnar forearm and hand. When people hold their elbow flexed for a prolonged period, such as when speaking on the phone, the ulnar nerve is placed in tension. Leaning on an elbow while working, and sitting at a computer workstation that requires elbow flexion greater than 90 degrees may cause cubital tunnel syndrome.

- **Pronator teres syndrome**

According to Repetitive Strain Injury Awareness (2007p), the pronator teres is a muscle in the forearm that is used in the act of turning the hand so the palm faces downwards (pronation).

According to the Hand and Wrist Centre of Houston (2013), pronator syndrome is compression of the median nerve by the forearm muscles. This is the same nerve as in carpal tunnel syndrome. The difference, besides location, is that muscular compression of the nerve is an on and off phenomenon occurring with use of the forearm muscles for powerful gripping and especially twisting activities. Symptoms are a deep ache in the forearm with radiation down towards the wrist and hand. Numbness and tingling can occur in the thumb, index, long, and ring fingers.

- **Radial tunnel syndrome**

According to Skill Builders (2009), radial tunnel syndrome happens when the radial nerve is squeezed where it passes through a tunnel near the elbow. If the tunnel is too small, it can squeeze the nerve and cause pain. Repetitive, forceful pushing and pulling, constant twisting movements of the arm, bending of the wrist, gripping, and pinching can stretch and irritate the nerve leading to radial tunnel syndrome.

- **Anterior interosseous nerve syndrome**

According to Right Health (2010a), anterior interosseous nerve syndrome is a medical condition in which damage to the anterior interosseous nerve, a motor branch of the median nerve causes pain in the forearm and a characteristic weakness of the pincer movement of the thumb and index finger. Most cases of this syndrome are due to compression of the nerve because of trauma at the elbow.

- **Posterior interosseous nerve syndrome**

According to Right Health (2010b) and New York University Medical Center (2013), the posterior interosseous nerve is a nerve in the forearm. It is the continuation of the deep branch of the radial nerve, after it has crossed the supinator muscle. The posterior interosseous nerve may be compressed where it passes through the supinator muscle in the proximal forearm. This nerve controls

finger extension, and to a small degree, wrist extension. Symptoms are pain and tenderness in the proximal forearm during activity and some degree of finger extension weakness (finger drop) compared to the normal arm.

- Thoracic outlet syndrome

Thoracic outlet syndrome is the term used to describe the symptoms produced from compression of **nerves** or blood vessels running through the thoracic outlet. The thoracic outlet is the space between the collarbone (clavicle) and the first rib. This can cause pain in the shoulders and neck and numbness in the fingers. In general, the cause of thoracic outlet syndrome is compression of the nerves and blood vessels in the thoracic outlet, just under the collarbone (Repetitive Strain Injury Awareness, 2007t & Mayo Clinic, 2013j).

According to Mayo Clinic (2013i) the cause of the compression itself, can include drooping of the shoulders, holding the head in a forward position, repeating a movement continuously, such as typing on a computer, working on an assembly line, stocking shelves and repeatedly lifting things above the head.

- Cervical syndrome

Repetitive Strain Injury Awareness (2007c) describes cervical syndrome as a term covering several conditions of the cervical (neck) area. Cervical spondylosis involves degeneration of the cervical vertebrae (the seven bones making up the neck region of the spine). Cervical spondylitis is inflammation of the synovial joints between the cervical vertebrae. This is osteoarthritis of the neck. Nerve-roots originating from the neck area may also become irritated. Cervical syndromes are common in people who perform repetitive motions of the shoulder or have to maintain a fixed neck position while making repetitive motions of the hands.

- Sciatica

Sciatica refers to pain that radiates along the path of the sciatic nerve and its branches, from the back down the buttock and leg. The sciatic nerve is the longest nerve in the body. It runs from the spinal cord to the buttock and hip area and down the back of each leg. According to Mayo Clinic (2012i), the radiating pain of sciatica signals another problem involving the nerve, such as a herniated disk. The

pain can vary widely, from a mild ache to a sharp, burning sensation or, excruciating discomfort. Prolonged sitting can aggravate the symptoms (Mayo Clinic, 2012j).

2.2.6.2 Tendon-related disorders

Tendons are rope or cord-like structures that connect muscles to bones in order to work the joints of the body. When any group of tendons are overused, microscopic tears can result, leading to inflammation. Even the slightest contraction of the muscle can then result in further irritation. This tender swelling is usually referred to as tendinitis and more commonly affects the hand, wrist, elbows, and shoulders, though it may occur at any joint in the body (Repetitive Strain Injury Awareness, 2007k).

Tendinosis, sometimes called chronic tendinitis, tendinosus, chronic tendinopathy or chronic tendon injury, is damage to a tendon at a cellular level (the suffix “osis” implies a pathology of chronic degeneration without inflammation). It is caused by micro tears in the connective tissue in and around the tendon, leading to an increase in tendon repair cells (Right Health, 2010c).

Tendonitis is inflammation of tendons and of tendon-muscle attachments and usually occurs at the part of the tendon that attaches to the bone. The main symptoms are pain, tenderness, and sometimes swelling of the affected part of the tendon. The pain is normally experienced when a person moves the affected area (Patient.co.uk, 2013a).

- **Epicondylitis**
Epicondylitis is a condition affecting the elbow. It is characterised by pain at the epicondyle, the bony parts on the inside and outside of the elbow joint. It is commonly known as tennis elbow in the lateral aspect (outside) and golfer’s elbow in the medial aspect (inside). Epicondylitis is the result of some kind of muscle lesion or inflammation of tendons at the point where they attach to the bone (Repetitive Strain Injury Awareness, 2007h).
 - *Tennis elbow* (lateral epicondylitis) is caused by repeated contraction of the forearm muscles that is used to straighten and raise the hand and wrist. The repeated motions and stress to the tissue may result in inflammation or a series of tiny tears in the tendons that attach the forearm muscles to the bone

at the outside of the elbow. The pain of tennis elbow occurs primarily where the tendons of the forearm muscles attach to the bony prominence on the outside of the elbow (lateral epicondyle). Pain can also spread into the forearm and wrist (Mayo Clinic, 2013f).

- *Golfer's elbow* (medial epicondylitis) is pain and inflammation on the inner side of the elbow, where the tendons of the forearm muscles attach to the bony bump on the inside of the elbow. The pain may spread into the forearm and wrist (Mayo Clinic, 2012g). Golfer's elbow is caused by damage to the muscles and tendons that control the wrist and fingers. The damage is typically related to excess or repetitive stress, especially forceful wrist and finger motions. Activities such as painting, raking, hammering, typing, and other repetitive wrist, hand, or arm movements can cause golfer's elbow (Mayo Clinic, 2012f).

- Tenosynovitis

A sheath called the synovium covers some tendons. The synovium makes a tiny amount of 'oily' fluid that lies between the tendon and its overlying sheath. The fluid helps the tendon to move freely and smoothly when it pulls on the bone that it is attached to (Patient.co.uk, 2013a).

Tenosynovitis involves inflammation of the protective sheaths surrounding some tendons (the rope or cord-like structures that connect muscles to the bones). It most commonly affects the tendons of the hand, wrist, and arms, although it may occur at other tendon sites. When the gliding surfaces of the tendon and sheath become roughened and inflamed from overuse, tenosynovitis will be present as aching, tenderness, and swelling of the affected area (Repetitive Strain Injury Awareness, 2007r).

- Dupuytren's contracture

Mayo Clinic (2012c) and Repetitive Strain Injury Awareness (2007g) describes Dupuytren's contracture as a hand disorder in which the fingers bend towards the palm and cannot be straightened. The little and ring fingers are most commonly affected but all the fingers can be affected. In patients with this condition, scar tissue accumulates under the skin on the palm of the hand. The tissue (fascia)

thickens and shortens so that tendons connected to the fingers cannot move freely. Dupuytren's contracture progresses slowly and is usually painless.

- **Rotator cuff impingement syndrome**
The rotator cuff is made up of the muscles (subscapularis, supraspinatus, infraspinatus, and teres minor) and tendons in the shoulder. These muscles and tendons connect the upper arm bone (humerus) with the shoulder blade (scapula). They also help hold the ball of the upper arm bone firmly in the shoulder socket (Mayo Clinic, 2010a). According to Mayo Clinic (2010b) a rotator cuff injury, involves any type of irritation or damage to the rotator cuff muscles or tendons. Common causes of rotator cuff injuries could be when a person slouches the neck and shoulders forward or repeatedly lift heavy objects above the head causing inflammation and eventually tearing.
- **Ganglion cyst**
Repetitive Strain Injury Awareness (2007i) defines a ganglion cyst as a bump or mass that forms under the skin. Inside the cyst is a thick fluid similar to that found in joints or around tendons. They can be painless but are often associated with tenderness that may restrict the range of movements. Most commonly, ganglions are seen on the wrist (usually the backside) and fingers, but they can also develop on the shoulder, elbow, or knee. These form when tissues surrounding certain joints become inflamed and swell up with lubricating fluid. They can increase in size when the tissue is irritated.
- **De Quervain's syndrome**
When a person grips, grasps, clenches, pinches or wrings anything in his/her hand, he/she uses two major tendons in the wrist and lower thumb. These tendons run side by side from the forearm through the thumb side of the wrist. These normally glide unhampered through the small tunnel that connects them to the base of the thumb. In De Quervain's tenosynovitis, the tendons' slippery covering becomes inflamed, restricting movement of the tendons. Chronic overuse of the wrist is commonly associated with De Quervain's tenosynovitis (Mayo Clinic, 2012b).

- Trigger finger/thumb

According to Mayo Clinic (2011i), the cause of trigger finger/thumb is a narrowing of the sheath that surrounds the tendon in the affected finger. Each tendon is surrounded by a protective sheath that is lined with a substance called tenosynovium. The tenosynovium releases lubricating fluid that allows the tendon to glide smoothly within its protective sheath as a person bends and straightens the finger. If the tenosynovium becomes inflamed from repetitive strain injury or overuse, the space within the tendon sheath becomes narrow and constricting. The tendon cannot glide through the sheath easily, at times catching the finger in a bent position before popping straight. With each catch, the tendon itself becomes irritated and inflamed, worsening the problem. With prolonged inflammation, scarring and thickening (fibrosis) can occur and bumps (nodules) can form.

2.2.6.3 Bursa-related disorders

Bursae cushion the movement between the bones, tendons, and muscles near the joints. There are over 150 bursae in the human body. Usually bursae are present from birth, but they may form in response to repeated pressure. Each sac contains a small amount of synovial fluid, a clear liquid that acts as a lubricant. Inflammation causes pain on movement (The free dictionary by Farlex, 2013a).

- Bursitis

Bursitis is a painful condition that affects the small fluid-filled pads (bursae) that act as cushions among the bones and the tendons and muscles near the joints. The most common locations for bursitis are in the shoulders, elbows, or hips but also in the knee, heel, and the base of the big toe. Bursitis often occurs in joints that perform frequent repetitive motion (Mayo Clinic, 2011a & Repetitive Strain Injuries Awareness, 2007a).

- Olecranon bursitis

According to Patient.co.uk (2013b), the olecranon is the top part of the bone called the ulna. It is the bony part of the back of the elbow on which a person would lean on. Olecranon bursitis means inflammation of the bursa at the back of the elbow over the olecranon. The bursa may fill with fluid and it then looks like a small soft

ball (like a cyst) and are painless, or are only mildly painful. The movement of the elbow joint is not affected.

- Subacromial bursitis
Subacromial bursitis is a painful inflammation of a bursa in the shoulder joint, typically caused by overuse, injury or ageing (Mayo Clinic, 2011h).
- Frozen shoulder (Adhesive capsulitis)
According to Chiropractic-Help (2013), frozen shoulder is a condition that causes substantial loss of movement in the shoulder joint. The joint capsule becomes shortened and tight, and adheres to the bone. Hence, the complete medical name for frozen shoulder is an adhesive capsulitis. Irritation of the nerves from the lower neck to the muscles, tendons, ligaments, or capsule is usually, but not always, central to this condition.

2.2.6.4 Circulatory disorders

A healthy circulatory system is essential for the body, since it is responsible for supplying nutrients and oxygen to the body cells and tissues. With each heartbeat, blood is pumped into the blood vessels in order to deliver the essential nutrients required for survival to the various parts of body. The circulatory system or cardiovascular system comprises the blood, heart and blood vessels. The blood consists of the red blood cells, white blood cells, platelets and blood plasma. The blood vessels, on the other hand, comprise the veins, arteries, arterioles and capillaries. All of these parts contribute to the proper functioning of the circulatory system. A disorder in any of the parts can cause certain health complications that may vary from a mild disease to a life-threatening condition (Buzzle.com, 2014).

Microscopic analysis reveals that blood vessel walls thicken and narrow in regions of repetitive strain injury. An interruption to the blood flow can also result from compression of a nerve due to swollen tissues. The blood vessels therefore constrict and dilate inappropriately (Repetitive Strain Injury Awareness, 2007q).

- Raynaud's disease (White finger)

According to Mayo Clinic, (2011e) Raynaud's disease is a condition that causes some areas of the body to feel numb and cool in response to cold temperatures or stress. In Raynaud's disease, smaller arteries that supply blood to the skin narrow, limiting blood circulation to affected areas. Women are more likely to have Raynaud's disease. During an attack of Raynaud's disease, affected areas of the skin usually turn white at first. Then, the affected areas often turn blue, feel cold and numb, and sensory perception is dulled. As circulation improves, the affected areas may turn red, throb, tingle, or swell. The order of the changes of colour is not the same for all people, and not everyone experiences all three colours. Occasionally, an attack affects just one or two fingers or toes. An attack may last less than a minute to several hours (Mayo Clinic, 2011f).
- Hand-arm vibration syndrome (Vibration white finger)

MedicineNet.com (2014) and Repetitive Strain Injury Awareness (2007w) defines vibration white finger as a condition in which the blood supply is interrupted, the result of a constriction of the blood vessels in the hand due to prolonged exposure to vibration. The fingers become white and swollen when cold and red and painful when warmed up again. Cold or wet weather may aggravate the condition. Picking up objects such as pins or nails becomes difficult as the feeling in the fingers diminishes and there is loss of strength and grip in the hands.
- Hypothenar hammer syndrome

According to Repetitive Strain Injury Awareness (2007j), the 'hypothenar eminence' refers to the fleshy edge of the palm between the little finger and the wrist. Hypothenar hammer syndrome is a thrombosis (clot) in the ulnar artery in the palm of the hand, often caused by repeated pounding of the base of the hand in occupations such as roofing, hence the name 'hammer' syndrome.
- Deep vein thrombosis

According to Mayo Clinic (2013a), deep vein thrombosis is a condition in which a blood clot (thrombus) forms in one or more of the deep veins in the body, usually in the legs. Deep vein thrombosis can develop if a person is sitting still for a long

time, such as working on a computer, travelling by plane or car, or if a person has certain medical conditions that affect how the blood circulates and clots. Deep vein thrombosis is a serious condition because a blood clot that has formed in a vein can break loose and travel to the lungs.

2.2.6.5 Muscle-related disorders

Muscle is a body tissue containing cells that contract to allow for bone movement. When these movements are quick and repetitive, normal blood flow and oxygen exchange with the muscle cells are inhibited. This can lead to pain, inflammation, and scar tissue. Muscle pain can also result from holding a fixed position for a long time. The muscles and other structures under the skin are wrapped in a connective tissue called fascia. With overuse injuries, the fascia becomes constricted, loses its elasticity, and causes the contraction of muscles to be less efficient. As the muscles bind together, friction between them increases and a vicious cycle ensues (Repetitive Strain Injury Awareness, 2007u).

- Tension neck syndrome
Tension neck syndrome can result from a number of factors, including holding a static posture. Symptoms include fatigue and stiffness in the neck, neck pain, and headache radiating from the neck. There may be some muscle spasm (Repetitive Strain Injury Awareness, 2007s).
- Muscle sprain and strain
Mayo Clinic (2011g) maintains that sprains and strains are common injuries that share similar signs and symptoms, but involve different parts of the body. A sprain is an injury to a ligament, caused by sudden overstretching. A ligament is a tough band of connective tissue that connects bones together at a joint. The ligament is flexible, but is not designed to stretch in length because part of its purpose is to restrict movement in certain directions. Therefore, it is not technically an injury of the muscle but rather an injury of the connective tissue. Strain is excessive stretching or working of a muscle, resulting in pain and inflammation. Different tissues in the body have different tolerances to stretching. The fibres within the muscles tear, that can cause muscle pain, but they regenerate, becoming larger and stronger. This happens to a greater or lesser extent when repetitive activities are carried out. Hence the term ‘keyboard athlete’. In repetitive strain injury, repeated

strain and, the magnitude of the load exceed the muscle tissue's ability to repair (Repetitive Strain Injury Awareness, 2007l).

- Myofascial pain syndrome

Myofascial pain syndrome is a chronic form of muscle pain. The pain of myofascial pain syndrome centers around sensitive points in the muscles called trigger points. The trigger points can be painful when touched and the pain can spread throughout the affected muscle. People with myofascial pain syndrome have muscle pain that persists or worsens. Myofascial pain caused by trigger points has been linked to many types of pain, including headaches, jaw pain, neck pain, low back pain, pelvic pain, and arm and leg pain (Mayo Clinic, 2012h).

- Myalgia

According to The free dictionary by Farlex (2013c) and Mayo Clinic (2013c & 2013d), myalgia is “muscle pain” and is a symptom of many diseases and disorders. The most common causes are overuse (using a muscle too much, too soon, too often), over-stretching, injury, or trauma including sprains and strains, tension, or stress. Muscle pain can range from mild to excruciating, and though it often goes away in a few days, some muscle pain can linger for months. Muscle pain can develop almost anywhere in the body, including the neck, back, legs and even the hands.

- Fibromyalgia

Mayo Clinic (2011d) defines fibromyalgia as a chronic condition characterised by widespread pain in the muscles, ligaments and tendons, as well as fatigue and multiple tender points.

- Dystonia (Writer's cramp)

In cases of repetitive muscle strain, it presents itself as a lingering tension and discomfort in the hand or forearm. Dystonic writer's cramp that is due to a malfunction of the central nervous system has sometimes remarkably specialised symptoms. These include excessive gripping of the pen, the involuntary extension

of fingers, hand tremors and distinct muscle spasms (Repetitive Strain Injury Awareness, 2007y).

2.2.6.6 Other disorders

In the previous sections, attention was devoted to work-related musculoskeletal disorders specifically those conditions that are nerve-, tendon-, bursa-, circulatory- and muscle-related disorders. In this section, other types of work-related (overuse) disorders will be discussed.

- Osteoarthritis

According to Mayo Clinic (2013e), osteoarthritis occurs when the cartilage that cushions the ends of bones in the joints deteriorates over time. The smooth surface of the cartilage becomes rough, causing irritation. Eventually, if the cartilage wears down completely, a person may be left with bone rubbing on bone, causing the ends of the bones to become damaged and the joints to become painful. While osteoarthritis can affect any joint in the body, the disorder most commonly affects joints in a person's hands, hips, knees, neck and lower back.

- Migraine

Mayo Clinic (2013b) defines migraines as chronic headaches that can cause significant pain for hours or even days. Symptoms can be so severe that the person needs to lie down in a dark, quiet place. Some migraines are preceded or accompanied by sensory warning symptoms or signs (auras), such as flashes of light, blind spots, or tingling in the arm or leg. A migraine is often accompanied by nausea, vomiting, and extreme sensitivity to light and sound.

- Tension headache

A tension headache is generally a diffuse, mild to moderate pain that many people describe as feeling as if there is a tight band around their head. This headache is generally referred to as a tension-type headache as it may feel as if muscle contractions are responsible for the head pain. The exact cause or causes of tension headache are unknown. Potential triggers for the development of tension headaches may include stress, depression, anxiety, poor posture, working in awkward

positions, holding one position for a long time and jaw clenching (Mayo Clinic, 2013g & 2013h).

- Back pain

A person's back is an intricate structure composed of bones, muscles, ligaments, tendons and disks. Disks are the cartilage-like pads that act as cushions between the segments of the spine. Back pain can arise from problems with any of these component parts. Back pain occurs from strained muscles and ligaments, improper or heavy lifting, and after a sudden awkward movement (Mayo Clinic, 2012a).

- Eyestrain

Mayo Clinic (2012e, 2012d) maintains that eyestrain occurs when the eyes get tired from intense use, such as reading or working at a computer. Other factors that can cause eyestrain include activities involving extended periods of intense focus and concentration, exposure to bright light (glare), and straining to see in very dim light. Using a computer for long periods is one of the most common causes of eyestrain and is called computer vision syndrome.

- Stress

Stress in humans results from interactions between persons and their environment that are perceived as straining or exceeding their adaptive capacities and threatening their well-being (The free dictionary by Farlex, 2013d).

EasyDSE (2010a) maintains that although the role of stress is not fully understood, it plays an important role in the development of repetitive strain injury. It is clear that employees under stress are more tense and, excessive tension in the muscles is an important risk factor for developing repetitive strain injury. The following causes of stress are listed:

- bullying or harassment, by anyone, not necessarily a person's manager;
- feeling powerless and uninvolved in determining one's own responsibilities;
- continuous unreasonable performance demands;
- lack of effective communication and conflict resolution;
- lack of job security;
- long working hours;

- excessive time away from home and family;
 - office politics and conflict among staff; and
 - a feeling that one's reward is not commensurate with one's responsibility.
- Depression

Mayo Clinic (2014) and The free dictionary by Farlex (2013b) maintains that although anxiety and depression are regarded as two distinct disorders, it is quite common to have both at the same time. The main characteristic of anxiety is being unreasonably fearful and worried. Anxiety disorders include panic attacks, specific and intense fears (phobias), generalised anxiety and obsessive-compulsive disorder. Depression is generally categorised by a core set of symptoms. Some of these same symptoms may be seen with anxiety disorders as well. Symptoms of depression can include ongoing feelings of sadness, fatigue, irritability, sleep difficulties, decreased interest in usually enjoyable activities and suicidal thoughts. An anxiety disorder may cause depression and vice versa. If a person has anxiety, depression, or both, the person may need to have the symptoms treated in order to improve.

2.2.7 Reasons to prevent work-related upper limb disorders

From the above discussion, it seems that repetitive strain injury conditions occur in both upper and lower limbs as well affecting the spine in various areas. These disorders can cause symptoms of numbness, tingling, sharp pain, dull ache, weakness, loss of grip and restricted movement of limbs. These symptoms can render people incapable of carrying out the simplest of tasks, at home or at work. Lack of accurate diagnosis and access to appropriate treatment further exacerbate the condition, frequently resulting in job loss and economic deprivation (Repetitive Strain Injury Awareness, 2007v).

In a study on the role of occupational health and safety interventions in the prevention of musculoskeletal disorders it was found that workers in many sectors experience pain, numbness and tingling in the neck, shoulder, arm, wrist and/or hand. These symptoms may be warning signs of current or impending musculoskeletal disorders, such as peripheral nerve entrapments (e.g. carpal tunnel syndrome, ulnar tunnel syndrome), peripheral enthesopathies (e.g. shoulder tendinitis, lateral epicondylitis, hand-wrist tendinitis) and many other non-specific musculoskeletal pain disorders. Workers may also experience more acute traumatic injuries of the upper extremity such as crushed fingers, tendon

lacerations and burns. Data from the 2005 European Foundation for the Improvement of Living and Working Conditions Survey showed that 25% of the workforce reported work-related neck/shoulder pain and 15% reported work-related arm pain. Together, musculoskeletal disorders and traumatic injuries are a large burden to society and to workplaces because of lost productivity, reduced performance and lost-time claims among affected workers (Kennedy, Amick, Dennerlein, Brewer, Catli, Williams, Serra, Gerr, Irvin, Mahood, Franzblau, Van Eerd, Evanoff & Rempel, 2010:128).

The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:9) maintain that work-related upper limb disorders might have severe consequences if prompt action is not taken, such as:

- decreased productivity due to pain and increased fatigue;
- inability to work;
- well-motivated and productive people have had to give up work because of pain and disablement from work-related upper limb disorders;
- lost production when employees take time off sick; and
- compensation claims from those who have to stop working because of work-related upper limb disorders.

The Occupational Health and Safety Act require employers to assess health and safety risks, and to put measures in place to ensure the health and safety of employees. Failure to comply could lead to legal action against the employer by the Department of Labour, who administers the Occupational Health and Safety Act (The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:9).

2.2.8 The impact of work-related upper limb disorders on the economy

According to the Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:8), no statistics are available for South Africa regarding the impact of work-related upper limb disorders on health care and the economy. Work-related upper limb disorders are regarded as a problem because they can affect every aspect of an employee's life, and they are costly for workplaces. Kennedy, *et al.* (2010:127) as well as Zungu and Ndaba (2009: 25) indicated

the lack of data/statistics on musculoskeletal disorders and the most effective occupational health and safety interventions to reduce musculoskeletal disorders and injuries.

According to Miller (2001:4-5) a study on musculoskeletal disorders in the United States Office Workforce also indicated that musculoskeletal disorders are a growing problem affecting not only employees but also employers. The average cost per incidence for a repetitive strain injury is estimated by the Occupational Safety and Health Administration to be \$12 000. This cost includes work with full wages, replacement wages, lost productivity and medical treatment (not including surgery). If surgery is required, the average costs bumps up to \$43 000 per incidence according to the American Society of Orthopaedic surgeons.

Occupational Safety and Health Administration (2013) defines ergonomics as follows:

“Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of the working population. Effective and successful “fits” assure high productivity, avoidance of illness and injury risks, and increased satisfaction among the workforce. Although the scope of ergonomics is much broader, the term here refers to assessing those work-related factors that may pose a risk of musculoskeletal disorders and recommendations to alleviate them.”

In this section the health and wellness aspects that could result from a “misfit” between an employee and his workplace has been investigated. The history and various definitions of musculoskeletal disorders were provided. The ergonomic risk factors that cause the musculoskeletal disorders were identified and discussed. The classification of work-related upper limb disorders according to the effect on specific tissue followed. This section was concluded with a description of the reasons why work-related musculoskeletal disorders should be prevented by referring to the impact and costs to the employer and employee. In the next section, ergonomics will be investigated to determine how the workplace could be organised to ensure a healthy and productive workforce.

2.3 ERGONOMICS

In the previous section, work-related musculoskeletal disorders were discussed according to their effects on nerves, tendons, bursa, blood vessels, muscles and joints. These disorders typically develop over a long period due to ergonomic risk factors in the workplace.

This section will deal with the relevant ergonomics. The terms workplace/office/working environment/virtual office/alternative workplace are used interchangeably in this section. The rationale behind this is the belief that the very same ergonomic principles as discussed in this section, are applicable to all employees in all kinds of work environments. The ergonomic principles applicable to the virtual environment are not different and therefore these terms include, and are applicable to all the different types of virtual offices as discussed in Chapter 2.1 of the literature review. This view is supported by Ellison (2012:9) stating that the ergonomic risk for teleworkers working on computers is the same as for their on-site counterparts. However, this is only true if teleworkers are provided with the same equipment and guidance. She maintains that it is possible that the ergonomic risk for teleworkers could actually be higher as a result of poor equipment. Guidance needs to be provided to the employee on how to set up the workstation properly in order to work in a safe manner.

According to the Occupational Safety and Health Administration (2013), common examples of ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects and prolonged awkward postures. Jobs or working conditions presenting multiple risk factors will have a higher probability of causing a musculoskeletal problem. The level of risk depends on the intensity, frequency, and period of the exposure to these conditions and, the individual's capacity to meet the force of other job demands that might be involved. Employees experiencing any symptoms of discomfort should report it early so that attention could be given to their causes. Early reporting could prevent injury by making changes to the job, the work practices or workstation. Ergonomics should be applied to avoid the ergonomic risk factors that cause work-related musculoskeletal disorders.

2.3.1 Ergonomics defined

All ergonomics textbooks begin with the Greek derivation of the word *ergonomics*, which comes from *ergon* (“work”) and *nomos* (“natural law”). The working definition of ergonomics, is simple: It is the study of how to fit work to the worker. More generally, ergonomics has come to mean the design of tools and equipment, in both work and non-work settings, to reduce the risk factors for musculoskeletal disorders (Atwood, 2004:151).

In August 2000, the International Ergonomics Association Council (International Ergonomics Association, 2014) adopted an official definition of ergonomics:

“Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimise human well-being and overall system performance”.

According to the International Ergonomics Association, the domains of specialisation within the discipline of ergonomics are broadly the following:

- Physical ergonomics is concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity. Relevant topics include working postures, materials handling, repetitive movements, work related musculoskeletal disorders, workplace layout, safety and health.
- Cognitive ergonomics is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system. Relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress and training as these may relate to human-system design.
- Organisational ergonomics is concerned with the optimisation of socio-technical systems, including their organisational structures, policies, and processes.

The Institute of Ergonomics and Human Factors (2014) defines ergonomics as the application of scientific information concerning humans to the design of objects, systems and environments for human use. Ergonomics is prevalent in almost every area and naturally involves people. Work systems, sport and leisure, health and safety should all embody ergonomic principles, if well designed. Ergonomics is an approach that puts human needs and capabilities at the focus of designing technological systems and work

environments. The aim is to ensure that humans and relevant environments and technologies interface in complete harmony and tasks are aligned to human characteristics.

Ergonomics is often referred to as “human factors” and the terms are interchangeable. Ergonomics is an interdisciplinary applied science that aims to match the demands of products, jobs and places of work with the people who use them. This should be done in a holistic manner, taking into account physical, cognitive, social, organisational and environmental implications and impediments. An ergonomist, therefore, seeks in a cost effective manner to optimise the interface between the person, the organisation and the environment. This in turn should lead to increased productivity, improved health and safety and reduced costs resulting in a more stable workforce and increased profitability for the organisation. Ergonomics is rapidly becoming mandatory in the workplace (Ergomax, 2014).

Ergonomic Evolution (2013) base their ergonomic philosophy on a human-centred design that is the scientific discipline concerned with human and organisational needs. The four main workplace considerations are the workplace environment, mental demands, task demands and the physical capabilities of the employees.

According to Ergonomic Evolution (2013), the value of ergonomics includes:

- Cost savings: a reduction in workers’ compensation claims due to healthier work environments and fewer injuries.
- Employee morale: organisations that invest in human capital lead to employees who feel valued and respected, resulting in higher morale and lower employee turnover.
- Productivity and quality: a properly fitted environment, along with improved employee morale, translates into greater productivity, higher quality products and better services provided.
- Profits: by lowering costs, reaping higher quality products and better services, result in increased profits.
- Return on investment: $\text{Ergonomics} = \text{Cost Savings} + \text{Employee Morale} + \text{Productivity and Quality} + \text{Profits} = \text{Return on Investment}$.

The Occupational Safety and Health Administration (2013), maintains that ergonomics is the science of fitting workplace conditions and job demands to the capabilities of the working population. Effective and successful ‘fits’ assure high productivity, avoidance of illness and injury risks, and increased satisfaction among the workforce. Although the scope of ergonomics is much broader, the term here refers to assessing those work-related factors that may pose a risk of musculoskeletal disorders and making recommendations to alleviate it. Employers are responsible for providing a safe and healthful workplace for their employees. In the workplace, the number and severity of work-related disorders, as well as their associated costs, can be substantially reduced by applying ergonomic principals. Implementing an ergonomic process has been shown to be effective in reducing the risk of developing work-related musculoskeletal disorders.

Ergonomics is a tool that employers can use to help prevent work-related musculoskeletal injuries in the work environment. Ergonomics reduces the risk of injury by adapting the work to fit the employee instead of forcing the employee to adapt to the work. In addition to injury prevention, ergonomics is also concerned with enhancing work performance, by removing the barriers that exist in many workplaces that prevent employees from performing to the best of their abilities. Therefore, another benefit of applying ergonomics is that it helps people work more effectively, efficiently, and productively (Washington State Department of Labour and Industries, 2002:1).

Although the human body can perform a wide variety of difficult, complex, and unique physical tasks, it is also limited in what it can do. Work-related musculoskeletal disorders occur where the demands of the job exceed the capabilities of the person performing the job. Furthermore, each person in a workplace is unique. This diversity in human traits shows up in many ways including size and shape, strength and endurance, flexibility, hearing, eyesight, knowledge and experience, education and skills. Because of these differences, the fact that one person can perform a job without suffering a work-related musculoskeletal disorder does not mean that everyone will be able to. Jobs should be designed for a variety of employees (Ontario Ministry of Labour, 2011).

Taking the uniqueness of each employee into consideration, ergonomics is about ensuring a good ‘fit’ between people and the things they use. Ergonomics uses information about human abilities, attributes, and limitations to ensure that their equipment, work and

workplaces allow for these variations. Designing tasks, equipment and workstations to suit the employee can reduce human error, accidents and ill health. Failure to observe ergonomic principles can therefore have serious repercussions, not only for individual employees but also for the whole organisation. Effective use of ergonomics will make work safer, healthier and more profitable (Repetitive Strain Injuries Awareness, 2007o).

Mahmud, Kenny, Zein, and Hassan (2011:16, 24) conducted a study to determine whether musculoskeletal disorders among computer users can be reduced by the provision of ergonomics training. They assessed the effect of intervention on workstation habits, musculoskeletal disorders, days and episodes of sick leave, and psychological well-being. A cluster randomised controlled trial was conducted in which three units were randomised for intervention and received training, and three units were given a leaflet. A significant improvement in workstation habits was found, and the differences remained significant at the follow-up time for keyboard, mouse, chair and desk use. The largest reduction in the percentage of musculoskeletal disorders was in the region of the neck joints and muscles. Significant differences were found at the follow-up time in the neck, right shoulder, right and left upper limbs, lower back, and right and left lower limbs. However, the improvements in the musculoskeletal disorders did not translate into fewer days lost from work or improved psychological well-being.

2.3.2 Sources of injury claims

The Washington State Department of Labour and Industries (2002:2) reports that the single largest class of injury claims in the work environment are work-related musculoskeletal disorders that account for over 40% of all Washington State Fund workers' compensation claims among office employees. These injuries result in medical and productivity costs of over \$12 million per year to State Fund employers, and are responsible for over 70 000 lost workdays per year. Due to the nature and severity of work-related musculoskeletal disorders, they account for more than their share of injury costs - about 60% of overall claim costs. Furthermore, work-related musculoskeletal disorders may worsen over time and therefore become more costly when compared to injuries resulting from a sudden event such as a slip and fall. This also means that it can take a long time to get an employee back to work, resulting in higher medical and productivity payments. In addition, hidden costs can be higher when employees use more sick leave or slow their

work pace during the period before a claim is filed when work-related musculoskeletal disorder symptoms are beginning to develop.

A review of the Labour and Industries State Fund claims data (WA State Fund claims data, 1993 cited in Washington State Department of Labour and Industries, 2002:3) for office employees indicated that employees' compensation claims for injuries that occur in the office environment come from computer work (33%), handling of materials such as lifting and carrying (32%) and general office work (35%).

2.3.3 Applying ergonomics to the worksite environment

The focus of human factor ergonomics is to jointly improve performance and well-being by designing the integrative whole better, and by integrating the human into the system better. This is done by aligning the environment to the human. Human factor ergonomics typically takes a hierarchical approach where environmental design to fit the human is seen as the priority, and selecting people to fit the environment or training people to fit the system is only considered when the former is not possible. With a better fitting environment, humans are better able to contribute to performance (Dul, Bruder, Buckle, Carayon, Falzon, William, Marras, Wilson & Van der Doelen, 2012:378).

The decision to follow an ergonomics program includes certain steps to be followed. The first step would be to conduct a thorough worksite analysis. This would include the following four areas: the individual workstation, the office design, an analysis of the environment and the organisation. The second step will then be the application of ergonomic solutions to the identified problem areas. These two steps will be discussed in detail in the sections to follow.

The first step in applying ergonomics in the work environment is to analyse the work being done. A careful analysis will help to find the true cause of the problem and to apply the appropriate resources. Quite often, an analysis will reveal that only small changes are necessary, in which case a more involved analysis may not be necessary. Alternatively, more complex problems may be identified that will require evaluation by an experienced professional. Most of the time, however, the problems can be resolved with the help of the employees in the area and the resources at hand (Washington State Department of Labour and Industries, 2002:11).

When applying ergonomics to an office “system” a holistic approach should be followed (Martin, n.d.) as depicted in Figure 2.3.1.

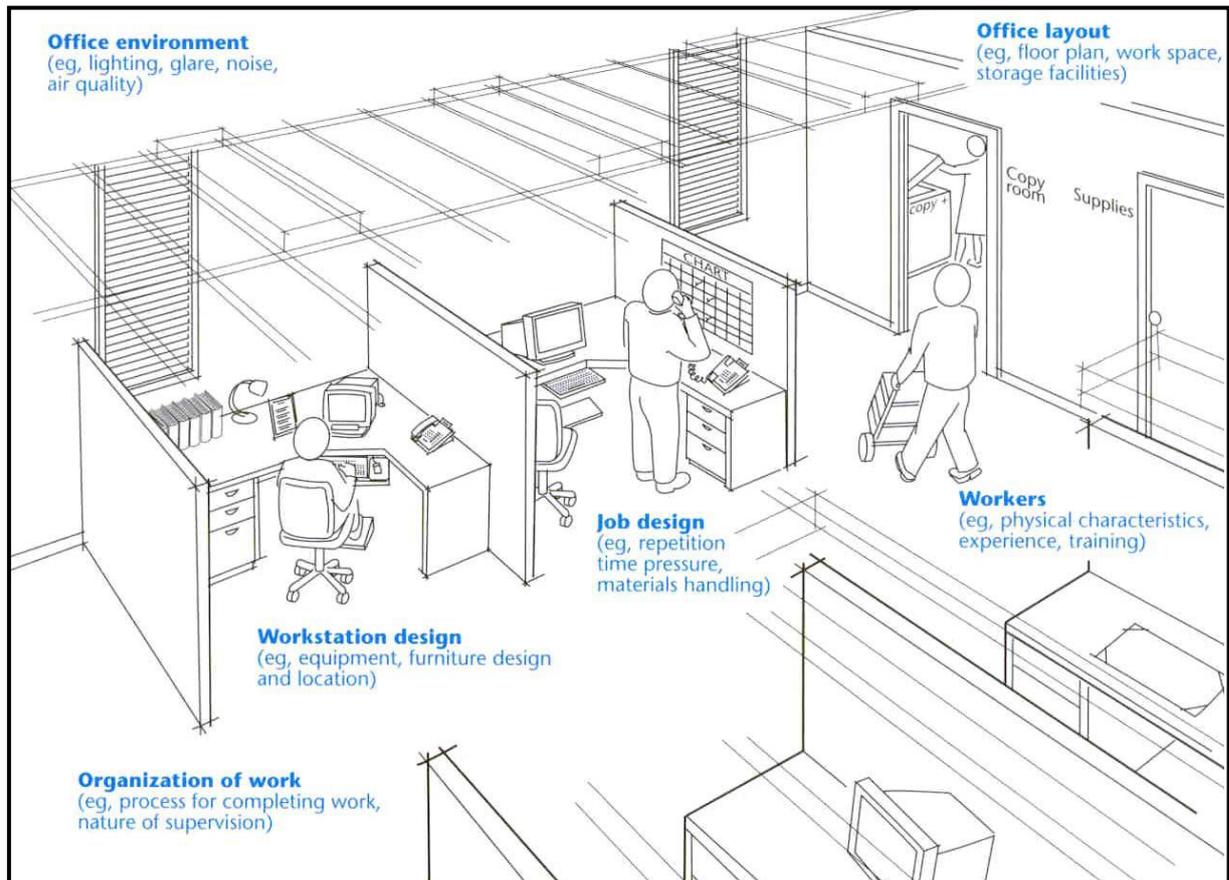


FIGURE 2.3.1: OFFICE ERGONOMICS – HOLISTIC APPROACH

(Canadian Standards Association, CSA-Z412, 2000:44 as cited in Martin, n.d.)

According to the Washington State Department of Labour and Industries (2002:9), ergonomics deals with many issues, starting with a single employee and their workstation, and expanding out to include an entire organisation. Most of the organisational and environmental factors, as well as the selection of workstation furniture, are under management control. Many of the factors related to the arrangement of the workstation and work habits are under each employee’s control. The focus of ergonomics is generally on designing for individual employees with unique requirements. Some of these requirements could include height and age that are constant, while others, such as training and experience are subject to interventions that can change the situation.

According to the Washington State Department of Labour and Industries (2002:13), worksite analysis is the first step in developing solutions to potential causes of work-

related musculoskeletal disorders. Causes of injury can come from any of the different levels in an organisation, as depicted in Figure 2.3.2. Therefore, the analysis must be as comprehensive as possible.



FIGURE 2.3.2: ANALYSIS OF THE WORKSITE

(Adapted from Washington State Department of Labour and Industries, 2002:11)

There are a number of different types of analyses that form part of a worksite analysis, including the following:

- *Task analysis* looks at what each individual employee does on the job on a daily basis. It differs from a job description that usually contains generic job requirements because it collects information about how a specific employee does his/her job. For this reason, the employee will need to be involved in the task analysis, as they are the best sources of information in their daily activities. The application of ergonomic principles to workstation equipment selection, lighting design and other worksite elements depends on the nature of the task being performed. Once the task analysis has been done, the subsequent analysis can be done.
- *Workstation analysis* looks at the physical components of the workstation, such as monitor and keyboard location, work surfaces, and chair adjustments. Each of these components is measured relative to the individual employee, and therefore

employee participation will be required for this analysis. Factors included are furniture, chairs, accessories, hardware and software.

- *Environmental analysis* examines the area surrounding the individual workstations, looking at factors that affect employee comfort and performance. Factors included here are lighting and glare; noise; temperature and humidity and office design.
- *Organisational analysis* deals with issues at the departmental or organisation-wide level, focusing on aspects that are typically considered as “working conditions”. These issues are typically outside the control of individual employees, but it can have the greatest impact on risk factors such as repetition and static loading, as well as the period of exposure to all risk factors. Aspects included here are staffing levels; assignment of responsibilities; work schedules; overtime policies and job design.

Any or all of these analyses may be appropriate, depending on the nature of the problem. Employees may not be aware of all of the potential problems or risk factors for injury that exist in their area. Therefore, it is always a good idea to perform some analyses beyond the obvious problems or stated concerns (Washington State Department of Labour and Industries, 2002:13).

2.3.4 Implementing ergonomic solutions to the worksite environment

After the worksite analysis has been performed, the second step would be to develop solutions to the identified ergonomic risk factors. The task analysis would reveal a list of the individual employee’s daily activities as well as time spent on each task. For each task, the associated risk factors and their causes should be detailed, for example, the number of risk factors, the amount of discomfort associated with each, the amount of time that the employee is exposed to the risk factor and the impact of environmental and organisational factors. From this information, it would be possible to develop and implement ergonomic solutions (Washington State Department of Labour and Industries, 2002:15).

A task analysis could be used to identify the actions associated with, for example, computer use that may lead to work-related musculoskeletal disorders. Some of these actions could be avoided by better workstation or equipment design. Employees themselves can cause these disorders by adopting wrong computing postures, for example the tendency to capture data with the wrists resting on the desk in front of the keyboard. This can compress the space available for the median nerve to the hand, leading to carpal

tunnel syndrome. The use of a soft wrist rest may help, but the employee will not be forced to adopt a better data capturing style. It is generally best to capture data with the hands hovering above the keyboard, parallel with the arms (e.g. with wrists straight). The use of the mouse could also cause risks. Many employees use the mouse with the wrist leaning against the desk and all the movement pivoting from the wrist. Furthermore, the design of the standard mouse involves awkward gripping movements. The design of most keyboards means that the mouse has to be placed too far to the side, meaning the arm has to maintain a stretched posture. A better way of using the mouse is to hold the mouse lightly and make smooth movements involving the whole arm. Other risks of poorly designed workstations include having the chair, desk or monitor too high or too low. This can mean that employees have to hunch their shoulders to reach the keyboard, or bend their head up or down to look at the monitor. Maintaining awkward static postures like this for extended periods during a workday can cause muscle strain and contribute towards work-related conditions. The holistic workstation, including chairs and desks should be adjusted for individual employees. It is not difficult to see how practices such as hot-desking, sharing workstations and the widespread use of laptops make it even more difficult for individual employees to work in the right conditions (Repetitive Strain Injuries Awareness, 2007o).

2.3.4.1 The individual workstation

Office Ergonomic Solutions (2011) maintains that ergonomics is the science of designing work tools (the desk, chair, keyboard, mouse, monitor, etc.) and the work environment to fit the physical capabilities of people. Office furniture and equipment design is important because employees are not of the same physical build. Employees have different arm lengths for accessing the keyboard, mouse and other documents on the desk. They have different leg and trunk lengths that vary the correct seat and desk height needed for each person. These physical differences are why one desk size does not fit everyone, nor does one keyboard style, mouse type, monitor height or one chair. Yet many of the workstations look exactly alike. It is therefore evident that individual employees need to adjust their workstations to fit their individual characteristics.

According to the Washington State Department of Labour and Industries (2002:16), setting up an individual's workstation is simply a matter of placing the employee in one of the neutral postures, and then arranging the furniture and equipment to allow the employee to work in that posture. A neutral posture is a comfortable working posture in which the

employee's joints are naturally aligned and the risk of developing a musculoskeletal disorder is reduced. The reason for doing a separate analysis for each employee, rather than just setting up all of the workstations according to a few general rules, is that it is impossible to come up with a set of rules that works in every situation. For instance, an employee who wears bifocals may need to position their monitor much lower in order to keep their head level if they read out of the bottom half of their lenses. If the task analysis reveals that employees also perform activities in other places besides their computer workstation, such as a copy room, storage area or mailroom, these areas should be treated as additional workstations.

The following are the important components of neutral posture while seated:

- The employee's head should be kept level or tilted slightly downward. Place the work in front of the employee so that they are looking straight ahead.
- The employee should sit with relaxed shoulders, not elevated, hunched or rotated forward.
- The employee should keep his/her elbows close to his/her sides and bent at about a 90 degrees angle, not extended out in front of the body.
- The chair's backrest should be used to support the lower back, or lumbar curve.
- The employee should sit with his/her entire upper body upright or leaning slightly back.
- The employee should keep the wrists straight while he/she works, not bent up, down or to the side.
- The employee should sit with his/her knees at the same level or slightly below the level of the hips.
- There should be no pressure points along the backs of the employee's thighs or at the backs of the knees.
- The employee should place his/her feet slightly out in front of the knees and, make sure they are comfortably supported, either by the floor or by a footrest (Washington State Department of Labour and Industries, 2002:16).

According to Hendricks (2012), the workspace consists of the desk, computer, mouse and keyboard, phone and any other objects around the employee. How these are arranged will significantly affect the posture and comfort of the employee. The employee should firstly

adjust the chair to the correct height for the keyboard. The employee's elbows should be at the height of the keyboard with forearms parallel to the floor. If the employee is sitting too low on the chair, the shoulders will get tense from trying to reach up to the keyboard. After the chair has been adjusted, the following steps should be followed:

- The employee's feet should be resting on the floor once the employee sits at the correct keyboard height. If this is not comfortable, then the employee should make use of a footrest so that the legs are supported with the hips slightly higher than the knees. The employee should sit as far back in the chair as possible so that the employee's back and thighs are fully supported. The backrest of the chair should be adjustable to provide the most support possible.
- The employee's computer/laptop should always be centrally located. If the computer is at an angle the employee's neck and/or back are twisted and that can cause tension and trigger points (especially on the side the employee are rotating towards).
- The employee should clear all obstacles underneath the desk. Any objects left at the feet will result in an awkward sitting position.
- When working from documents, the employee should use a document holder that should be at the same height as the monitor. The employee should not put documents between him/herself and the keyboard. This will lead to the employee reaching forward for the keyboard causing a rounded shoulder posture as well as muscle fatigue.
- When positioning the monitor, the viewing distance should be about 45-65 centimetres. If the monitor is pushed all the way to the back of the desk, the employee will end up leaning forward and poking the chin. The correct height for the monitor is when the top line of the work is at eye level.
- When an employee is working on two monitors, the monitors should be positioned at the same height and distance away from the employee. If the employee works equally on both monitors then the employee should be positioned in the middle, close together. If the employee spends more than 80% of the day on one of the monitors then this primary monitor should be positioned directly in front of the employee with the secondary monitor next to, but slightly off to the side. The monitor's brightness and resolution should be the same to prevent eyestrain.

- The mouse and keyboard should be at the same height and distance from the employee, preferably close to the body as the shoulders function a lot better when closer to the employee's body.
- If the employee spend more than 50% of the day on the phone or need to capture data while on the phone, a headset should be acquired. The phone should be on the employee's non-dominant hand so that the employee's writing hand is free.
- Laptops certainly present ergonomic challenges, as they are far less adjustable. The low position of the screen and positive angle of the keyboard result in poor postures, neck pain and headaches. It is possible to prevent this by either using a separate keyboard, mouse and monitor or by getting a laptop stand or docking station. If none of these is available to the employee, the back of the laptop could be raised by placing a book or ream of paper underneath it, effectively raising the screen and putting the keyboard at a slight upward angle.
- The employee's workspace should be arranged according to the main task that the employee is doing.

The various components of the individual workstation will be discussed in the rest of this section:

- Adjustable desks
Occupational Health Clinics for Ontario Workers Inc. (2008:16) states that is it often possible to add adjustable accessories to the employee's desk. When purchasing a new desk, decide whether adjustability should be built in. There are several methods of achieving adjustability:
 - Purchase a complete workstation that allows for both regular deskwork and space for the computer. The computer section should have an adjustable portion for the keyboard and mouse, and a separate adjustable portion for the monitor. The portion designed for the keyboard should have enough space for the mouse and keyboard to be placed side by side.
 - Attachments can be added to the employee's desk such as a keyboard tray or monitor arm.
 - A smaller separate computer workstation can be used while the employee continues to use his/her desk for regular work.

- Purchase an L-shaped workstation that allows for a separate writing and data capturing area.

If the employee has shelves above the workstation, ensure they do not interfere with adjusting the monitor height or block overhead lights. Items found on the employee's desk should be arranged based on their weight and frequency of use. Heavier items, such as reference books, should be placed between seated shoulder and waist height. Frequently used items, such as the keyboard, mouse and telephone should be located close to the employee at a minimal reach distance. Infrequently used items, such as reference material, calculators or staplers can be located towards the back of the desk. A simple point to remember is that the more the employee uses an item the closer it should be.

- The chair

The University of Toronto (2009), Environmental Health and Safety, implemented an Office Ergonomics Standard, "Ergonomic requirements for moderate and intensive computer users". This standard is based on the Canadian Standards Association, Standard Z412-M89 and on widely accepted "best practices guidelines" that are considered prudent practice for the avoidance of ergonomic-related injuries and losses. According to the ergonomic standard, chairs are a crucial component of the office environment. A good adjustable chair can assist computer users to work comfortably and to accommodate the work surface and tasks performed. Chairs should have the following features:

- *Seat height* must be adjustable to allow the user to place the feet firmly on the floor or a supportive footrest. This is based on the assumption of an adjustable work surface height. An adjustment range of 38-52 centimetres will allow 90% of potential users to find a comfortable sitting height while wearing shoes.
- *Seat pan depth* must be such that the user can maintain contact with the backrest in the lumbar area and avoid increased pressure on the back of the legs and behind the knees. Therefore, the seat pan depth should be less than 43 centimetres and there should be space, about the width of a clenched fist, between the front of the seat pan and the back of the knees. A horizontal adjustment of the backrest is an excellent feature to permit changing the effective seat pan depth. A good range of seat pan depth is 38-43 centimetres.

A backrest like this will permit all employees except the shortest 5% of users to have adequate back support while seated.

- The *seat pan* should have a “waterfall” or rounded front edge to minimise pressure on the back of the legs.
- The *backrest* should provide good contact and support for the lumbar region of the employee’s back and should be vertically adjustable. The backrest should have a height of 38-53 centimetres and a width of 36-48 centimetres. The backrest tilt angle may be fixed, adjustable or spring-tensioned. If fixed, an angle of 103 +/- 1 degree is suitable; if adjustable, a range of 95-110 degrees is usually sufficient. The force of a spring-tensioned reclining backrest should be adjustable to suit the user’s needs.
- *Adjustable armrests* (adjustable in both the horizontal and vertical planes), that can provide light arm support is recommended for moderate and intensive computer users. The armrests should however not impede access to the workstation or arm movement.
- *Five-pronged chair base with casters* for stability and easier mobility. The ability to swivel 360 degrees and to move the chair around would improve access to work materials, eases sitting down and standing up and reduces twisting stresses on the spine. The casters should be appropriate for the surface for example, hard casters for soft floors or soft casters for hard floors.
- The *seat cushion* should have minimal contouring to allow for easy shifting of position by the employee. There should not be any local pressure points such as buttons or prominent seams in the seat cushion.

Triano (2010), is of the opinion that an ergonomic office chair is a tool that, when used properly, can help one maximise back support and maintain good posture while sitting. However, simply owning an ergonomic office chair is not enough. It is also necessary to adjust the office chair to the proportions of the individual employee’s body to improve comfort and reduce aggravation to the low back and neck. The first step in setting up an office chair is to establish the desired height of the individual employee’s desk or workstation. This decision is determined primarily by the type of work to be done and by the height of the employee using the office chair. The height of the desk or workstation itself can vary greatly and will require different positioning of the office chair. Once the workstation has been

situated, the user can adjust the office chair according to his/her physical proportions to ensure that the office chair and work area are as comfortable as possible.

Lefler (2004) pointed out that, as an alternative to the more traditional office chair, new styles of ergonomic chairs have been designed to try to create good support, comfort and promote good posture. Use of these types of ergonomic chairs can be very beneficial for people with lower back pain or discomfort. Alternative chairs include:

- Kneeling ergonomic chair

The kneeling chair is an office chair that has no back, and places the user in a modified kneeling position. The design encourages good posture by sliding the hips forward and aligning the back, shoulder and neck.

- Saddle chair

This type of office chair is in the shape of a horse's saddle and puts the user in a position somewhere between sitting and standing, similar to the position used when riding a horse. This allows the legs to drop naturally, and widen, creating a healthy and stable position.

- Exercise ball chair

As the name states, it is a ball, that is large enough to support the user in any long-term sitting usage. The major advantage to this type of chair is that it encourages movement and active sitting. There is slight bouncing involved that keeps the legs moving, that stimulates circulation and keeps muscles busy, reducing stress and fatigue. The ball comes in different sizes to suit the appropriate height for individual users. Some of these chairs can be modified with a base frame with wheels for improved mobility, and can even have a backrest and armrests attached.

- The computer

Adams (2011) is of the opinion that there are four areas that a computer user interfaces with: the monitor, the keyboard and mouse, the chair, and the lighting of the environment. Setting up the interfaces according to ergonomic guidelines as well as maintaining a good posture will enhance the employee's comfort and efficiency as well as prevent work-related musculoskeletal injuries.

- The monitor

Ontario, Ministry of Labour (2010) provided the following guidelines for setting up the computer monitor:

- Monitors should be placed so that the top of the screen is at the employee's eye level. The viewing distance between the employee's eyes and the screen should be in the range of 40-74 centimetres.
- The size of the monitor often dictates viewing distance. If the monitor is large, the workstation should be large enough to accommodate it. The increasing use of flat screen monitors is allowing for better space use and more flexibility in screen position.
- If the screen is too low or too high, the muscles of the neck must work continuously to hold the head in a viewing position that may result in fatigue and discomfort.
- If the screen is viewed continuously or frequently, it should be directly in front of the employee to avoid having to keep the head turned to one side.
- Improper viewing distances or positions may result in fatiguing head positions and in visual fatigue caused by the effort needed to focus.
- A computer operator who wears bifocals may tilt the head back to view the monitor through the bottom, close-vision part of the glasses. If bifocals cause discomfort or awkward head positions, several approaches can be taken. The screen should be lowered such that the head is in a neutral position when viewing the top line of text or other material.
- Alternatively, one could wear single-focus glasses designed specifically for computer work, with the focal distance chosen for the viewing distance between the employee and the screen. In this case, it is important that a document holder should be used, to position documents at the same viewing distance.
- Other options are graduated bifocals that have no sharp line between the two parts of the lens, trifocals, or the use of reverse bifocal lenses, where the computer screen prescription is in the upper part of the lens.

- The keyboard

Ontario, Ministry of Labour (2010) provided the following guidelines for using a keyboard:

- When working at a keyboard, the employee should be sitting with the upper arms hanging naturally from the shoulders.
 - The elbows should be bent at roughly a 90 degrees angle when the fingers are in data capturing position on the home row of the keyboard.
 - This posture allows the arms and wrists to be held in a natural and relaxed position that puts the least amount of physical stress on muscles and joints.
 - If work surfaces are too high, users must raise their arms and shoulders. This requires continuous muscular effort, called “static loading or effort”. This static effort in the arms and shoulders may be fatiguing, and it may hinder blood flow, adding to discomfort and even to the risk of injury. In addition, the wrist may be flexed (bent forward) to reach the keys, placing stress on forearm muscles and wrist tissues.
 - If the work surfaces are too low, the employee must lean forward, placing stresses on the arms and back. The wrists will tend to bend back, also stressing the muscles and tissues.
 - A desk height that is too high or too low for writing can result in the same kinds of problems. The keyboard selected should be suitable to the task and the employee.
- The mouse

Ontario, Ministry of Labour (2010) provided the following guidelines for the use of the mouse and other pointing devices:

 - Input devices such as computer mouses, trackballs and digitising tablets are used to perform a variety of computer work ranging from word processing to computer aided design. There are a number of types and styles of devices. For example, some mouses now have scroll buttons. Mouse settings can also be adjusted for left-handed users and to change the speed and distance of mouse travel and clicking actions required. It is important that employees are aware of the range of devices and settings available in order to determine what are most appropriate for their application and use.
 - Even with the appropriate device, poor positioning can lead to problems. Employees may hold the arm they use to control the device in a fixed, raised or outstretched position. This results in static loading of the shoulder and in bent wrist postures that contribute to discomfort and risk of injury.

- A mouse or a tablet should be placed as close to the employee's side as possible at a height that allows the upper arm to hang relaxed from the shoulder with a "neutral" wrist position, with the hand in line with the forearm. This position causes the least physical stress. The mouse should also be placed so that the cord and items on the desk do not limit movement.
 - If a keyboard/mouse platform is used, take care that it allows the mouse to be placed as close to the keyboard as possible (at the same height and in the same plane), and that it provides a stable surface of sufficient size.
 - At computer aided design and other workstations where work is done with one arm for long periods, the forearm should be supported by a desk surface to the side of the employee or by adjustable armrests on the desk or the chair. This support is necessary to reduce static loading.
 - The mouse or other hand-held input device should not contribute to cramped hand postures. This may require consideration of different-sized devices for different hand sizes. The device should be shaped to minimise bent wrist postures, or, failing that, the forearm should be supported on a raised smooth surface to allow a comfortable wrist posture.
 - The mouse buttons should be located to avoid awkward finger and hand postures. The activation force (the force needed to make a button click) should not be so great as to cause fatigue. However, it should not be so little that buttons can be clicked inadvertently since users will then tend to hold their fingers up away from the buttons, causing static loading of the muscles.
 - Users should be encouraged to hold the mouse in a relaxed way, not to grip it tightly, and to move it from the shoulder rather than just the wrist. In this manner, muscular distribution demands are improved and wrist movements and static loading are reduced.
- Computer accessories

Computer accessories refer to all the additional items that can be used to avoid risk factors that may lead to work-related musculoskeletal disorders.

 - Document holder

Occupational Health Clinics for Ontario Workers Inc. (2008:32) recommends that a document holder should be used if an employee enters information from papers, files, binders, onto the computer. Document holders help keep

papers vertical or angled so that the employee does not have to bend his/her neck to read them.

- Footrest

Ontario, Ministry of Labour (2010) are of the opinion that footrests, where they are necessary, should have a stable surface and be large enough to accommodate both feet easily. The footrest angle could be adjustable, though a fixed footrest is suitable if it allows for comfortable ankle angles (roughly 90 degrees between foot and leg). Generally, fixed footrest angles are in the range of zero-30 degrees.

- Monitor risers or blocks

A monitor riser helps reduce shoulder, neck, and eyestrain by positioning the monitor at a comfortable viewing angle (Ergoguys.com, 2013a).

- Monitor arms

Monitor arms should allow the monitor to move in all directions and allow the employee to push the monitor completely out of the way when not in use (Occupational Health Clinics for Ontario Workers Inc., 2008:32).

- Wrist and hand rests

Occupational Health Clinics for Ontario Workers Inc. (2008:25) maintains that padded wrist rests are often used in front of keyboards and mouses to support the employee's wrists. Wrist rests also reduce the contact pressure on the wrists from sharp workstation edges when the employee is taking a break from data capturing.

- Arm rests

An armrest is specifically designed to benefit all computer users including the physically challenged computer users on wheel chairs. This ergonomic arm support helps alleviate upper body stress syndrome associated with repetitive motion. Upper body stress syndrome can lead to carpal tunnel syndrome and other repetitive stress injuries (Ergoguys.com, 2013c).

- Adjustable under desk keyboard/mouse support device

The University of Toronto (2009) suggests the use of an adjustable under desk keyboard/mouse support device if the work surface cannot properly accommodate a keyboard/mouse and monitor.

- Keyboard and mouse tray
A keyboard and mouse tray attaches directly to the employee's existing chair. These trays are uniquely designed to naturally position both desktop and laptop computer users in a comfortable and healthy neutral body position (Ergoguys.com, 2013b).
- Laptop riser
A laptop riser relieves stress and increases the employee's efficiency by tilting the laptop from a flat position. The angle of the lift helps keep users heads up and backs and necks in a relaxed position. It also eases the stress on wrists, thereby helping carpal tunnel syndrome sufferers (Ergotherapy Solutions, 2011).
- Laptop stand
It can be used with an office chair or as a useful extension to the employee's home or office desk (Ergo in Demand, 2013b).

2.3.4.2 Office design

According to the Washington State Department of Labour and Industries (2002:24) the design or layout of the office and its furnishings and equipment should also be analysed to determine if they present risk factors that may contribute to work-related musculoskeletal disorders. For example, when arranging office shelving, place those items used most frequently close to the work area to reduce the amount of frequent, awkward, overhead reaching. Input from the employees prior to making office changes or equipment purchases will often result in a more efficient work environment while also reducing the employer's risk.

According to the Washington State Department of Labour and Industries (2002:19), the office floor plans (layout of furniture in the office) can be just as important as the type of furniture. Consider the following when designing an office:

- Space allocation
A standard computer with a keyboard, mouse, monitor and room in front of it for an employee to sit, takes up 1.11 square metres of floor space. Also, allocate additional space as necessary for the following:
 - printers and other large pieces of equipment;
 - telephones;

- storage such as bookcases and file cabinets;
 - space to work with documents, especially large binders, folders or technical drawings and
 - sufficient space for changes in posture, stretching (Washington State Department of Labour and Industries, 2002:19).
- Work flow
- According to the Washington State Department of Labour and Industries (2002:19) the layout of furniture and the organisation of an individual workstation can make a big difference in the way work is performed. The following must be kept in mind when designing workstations:
- Right-handed employees usually find it easier to move between the computer and deskwork if the writing surface is to the right of the computer, while left-handed employees are the opposite.
 - Right-handed employees may need to answer the phone with their left hand if they need to take notes with their right, while left-handers are the opposite; place instruments accordingly.
 - Phone lines, power cords and computer cables should be long enough to allow some flexibility in the placement of equipment.

The way the work area is organised will affect the employee's body position and the amount of reaching. Long reaches to pick up heavy objects or items that the employee uses frequently can contribute to discomfort and injury. This is because reaching puts the body in an awkward position and stretches the employee's muscles beyond their normal limits, making them vulnerable to pulls and strains (Washington State Department of Labour and Industries, 2002:26).

2.3.4.3 Environmental analysis

The environment surrounding an employee's workstation can be just as important as the workstation itself in determining the employee's comfort and performance. The ideal office environment is well lit, without being overly bright or harsh, has a comfortable temperature and humidity level, is quiet enough to allow concentration, and is not overcrowded or hectic (Washington State Department of Labour and Industries, 2002:23).

The following factors should be considered when analysing the environment:

- **Lighting**

According to Washington State Department of Labour and Industries, (2002:23) office lighting can have a considerable effect on both comfort and performance. Harsh, excessively bright fluorescent lighting can cause eyestrain, especially when it creates glare on computer monitors. Too little lighting can also result in eyestrain when working with paper documents, as well as a “gloomy” atmosphere in which to work. Windows can cause lighting and glare problems as well, although most employees prefer to have natural light and a view. Direct sunlight can create light levels many times brighter than what is needed for office work.

Discher (2007) is of the opinion that visual problems such as eyestrain and irritation are among the most frequently reported complaints by computer employees. These visual symptoms can result from improper lighting, glare from the screen, poor positioning to the screen itself, or copy material that is difficult to read. These problems can be corrected by adjusting the physical and environmental settings.

- **Temperature and humidity**

According to Washington State Department of Labour and Industries, (2002:25) the temperature and humidity levels in the office affect not only comfort, but also productivity. Most office work is done while seated, and the low level of physical activity means that employees will typically prefer a slightly higher temperature than if they were active. Uncomfortably high temperatures can cause fatigue that can then lead to awkward postures such as slouching or slumping in the chair. Problems with low temperatures are typically localised, such as when an individual employee’s office has been placed directly under a cooling vent. The cool air blowing directly down can cause cold feet and hands, as well as increased muscle tension and increased risk for tendinitis.

Occupational Health Clinics for Ontario Workers (2008:41) maintains that the recommended temperature range is 20 to 23.5 degrees Celsius in the winter and 23 to 26 degrees Celsius in the summer with a relative humidity between 30% and 60%. The temperature range is lower in the winter because people tend to dress in warmer clothes. The heating, ventilation and air conditioning system, the work activities, and personal preference of the employee affect thermal comfort.

Humidity levels are also important to comfort and health. Too low a level of humidity results in dry skin, especially when handling paper, and can increase the amount of force used as sensation through the fingertips is reduced. Too much humidity can lead to a “stuffy” feeling and can make the temperature seem higher than it actually is. It can also have an effect on actual or perceived indoor air quality (Washington State Department of Labour and Industries, 2002:25).

Occupational Health Clinics for Ontario Workers (2008:40) are of the opinion that poor indoor air quality can cause many health problems. Common concerns in the office environment associated with poor indoor air quality can include eye, nose and throat irritations, headache, dry mucous membranes, dry skin, mental fatigue, trouble concentrating, nausea and dizziness, increased incidence of respiratory infections.

- Noise

Noise is any unpleasant sound. People tend to call it “sound” when it is not annoying and “noise” when it is. Noise levels in the office are probably not high enough to damage employee’s hearing, but noise may still cause problems like interference with communication, annoy or distract employees, increase the level of concentration required, increase the level of fatigue and cause stress (Occupational Health Clinics for Ontario Workers, 2008:44).

- Floor surfaces

The Government of Newfoundland and Labrador (2009:7), is of the opinion that for purposes of recognising and evaluating risk factors in the environment, the floor surfaces should be considered. This refers to the physical characteristics of a floor, including grade, surface texture and material, unevenness, and slip resistance.

2.3.4.4 Organisational analysis

Organisational analysis includes both business-wide and department-wide issues that are beyond the control of a single employee. The analysis looks at job design factors such as scheduling, overtime, shift work, rotation, staffing levels, incentive work, machine-paced jobs, and break schedules (Washington State Department of Labour and Industries, 2002:26).

- Job design

The Workers Compensation Board in Alberta (2007:18) maintains that job design is job organisation. It defines what jobs need to be done and how. A good job design fits tasks to employee's physical and mental needs. A good job design takes all of the following into consideration:

- Task variety:
 - job enlargement - employees are given more or different tasks to stimulate interest in the work. This does not necessarily mean more responsibility;
 - teamwork - each member of the team shares several different tasks;
 - job rotation - employees move from one task to another according to a schedule.
- Work pace:
 - a fast pace of work does not allow the body to recover between repetitive or forceful movements, and it can also increase the chance of mistakes and poor technique;
 - employees and employers need to discuss reasonable work quotas, schedules and goals.
- Work and rest breaks:
 - work breaks allow for changes in position. An example of a work break is the time between moving from a seated position at the computer to filing documents in a standing position;
 - rest breaks are the times when we stop working. Besides leaving the workstation, we should use this time to stretch and change positions. Every hour, the employee should have a five-minute "micro-break". Multiple micro-breaks are sometimes better for the employee than fewer long breaks.
- Adjustment periods:
 - an adjustment period is the time we need to get "in shape" for a new job or for a job we are returning to after a long absence or extended illness;
 - the length of the adjustment period depends upon the type of job.
- Training and education:
 - it is important employees know what is expected of their roles and how to perform their tasks safely;

- improper technique can result in devastating injuries (Workers Compensation Board, Alberta, 2007:18-19).

How employees' jobs are designed can influence the risk factors associated with work-related musculoskeletal disorders. Good job design is especially important in reducing the period of exposure to risk factors and reducing the overall repetitiveness of a job. When analysing how the business or department's work is performed, attention should be paid to any factors that influence how frequently the employees are performing repetitive tasks and for what period. These job and organisational design factors, sometimes referred to as psychosocial factors, may increase risk for injury by increasing stress levels. High workplace stress can cause physiological changes to body systems that lead to musculoskeletal changes such as increased muscle tension. A relaxed working atmosphere, on the other hand, may increase productivity and reduce the risk of work-related musculoskeletal disorders. Employee participation is especially important when it comes to job design. Allowing employees to provide input into the structure and content of their own jobs is one of the best opportunities to have a positive effect on injury prevention and productivity, without the capital expense of buying new furniture or equipment (Washington State Department of Labour and Industries, 2002:26).

The job design factors that are associated with an increase in work-related musculoskeletal disorders symptoms include overtime, incentive pay, lack of control over work pace, deadlines, electronic monitoring, close supervision, conflicting responsibilities, boring, mundane work, no authority to make decisions, social isolation and lack of support from the supervisor (Washington State Department of Labour and Industries, 2002:26).

The Washington State Department of Labour and Industries (2002:27) suggests that a good job design should include a periodic (every two hours) rotation of tasks with lower repetition, or of tasks where different muscle groups are used. This may not only provide employees with variety and increased job satisfaction but could also decrease their risk of work-related musculoskeletal disorders. Job enlargement is similar to job rotation. It is a way to add meaningful variety to the employee's job, reducing the risk of injury while potentially improving morale. Jobs can be

enlarged by giving employees more control over some of the issues that affect them but are typically handled by management or their supervisor. Employees gain responsibility and ownership in their jobs while reducing monotony and repetition.

- Staffing and scheduling

In some cases, adding temporary staff rather than requiring employees to work overtime at a repetitive task may have long-term financial advantages due to reduced injury costs. Likewise, adjusting the schedule to spread out highly repetitive tasks over a longer time, rather than letting a job wait until it requires lengthy repetitive work, may lessen the risk of work-related musculoskeletal disorders (Washington State Department of Labour and Industries, 2002:28).

- Rest breaks

Breaks at mid-morning, lunch and mid-afternoon have long been a part of work schedules and are an important part of allowing employees time to recover from the demands, both mental and physical, of their jobs. Employees should be encouraged to take these breaks away from their computers and use the opportunity to walk around and give their hands and eyes a rest (Washington State Department of Labour and Industries, 2002:28).

- Recovery pauses

Recent studies have shown that shorter (one to three minutes), more frequent (every 30-60 minutes) breaks, when given in addition to the usual breaks, may help to reduce discomfort while improving productivity. These short breaks, called micro-breaks or recovery pauses, work best if taken before discomfort and fatigue set in. Recovery times will be faster and employees will be less tired at the end of the day (Washington State Department of Labour and Industries, 2002:28).

- Stretch and exercise breaks

The Canadian Centre of Occupational Health and Safety (2002) maintains that even if a workstation is well designed, problems may arise if attention is not paid to the way the work is done. Working at a computer often involves very few changes in body position. This lack of movement can lead to muscle pain and strain. It is

recommended that an employee break for 5-10 minutes for every hour spent at a workstation. The following are a few suggestions:

- Employees should vary the work tasks. Break up keyboarding tasks work by doing other job duties or tasks that involve moving around or changing body position. Employees should stand up and move around.
- Employees should look away from the screen occasionally and focus their eyes on an object far away.
- Take regular rest breaks to ease muscle aches, eyestrain and stress.
- Employees should relax their muscles, stretch and change position.

According to the Washington State Department of Labour and Industries (2002:6), the application of ergonomics principles is most effective when used before problems result in serious injury. The goals of a proactive program should be to prevent as many employees' compensation claims as possible and to reduce the severity of those claims that could occur. Injuries that are addressed early on through an ergonomics process will often be less severe, have little or no time loss, and will allow the employee to continue as a productive member of the organisation. Employers also benefit through reduced employees' compensation costs. Important elements of a proactive approach include:

- comprehensive program with management support;
- employee involvement;
- worksite analysis to identify problems;
- employee awareness training;
- early reporting of symptoms.

In a study on the role of occupational health and safety interventions in the prevention of musculoskeletal disorders, a mixed level of evidence was found. A strong level of evidence for "no effect" was found in terms of adjustments to computer workstations on upper extremity musculoskeletal disorder outcomes. An occupational health and safety intervention approach that relies solely on adjustments to computer workstations is strongly discouraged. A moderate level of evidence was found for a "positive effect" in terms of arm supports on upper extremity musculoskeletal disorder outcomes. The review team considers the use of arm supports a practical design strategy to reduce muscle loading in the upper extremity and potentially useful in a range of work environments. Workstation

adjustment combined with ergonomics training appears to be more effective compared to using either intervention independently. The conclusion was that it is difficult to make strong evidenced-based recommendations about what employers should do to prevent or manage upper extremity musculoskeletal disorders (Kennedy *et al.*, 2010:156).

In this section, ergonomics and the impact it could have on the prevention of musculoskeletal disorders in the workplace was investigated. In the last section of the literature review, an investigation will be done on the legislation applicable to the work environment (including all the alternative virtual workplaces) in South Africa.

2.4 REGULATORY COMPLIANCE

In the previous section, ergonomics and the impact it could have on the prevention of work-related musculoskeletal disorders in the workplace were investigated. In this last section of the literature review, the Acts in South Africa with regard to the prevention of work-related musculoskeletal disorders will be investigated. The role that these Acts fulfil in the formulation of organisational policies, procedures and regulations will be outlined. Chapter 2 will conclude with a discussion of the South African Excellence Model that will be adapted and presented as a conceptual telework framework in Chapter 5 (*cf.* paragraph 5.5). Organisations normally derive their policies on the requirements as set out in the applicable Acts. The organisational policies and regulations required to implement telework successfully will be included in the proposed telework framework based on the Acts currently applicable to the telework environment.

The Acts under investigation are:

- **Occupational Health and Safety Act of 1993 (Act 85 of 1993)**
“To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith” (Republic of South Africa, 2004b).
- **Compensation for Occupational Injuries and Diseases Act (No. 130 of 1993)**
“To provide compensation for disablement caused by occupational injuries or diseases sustained or contracted by employees in the course of their employment, or for death resulting from such injuries or diseases; and to provide for matters connected therewith” (Republic of South Africa, 1993).
- **Circular Instruction 180 regarding the Compensation of Work-related Upper Limb Disorders, Compensation for Occupational Injuries and Diseases Act, 1993 (Act no 130 of 1993), as amended.**
“The circular instruction is issued to clarify the compensation of claims for work-related upper limb disorders and supersedes all previous instructions in this regard. The Compensation Commissioner’s “Guidelines for medical practitioners and employers on how to manage work-related upper limb disorders” can also be used for further reference” (Republic of South Africa, 2004a).

2.4.1 The impact of work-related musculoskeletal disorders

On the question why pains and strains are a problem, the Ontario Ministry of Labour (2009f) answers as follows: “Musculoskeletal disorders are a problem because they can affect every aspect of a worker’s life and they are costly for workplaces”. According to the Workplace Safety and Insurance Board, musculoskeletal disorders are the number one reason for workers to file a compensation claim and lose time from work because of injury. In Ontario in 2007, there were 35 498 musculoskeletal disorder lost-time claims that accounted for:

- 43 percent of all claims involving time lost from work;
- 43 percent of all costs related to time lost from work;
- 46 percent of all days lost from work.

From 2003-2007, Ontario’s workers compensation system approved more than 187 000 musculoskeletal claims that resulted in time lost from work. This equates to about 37 500 musculoskeletal disorder claims per year. These claims meant that there were over 2.5 million days when workers were absent from work and direct costs of more than \$314 million. It is estimated that from 2003-2007, Ontario’s employers paid more than \$1 billion in direct and indirect costs related to these injuries. Indirect costs include:

- overtime or replacement wages;
- equipment modifications;
- administration;
- retraining, and
- lost productivity and reduced quality (Ontario, Ministry of Labour, 2009f).

The rising prevalence of musculoskeletal disorders has a significant impact on the economy of the United Kingdom. Employers whose employees develop work-related musculoskeletal disorders face a range of costs and other consequences:

- Loss of production;
- poor worker morale;
- sickness payments for those absent;
- ‘presenteeism’, staff at work when they are not fit to be there, but are afraid to be absent;
- ill-health retirement costs for those permanently unable to work; and
- injury benefits payments in some industries;

- recruitment and retraining costs as skilled and experienced employees need to be replaced. The average cost of replacing employees due to injury, long-term illness or early retirement is £3,000- £4,000 per employee. This is likely to be double the amount for experienced employees;
- bad publicity;
- difficulties with recruitment, due to a number of the above factors;
- litigation costs and compensation payments;
- increased insurance premiums; and
- in some cases, the total cost to an employer of an ill-managed musculoskeletal disorders condition can be the equivalent of up to 50% of the employee's salary.

Work-related musculoskeletal disorders are increasingly recognised as a significant occupational health problem by occupational doctors, employers, academia, trade unions and governments. It would seem, therefore, that there is considerable potential for reducing the exposure to work-related risk factors causing musculoskeletal disorders (Repetitive Strain Injury Awareness, 2007o).

The Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:8-9) confirms that there are no statistics available for South Africa regarding the impact of work-related upper limb disorders on health care and the economy. Evidence on international work-related upper limb disorders indicates an alarming impact, causing significant occupational health problems estimated to affect many millions of employees. The United States of America's Bureau of Statistics (1999) reported that among major disabling injuries and illnesses, the average days away from work were highest for carpal tunnel syndrome (27 days), fractures (20 days), and amputations (18 days). Among the leading events and exposures, repetitive motion such as grasping tools and typing or capturing data, resulted in the longest absences from work - an average of 17 days. Conservative estimates calculate the cost of work-related upper limb disorders in the United States of America at between \$13 and \$20 billion annually. Table 2.4.1 reflects the direct and indirect costs.

TABLE 2.4.1: DIRECT AND INDIRECT COSTS ASSOCIATED WITH WORK-RELATED UPPER LIMB DISORDERS

(The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders, 2004:9)

DIRECT COSTS	<ul style="list-style-type: none"> • medical expenses • employees compensation premiums • lost workdays • paid leave 	±20%
INDIRECT COSTS	<ul style="list-style-type: none"> • loss of injured employee’s production • time lost by uninjured employees • temporary re-placement • training and re-training • reporting and claims • management time • employee/management discussions • litigation processes 	±80%

The Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage Work-related Upper Limb Disorders (2004:8-9) states that although there are limited records on the incidence of work-related upper limb disorders in South Africa, it is very likely to be substantially higher than that reported for the United States of America and Europe. This is due to the excessive physical demands placed on employees in industrially developing countries. The direct costs for compensation of musculoskeletal disorders are appreciated far more than the indirect costs associated with disruptions in productivity and quality, worker replacement costs, training and other work absence costs. It is believed that the direct costs due to compensated work-related musculoskeletal disorders are a relatively low proportion of the total costs.

2.4.2 Occupational Health and Safety Act, 1993 (Act 85 of 1993)

The South African Labour Guide (n.d.) explains the Occupational Health and Safety Act, 1993 as follows. The act requires the employer to bring about and maintain, as far as reasonably practicable, a work environment that is safe and without risk to the health of the workers. This means that the employer must ensure that the workplace is free of hazardous substances, articles, equipment, and processes that may cause injury, damage or disease. Where this is not possible, the employer must inform workers of these dangers, how they may be prevented, and how to work safely, and provide other protective measures for a

safe workplace. However, this is a shared responsibility between the employer and the worker. The Act is based on the principle that dangers in the workplace must be addressed by communication and cooperation between the workers and the employer. Both parties must pro-actively identify dangers and develop control measures to make the workplace safe. In this way, the employer and the workers are involved in a system where health and safety representatives may inspect the workplace regularly and then report to a health and safety committee, who in turn may submit recommendations to the employer.

The Occupational Health and Safety Act is administered by the Chief Directorate of Occupational Health and Safety of the Department of Labour. In order to ensure the health and safety of employees, provincial offices have been established in all the provinces. To this end, occupational health and safety inspectors from these provincial offices carry out inspections and investigations at workplaces. Inspections are usually planned according to the occurrence of accidents as statistically evidenced, the presence of hazardous substances, such as the use of benzene in laundries, or the use of dangerous machinery in the workplace. Unplanned inspections, on the other hand, usually arise from requests or complaints by employees, employers, or members of the public. These complaints or requests are treated confidentially (The South African Labour Guide, n.d.).

2.4.2.1 General duties of employers towards workers

On the question, “what must the employer do to ensure that the work environment is safe and without risk to the health of his or her workers?” the South African Labour Guide (n.d.) explains as follows:

- The employer must provide and maintain all the equipment that is necessary to do the work, and all the systems according to which work must be done, in a condition that will not affect the health and safety of workers. Before personal protective equipment may be used, the employer must first try to remove or reduce any danger to the health and safety of his workers. Only when this is not practicable, should personal protective equipment be used. The employer must take measures to protect his or her workers’ health and safety against hazards that may result from the production, processing, use, handling, storage or transportation of articles or substances, in other words, anything that workers may be coming into contact with at work.

To ensure that these duties are complied with, the employer must:

- identify potential hazards that may be present while work is being done, something is being produced, processed, used, stored or transported, and any equipment is being used;
- establish the precautionary measures that are necessary to protect his or her workers against the identified hazards and provide the means to implement these precautionary measures;
- provide the necessary information, instructions, training and supervision while keeping the extent of workers' competence in mind. In other words, what they may do and may not do;
- not permit anyone to carry on with any task unless the necessary precautionary measures have been taken;
- take steps to ensure that every person under his or her control complies with the requirements of the Act;
- enforce the necessary control measures in the interest of health and safety;
- see to it that the work being done and the equipment used, is under the general supervision of a worker who has been trained to understand the hazards associated with the work.

To ensure that these duties are complied with, the employer must inform the worker that the worker must ensure that the precautionary measures are implemented and maintained (The South African Labour Guide, n.d.).

- The South African Labour Guide (n.d.) maintains that the employer must see to it that every worker is informed and clearly understands the health and safety hazards of any work being done, anything being produced, processed, used, stored, handled or transported, and any equipment or machinery being used. The employer must then provide information about precautionary measures against these hazards.
- The employer must inform health and safety representatives when an inspector notifies him or her of inspections and investigations, to be conducted at the premises. The employer must also inform health and safety representatives of any application for exemption made or, of any exemption granted to him or her in terms of the Act. Exemption means being exempted from certain provisions of the Act, regulations, notices or instructions issued under the Act.
- The employer must inform the health and safety representatives of the occurrence of an incident in the workplace as soon as possible. An incident is an event that occurs at the workplace.

2.4.2.2 General duties of the worker

The South African Labour Guide (n.d.) lists the duties of the worker as follows:

- to take care of his or her own health and safety, as well as that of other persons who may be affected by his or her actions or negligence to act. This includes playing at work. Many people have been injured and even killed owing to horseplay in the workplace, and that is considered a serious contravention;
- where the Act imposes a duty or requirements on the worker to cooperate with the employer;
- to give information to an inspector from the Department of Labour if he or she should require it;
- to carry out any lawful instruction that the employer or authorised person prescribes with regard to health and safety;
- to comply with the rules and procedures that the employer gives him/her
- to wear the prescribed safety clothing or use the prescribed safety equipment where it is required
- report unsafe or unhealthy conditions to the employer or health and safety representative as soon as possible;
- if he or she is involved in an incident that may influence his or her health or cause an injury, report that incident to the employer, and authorised person or the health and safety representative as soon as possible, but no later than by the end of the shift.

2.4.2.3 Rights of the worker

The Occupational Health and Safety Act have extended workers' rights to include the following:

- The right to information
 - The worker must have access to:
 - the Occupational Health and Safety Act and regulations;
 - health and safety rules and procedures of the workplace; and
 - health and safety standards that the employer must keep at the workplace.
 - The worker may request the employer to inform him or her about:
 - health and safety hazards in the workplace;

- the precautionary measures that must be taken; and
 - the procedures that must be followed if a worker is exposed to substances hazardous to health.
- The worker may request that his or her private medical practitioner investigate his or her medical and exposure records.
- If the worker is a health and safety representative, he or she may investigate and comment in writing on exposure assessments and monitoring reports.
- The right to participate in inspections

If the worker is a health and safety representative, he or she may accompany a health and safety inspector from the Department of Labour during an inspection of the workplace and answer any questions the inspector may ask.
- The right to comment on legislation and make representations

The worker may comment or make representations on any regulation or safety standard published under the Occupational Health and Safety Act.
- The right not to be victimised

An employer may not dismiss a worker from his service, reduce a worker's salary or reduce a worker's service conditions because -

 - the worker supplied information, that is required of him or her in terms of the Act, to someone who is charged with the administration of the Occupational Health and Safety Act;
 - the worker complied with a lawful notice, (e.g. a prohibition, contravention notice, etc.);
 - the worker did something that in terms of the Act should have been done
 - the worker did not do something that in terms of the Act is prohibited; and
 - the worker has given evidence before the Industrial Court or a court of law on matters regarding health and safety.
- The right to appeal

The worker may appeal against the decision of an inspector. Appeals must be referred in writing to the Chief Inspector, Occupational Health and Safety, Department of Labour, Private Bag X117, Pretoria, 0001 (The South African Labour Guide, n.d.).

2.4.2.4 Duty not to interfere with or misuse objects

No-one may interfere with or misuse any object that has been provided in the interest of health and safety. A person may, for example, not remove a safety guard from a machine and use the machine or allow anybody else to use it without such a guard (The South African Labour Guide, n.d.).

The Occupational Health and Safety Act, 1993 also elaborates on the role of health and safety representatives, health and safety committees and reporting occupational diseases to the Chief Inspector. For the purpose of this study, it is not discussed in detail.

From the above it is clear that employers have a legal obligation to provide safe and healthy working conditions to all employees, and their work activities may not expose others, such as customers or suppliers, or the surrounding community to hazards and risks. If an employer does not comply with legislation, a penalty, prosecution or even criminal liability could be the consequence. Implementing such measures will save the employer money, improve productivity, and increase employee morale. Organisations often incur financial losses associated with occupational injuries and illnesses. These expenditures have to come out of the organisation's profits. These losses include costs such as legal fees, fines, compensatory damages, investigation time, lost production and lost goodwill from the workforce, from customers and from the wider community. The main objective of the Occupational Health and Safety Act, 1993 could be described as a pro-active attempt by government to provide and maintain a safe and healthy work environment to all (Boshoff, 2013).

Ellison (2012:8-11) states that most telework guidelines do not include any information on how to ensure that the work environment at home is suitable from a safety perspective. She regards this as interesting since the employer is required to provide a place of employment free from recognised hazards according to the Occupational Safety and Health Administration's general duty clause. In addition, if injured while performing work-related activities at home, the injury will still be viewed as a workers' compensation claim. Possible solutions for providing ergonomic support to teleworkers include an online ergonomic assessment, such as commercially available systems or a program developed in-house. The online assessment systems provide training and/or guidance and tips on ergonomics. In addition to the online system, organisations provide remote phone support

to assist with questions or to provide further support in the event of any discomfort or early warning sign of work-related disorders. Organisations refrain from onsite ergonomic assessments in employees' homes. Various methods are available to conduct remote assessments of home office workstations. Digital pictures can be useful when conducting remote assessments because the evaluator can see the exact equipment that employees are using and where they are working. Computers with web cameras allow the evaluator to see live pictures of employees working at their workstations. It can also allow the evaluator to demonstrate what posture is appropriate and how things should be positioned, instead of having to merely rely on a verbal description. Teleworkers can make use of home office safety checklists that are quick to complete and allow the evaluator to review it. Another method is online self-evaluations that combine training and safety checklists in one place and provide immediate feedback to employees to help them adjust their own workstations. Telephone assessments provide direct interaction with employees. Evaluators can call employees while they are at their workstations, ask open-ended questions to gain better insight into employees' working habits, positions and challenges and then direct employees how to set up their workstations. Lastly, pre-established vendor and equipment lists can be keys to creating an efficient ergonomics program. The ideal solution would be to use a tiered approach of online self-assessments involving telephone assessments with digital photographs and pre-approved solutions that allow employees to be empowered to set up their own workstations and to get the assistance they need as quickly as possible.

In the United States of America, musculoskeletal disorders are a widespread occupational health problem, with severe consequences for the worker and the employer. It is possible to track musculoskeletal disorders in a workplace in order to prioritise ergonomic interventions that are usually cost-effective and tend to decrease fatigue and improve productivity as well as reduce health problems. While the United States Occupational Safety and Health Administration does not have a specific standard on ergonomics, it does cite and fine organisations with musculoskeletal disorder problems based on the general duty clause and other provisions. Currently, the Occupational Safety and Health Administration's primary regulatory tool for ergonomics falls under what is called the "General Duty Clause" of the original Occupational Safety and Health Administration Act, which states that the employer must "furnish to each of its employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm" (Section 5(a) (1) of the OSHA Act). Occupational

Safety and Health Administration has been interpreting that to mean that if there is evidence (primarily from reports of musculoskeletal disorders) that there are ergonomic problems, that those problems must be addressed. Occupational Safety and Health Administration has issued significant fines in some industries around ergonomic issues based on the “General Duty Clause” (Atwood, 2004:55-58).

The South African Occupational Health and Safety Act, 1993 is clearly preventative in nature. The organisations, who allow flexible work arrangements must also adhere to the Occupational Health and Safety Act to ensure that teleworkers are working in safe environment, apply ergonomics and therefore protect teleworkers from work-related musculoskeletal disorders.

2.4.3 Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act, (No. 130 of 1993) and Circular Instruction 180 regarding the Compensation of Work-related Upper Limb Disorders

Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act, (No. 130 of 1993) states that an employee will be entitled to compensation if it is proven to the satisfaction of the Director General that the employee has contracted a disease mentioned in Schedule 3 and that such a disease has arisen out of and in the course of his or her employment. Schedule 3 states that musculoskeletal conditions caused by specific work activities or a work environment where particular risk factors are present will be regarded as an occupational disease. Examples of such activities or environment include:

- rapid or repetitive motion
- forceful exertion
- excessive mechanical force concentration
- awkward or non-neutral postures
- vibration

Compensation for work-related upper limb disorders caused by exposure to these risk factors is covered in Circular Instruction 180. Musculoskeletal diseases that are not of the upper limbs (e.g. neck, lower limbs, etc.) are not covered in the Compensation Commissioner’s guidelines or in Circular Instruction 180, but can still be reported in terms of Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act,

1993 (Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage work-related upper limb disorders, 2004:3).

2.4.3.1 Diseases versus injuries

At this stage, it is important to distinguish between occupational diseases and occupational injuries. Work-related upper limbs disorders will be regarded as an occupational disease and not as an 'injury'. However, if work-related upper limb disorders develop as a result of an occupational injury (e.g. a fracture into the wrist joint with the consequent development of carpal tunnel syndrome), the work-related upper limb disorders should be considered part of the injury and the Compensation Commissioner should be notified in the subsequent progress reports of the occupational injury (Compensation Commissioner's Guidelines for Health Practitioners and Employers to manage work-related upper limb disorders, 2004:3).

2.4.3.2 Diagnosis of work-related upper limb disorders

Circular Instruction 180 (Republic of South Africa, 2004a) states that the following criteria should be used to confirm the diagnosis of work-related upper limb disorders:

- A diagnosis of work-related musculoskeletal upper limb disorder by the medical practitioner.
- Medical history and clinical signs indicating - site and distribution, quality (type, character), severity (intensity, frequency, and duration) and progression of the symptoms according to the type of disorder.
- Functional ability report by an occupational therapist and/or physiotherapist, where necessary.
- Occupational exposure to known risk factors and a chronological relationship between the work-related musculoskeletal upper limb disorder and the work environment.
- The confirmatory tests/investigations (e.g. x-rays, strength testing, range of motion testing, nerve conduction tests), where appropriate.

The medical officers in the Compensation Office will determine whether the diagnosis of work-related musculoskeletal upper limb disorder was made according to acceptable medical standards.

2.4.3.3 Impairment determination

Circular Instruction 180 (Republic of South Africa, 2004a) states that impairment will be determined, in accordance with the internal instructions 157 for residual impairment of the function of the muscles, tendons, joints or nerves involved, after maximum medical improvement has been reached.

2.4.3.4 Benefits payable

Benefits will be payable according to the Compensation for Occupational Injuries and Diseases Act, 1993 (Act number 130 of 1993), as amended.

- Temporary total disablement

Payment for reasonable temporary total or partial disablement will be made based on the medical reports for as long as such disablement continues, for a period not exceeding 24 months.

- Permanent disablement

Permanent disablement will be assessed when a Final Medical Report is received, after a reasonable recovery period not exceeding 24 months, and failure to perform work effectively after the appropriate course of treatment and rehabilitation.

- Medical aid

Medical expenses shall be provided for a period of not more than 24 months from the date of the diagnosis. This period may be extended if, in the opinion of the Director General, further medical aid will reduce the extent of the disablement. The medical aid covers the costs of diagnosing a work-related musculoskeletal upper limb disorder and any necessary treatment provided by any healthcare provider. The Compensation Commissioner will decide on the need for, the nature and the sufficiency of the medical aid supplied (Republic of South Africa, 2004a).

2.4.3.5 Reporting to the Compensation Commissioner

The following documentation (*cf.* Table 2.4.2) should be submitted to the Compensation Commissioner, or the employer individually liable, or the mutual association concerned:

TABLE 2.4.2: REPORTING TO THE COMPENSATION COMMISSIONER

(Compensation Commissioner’s Guidelines for Health Practitioners and Employers to manage work-related upper limb disorders, 2004:6)

W. CL. 1	Employer’s report of an occupational disease OR
W. CL. 305	Employee affidavit for an occupational disease (when the employer does not timeously submit the employer’s report of an occupational disease (W. CL.1))
W. CL. 14	Notice of an occupational disease and claim for compensation (signed by the employee)
W. CL. 110	Exposure history or an appropriate employment history
W. CL. 301	First medical report in respect of a work-related upper limb disorder
	All other reports that may be relevant to the diagnosis and treatment of the condition (e.g. an ergonomic assessment supported by photographs, video clips, etc.)
W. CL. 6	Resumption report (even if the employee is at work)
W. CL. 302	Progress/final medical report in respect of a work-related upper limb disorder
	As long as the case is open, the employer must submit the following reports on a monthly basis to the compensation commissioner or mutual association or employer individually liable, as the case may be, until the employee’s condition has become stabilised, when a final medical report (W.CL. 302) should be submitted.
W. CL. 6	Resumption report (even if the employee is at work)
W. CL. 302	Progress/final medical report in respect of a work-related upper limb disorder when work-related upper limb disorder are reported

2.4.3.6 Claim processing

The Office of the Compensation Commissioner will consider and adjudicate upon the liability of all claims. The medical officers in the Compensation Commissioner’s office are responsible for the medical assessment of a claim and for the confirmation of the acceptance or rejection of a claim (Republic of South Africa, 2004a).

It is clear that work-related upper limb disorders are reported to the Compensation Commissioner so that payment of medical costs, sick leave and compensation can be considered in terms of the Compensation for Occupational Injuries and Diseases Act. It is therefore concluded that these two acts are opposite sides: The Occupational Health and Safety Act, 1993 are preventative in nature while the Compensation for Occupational Injuries and Diseases Act, 1993 (Act number 130 of 1993) will compensate the worker if the worker suffered an injury due to poor health and safety in the work environment.

Boshoff (2013) confirms that poor occupational health and safety performance results in cost to the State (e.g. through social security payments to the incapacitated, costs for

medical treatment, and the loss of the “employability” of the worker). If potential hazards or risks are not properly managed, it will result in loss to organisational resources. Injuries and illnesses also decrease productivity, morale, and profits. It is therefore important to manage occupational and environmental accidents and ill health pro-actively by applying ergonomics, by training the teleworkers and ensuring compliance to the Health and Safety Act at all the alternative workplaces of an organisation.

Pyöriä (2011:388) emphasises the importance of labour legislation in designing a formal telework contract, an often neglected aspect in the research literature as well as in practice. Pyöriä (2011:397-399) maintains that a successful telework arrangement is a matter of agreeing on a common set of rules and adhering to those rules. However, it is important to note that the provisions of national legislation must be followed even when work is done in the employee’s home or some other place of the employee’s choice, and when it is done using the employee’s tools or machines. As in all ordinary work arrangements that fit the criteria of an employment relationship, it is always advisable to set out the terms of employment in writing. A carefully drafted written or electronic contract provides a useful tool with which both the employee and management can see the benefits and drawbacks of the new work arrangement. Such a telework contract should include the following as unambiguously as possible:

- Validity of the contract
 - The date of commencement;
 - nature of employment contract, indefinite/fixed term (criteria for fixed term appointments to be specified if necessary);
 - trial period and/or period of notice if applicable; and
 - if the telework contract terminates or is terminated by one party or by mutual consent, the employee shall have the right to return to his or her previous or equivalent job.
- Place and time of work and payment
 - Place: definition of telework site (e.g. employee’s home or electronic cottage); in the case of part-time telework it is recommended that terms and conditions are defined regarding arrangements for the use of the employer’s premises (e.g. sharing of a workstation by several teleworkers).
 - Time: as a general rule, teleworkers shall be responsible for compliance with working hour norms specified in the contract; in part-time telework, it is

recommended that rules are laid down on how work hours shall be divided between the telework site and the employer's premises.

- Pay: criteria for wage determination (e.g. normal monthly salary and overtime pay separately).
- Employee's duties
 - The teleworker must be present at the employer's premises whenever work demands require their presence (e.g. meetings);
 - the teleworker must be contactable by the employer, other employees or customers during specified times;
 - the teleworker must comply with the employer's safety guidelines; and
 - reporting on the progress and completion of work (e.g. hourly logbook).
- Employer's duties
 - To compensate the costs incurred to the employee from telework as applicable (e.g. telephone and telecommunications connections);
 - provision of necessary training and other instructions (e.g. definition of the rules and restrictions regarding the use of information and communication technology and the consequences of violating these rules);
 - occupational safety (e.g. ergonomics); ensure that teleworkers and other employee groups are treated equally in internal workplace communications, personnel training, recreational activities, etc.; and
 - respect the teleworker's privacy.
- Job tasks and monitoring performance
 - The content of telework job tasks, timetable and possible interim objectives must be defined on a case by case basis to a degree of accuracy that leaves no room for misinterpretations; and
 - the focus of monitoring in telework must be on outcomes and results, not on the actual work process or working hours.

To assist organisations with regulatory compliance with the Acts discussed, a conceptual telework framework will be proposed to the teleworking organisations (*cf.* Chapter 5, paragraph 5.5). This framework will incorporate the policies and regulations required to ensure the successful implementation of a telework programme in organisations.

2.4.4 Conceptual Telework Framework

There are a number of business management models available that could be implemented by organisations to enhance organisational quality and excellence. Examples of such models are the Malcolm Baldrige Model, the Deming Model and the European Foundation Quality Model (EFQM). The South African Excellence Model (SAEM) was derived from these international models. It was consequently decided to utilise a management model that has been implemented by numerous organisations in South Africa as the proposed conceptual telework framework. The SAEM is a model for performance excellence. The SAEM was established to help South African organisations to assess their levels of efficiency and effectiveness, identify business areas that needed improvement, and institute significant performance improvements to achieve higher levels of competitiveness in the global marketplace. Its strengths lie in identifying good management practices. The model drives continuous improvement and, allows organisations to benchmark themselves against global businesses (South African Excellence Foundation, 2002 and Bond, 2014).

The inception and background to the SAEM needs to be clarified. In 1990, a group of concerned South African organisations met to discuss quality related challenges in South Africa. This resulted in the establishment of the South African Quality Institute (SAQI) in 1993. One of the objectives of the SAQI was to implement a national quality award. The initial SAEM was developed over the period from the 17th of January 1997 to the middle of August 1997 and, was based on the experiences of the European Foundation Quality Award (EFQA) and the Malcolm Baldrige National Quality Award (MBNQA). The South African Excellence Foundation (SAEF) was formally established on 27 August 1997 (a Section 21 not-for-profit organisation) to take ownership of the SAEM (Intellectual Property issues), and to promote and manage the implementation of the Model. The SAEF founding members were ABSA Bank, Armscor, CSIR, ESKOM, Greater Pretoria Metropolitan Council, Growman Consulting Group, Honeywell Southern Africa, IDEAS Management Southern Africa, Ingersoll-Rand Southern Africa, Mercedes-Benz South Africa, SABS, South African Post Office, South African Bureau of Standards, South African Society for Quality, South African Quality Institute and Standard Bank of South Africa. The South African Excellence Awards (SAEA) was South Africa's most prestigious award for organisational excellence. However, the SAEF was declared insolvent on 16 February 2005 and liquidated on 27 July 2006. On 20 August 2007, IDEAS Management was informed by St Adens, International Insolvency Practitioners that

their offer to purchase the SAEM (Intellectual Property) was accepted by the Master of the High Court and that ownership now vests in IDEAS Management Southern Africa CC (Bond, 2014).

Following the purchase of the SAEM, IDEAS Management Southern Africa now operates as the Centre for Excellence. The Managing Member, Weldon Bond, gave permission for the use and adaptation of the SAEM framework for the purposes of this research (*cf.* Annexure N).

The SAEM is advocated as a generic framework of criteria that allows organisations to adapt the criteria and criterion parts to suit their specific needs. The former SAEF described the SAEM as follows:

“The South African Excellence Model is a non-prescriptive, holistic framework around which all stakeholders in an entire organisation could rally with enthusiasm, a ‘road map’ that could be used to address the many challenges facing organisations collectively and in an integrated way” (SAEF, 2000 & Smit, n.d.).

This SAEF description of the SAEM implied that the proposed existing management model had to be adapted and that the content for such an adapted model had to be identified and developed specifically for telework. Therefore, the generic framework of criteria of the SAEM was adapted and changed to include the elements that were deemed essential to implement a telework programme successfully in an organisation.

The framework and premise of the SAEM were retained but the criteria and criterion parts were adapted based on the literature review to suit the purpose of the conceptual telework framework as well as the research objectives and questions. The purpose of the conceptual telework framework is to be used as a guide by organisations that envisage implementing a flexible work programme in their organisations. The adapted SAEM will be referred to as the conceptual telework framework for the remainder of this section.

The proposed conceptual telework framework comprises 11 criteria that can be used as a guide to implement a telework programme. The same criteria can also be implemented to assess a teleworking organisation’s progress towards performance excellence. The criteria are grouped into enablers (the first six criteria) and results (the last five criteria). The

enablers focus on what an organisation does to achieve an end result. Each criterion is subdivided into several criterion parts. The enabler criteria are concerned with how an organisation approaches each of the criterion parts. The focus is on the quality of the input and the processing of the input. Enablers are commonly referred to as representing the actions, work and culture of an organisation and these indicate how an organisation does things. The actions/work done in an organisation should be seen *versus* the results. The results criteria are concerned with organisational achievement. The focus is on the quality of the output. The results represent measurements of what has been achieved on the work done on the enabler's side. The results represent what an organisation targets, measures and achieves. The actual relationship between enablers and results (cause and effect) are one of continuous improvement. The full power of the conceptual telework framework is derived from the relationships between criteria. At a basic level, if a process is said to be key in an enabler criterion, then results related to the performance of that process should appear in one of the results criteria (SAEF, 2000, 2002 & Bond, 2014). Structurally, the adapted criteria are illustrated in Figure 2.4.1.

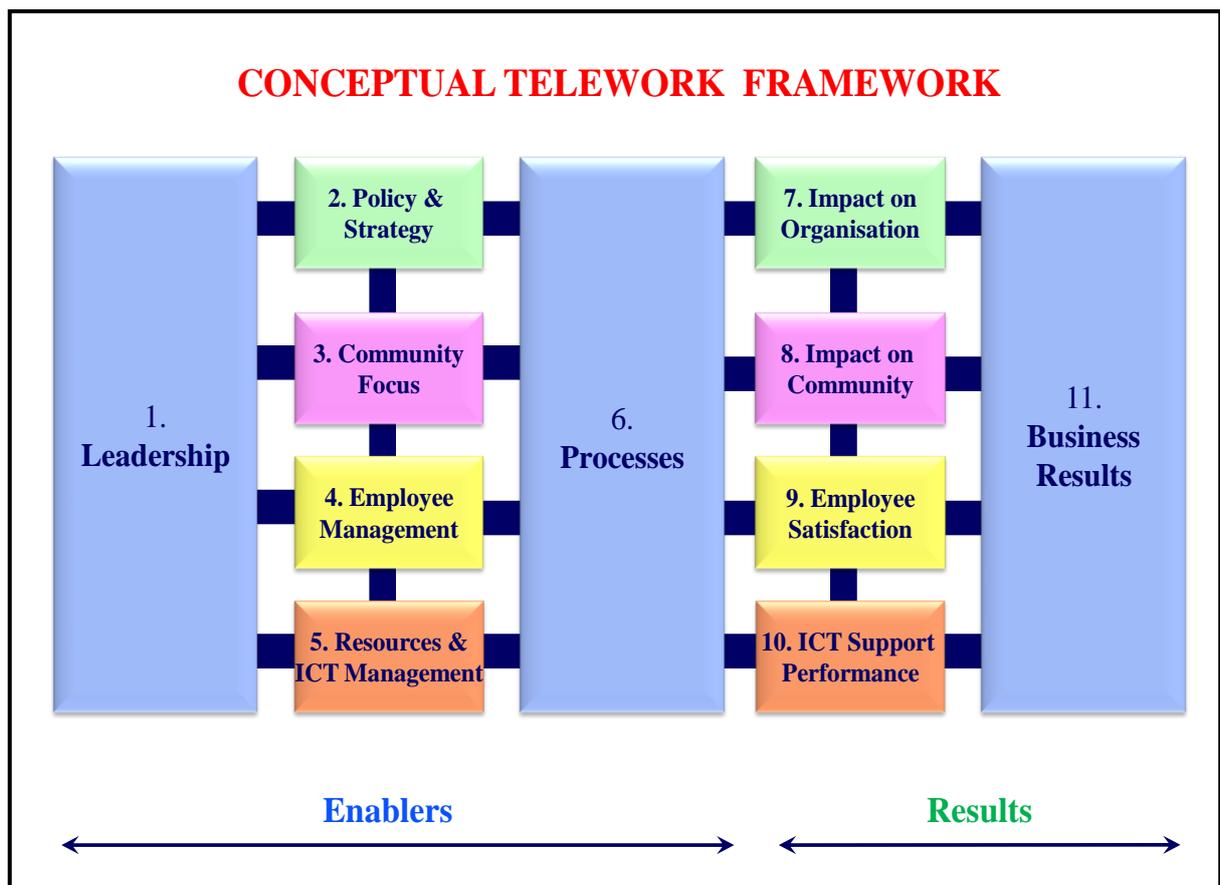


FIGURE 2.4.1: CONCEPTUAL TELEWORK FRAMEWORK
(Adapted from SAEM, SAEF, 2002 & Bond, 2014)

The conceptual telework framework is based on a premise that can be presented as follows:

(a) Impact on the Organisation; Impact on the Community; Employee Satisfaction and Information and Communication Technology Support Performance

↓ *are achieved through*

(b) Leadership

↓ *driving*

(c) Policy and Strategy; Community Focus; Employee Management; Resources; Information and Communication Technology Management and Processes

↓ *leading ultimately to excellence in*

(d) Organisation Results (SAEF, 2000; Williams, 2008 & Bond, 2014).

The dynamics (premise) of the conceptual telework framework are presented by (a) to (d) in Figure 2.4.2.

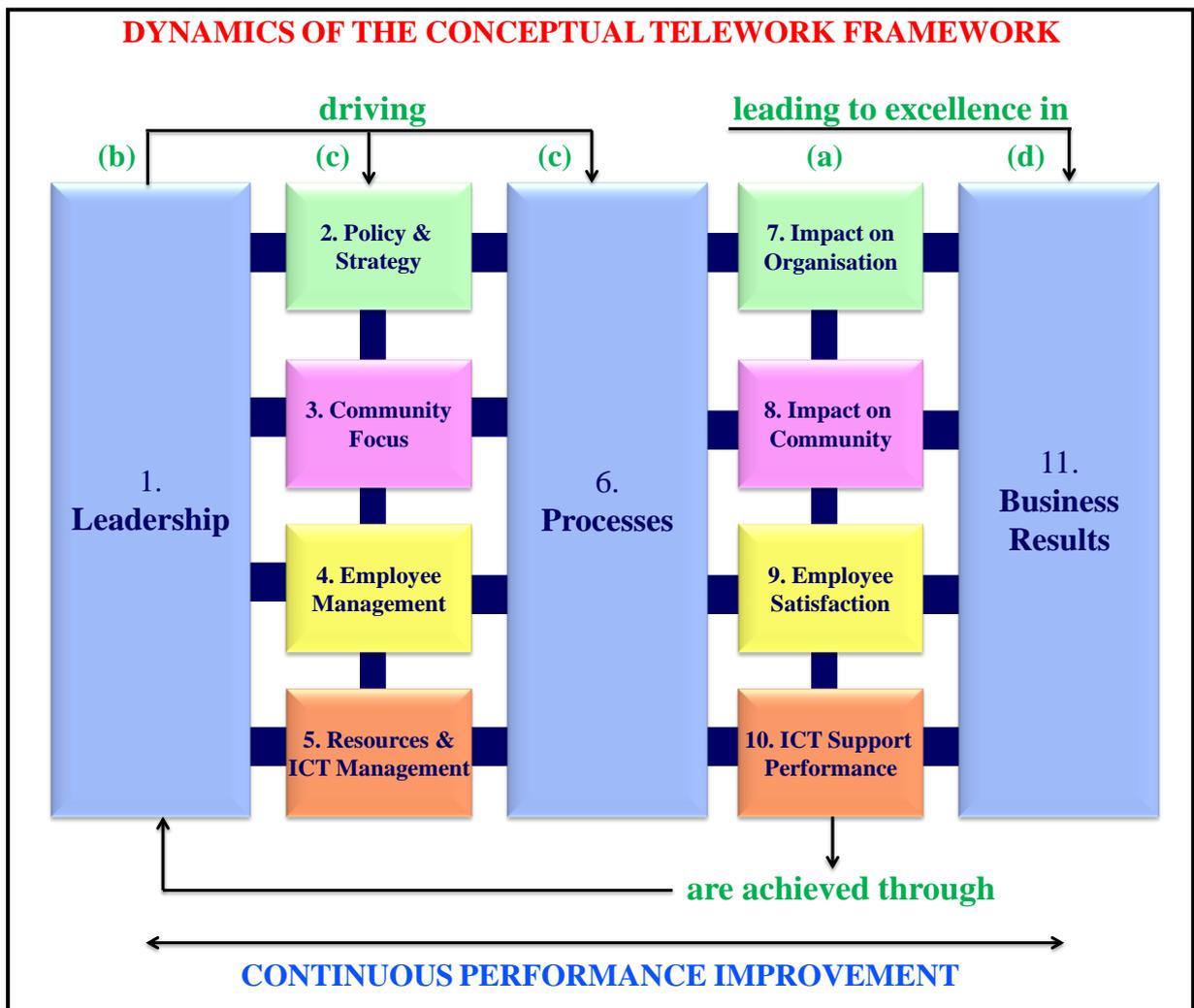


FIGURE 2.4.2: DYNAMICS OF THE CONCEPTUAL TELEWORK FRAMEWORK

(Adapted from SAEM, SAEF, 2002 & Bond, 2014)

The enablers represent the elements that an organisation should implement and the results represent the outcomes, benefits and results of what have been implemented. The enablers and results criteria and criterion parts will be discussed as these were adapted in Chapter 5, paragraph 5.5.

2.5 SUMMARY

Chapter 2 was dedicated to the literature review on the key concepts of this study. It provided the theoretical framework on which the investigation has been based. It also provided a detailed description on information administration technologies, the virtual office, telework and e-environment. It covered the health and wellness aspects (work-related musculoskeletal disorders), relevant ergonomic requirements and the applicable acts, policies and procedures that should be complied with in an e-environment. It included a discussion on the conceptual telework framework that was envisaged as secondary research objective number four. Chapter 3 describes the research methodology followed in this study to address the research objectives and answer the research questions.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

3.2 RATIONALE FOR RESEARCH APPROACH SELECTED

3.3 RESEARCH DESIGN

3.4 ETHICS

3.4 SUMMARY

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

In Chapter 2 the literature was reviewed. Chapter 3 describes and justifies the approach used to study the topic as covered in the research problem, questions and objectives. The philosophical assumptions adopted, the procedure of inquiry (research design) as well as the specific research methods of data collection and analysis informed/influenced the decision to adapt this approach. The selection of the approach is based on the nature of the research problem, the personal experiences and the audience for this study (Creswell, 2014:3). The specific research design and the research methods that were followed will be discussed according to a flowchart (*cf.* Figure 3.2).

3.2 RATIONALE FOR RESEARCH APPROACH SELECTED

Bouma and Ling (2006:7) define scientific research as follows: “Scientific research involves the attempt to gather evidence in such a way that others can see why particular evidence was gathered, how that evidence was gathered, and what the findings were; they can then draw their own conclusions on the basis of that evidence.”

Collis and Hussey (2008:3-4) define research as “a systematic and methodical process of enquiry and investigation with a view to increasing knowledge”. The outcome of the research could be applied or basic research depending on whether the expected outcome is the solution to a particular problem or a more general contribution to knowledge. The purpose of research (the reason why it was conducted) could be exploratory, analytical, predictive or descriptive. The process/approach of the research, referring to the way in which the data was collected, analysed and interpreted can be quantitative, qualitative or mixed method research. The logic of the research, whether the research logic moves from the general to the specific or *vice versa*, could be deductive or inductive research (Collis & Hussey, 2008:3-4; Creswell, 2014:3).

According to Creswell (2014:4), quantitative research is an approach for testing objective theories by examining the relationship among variables. These variables can be measured, so that numbered data can be analysed using statistical procedures. The final research

report has a set structure consisting of introduction, literature and theory, methods, results and discussion. Researchers who engage in quantitative research have assumptions about testing theories deductively, building in protection against bias, controlling for alternative explanations and being able to generalise and replicate the findings.

Two important components in this definition are that the approach to research involves philosophical assumptions as well as distinct methods or procedure. The broad research approach is the plan to conduct research, involves the intersection of philosophy, research designs and specific methods (Creswell, 2014:5). Figure 3.1 illustrates the interaction of these three components.

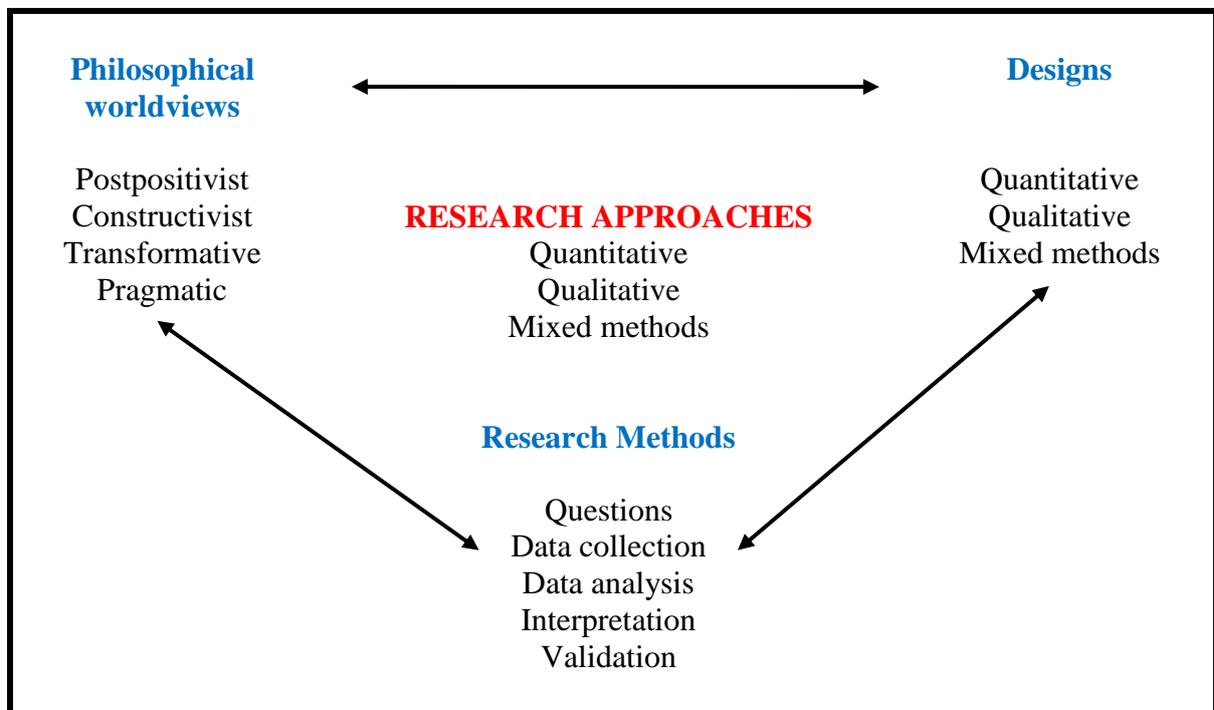


FIGURE 3.1: A FRAMEWORK FOR RESEARCH - THE INTERCONNECTION OF WORLDVIEWS, DESIGN AND RESEARCH METHODS (Creswell, 2014:5)

The quantitative philosophical worldview (paradigm) is termed the postpositivism, the constructivism, transformative or pragmatism. This worldview is general philosophical orientation about the world and the nature of research that is brought to a study. A worldview arises based on discipline orientations, mentors and past research experiences. The worldview has to be understood as it will provide direction for designing all phases of the research study (Creswell, 2014:6). Table 3.1 depicts the contrasting aspects of the

quantitative and qualitative paradigms on the following assumptions: ontological, epistemological, axiological, rhetorical and methodological.

TABLE 3.1: QUANTITATIVE AND QUALITATIVE PARADIGM ASSUMPTIONS

(Creswell, 1994:5)

Assumption	Question	Quantitative	Qualitative
Ontological assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple as seen by participants in a study
Epistemological assumption	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched	Researcher interacts with that being researched
Axiological assumption	What is the role of values?	Value-free and unbiased	Value-laden and biased
Rhetorical assumption	What is the language of research?	Formal Based on set definitions Impersonal voice and use of accepted quantitative words	Informal Evolving decisions Personal voice Accepted qualitative words
Methodological assumption	What is the process of research?	Deductive process Cause and effect Static design - categories isolated before study Context-free Generalisations leading to prediction, explanation and understanding Accurate and reliable through validity and reliability	Inductive process Mutual simultaneous shaping of factors Emerging design - categories identified during research process Context-bound Patterns, theories developed for understanding Accurate and reliable through verification

For the purpose of this study, the quantitative research approach has been selected based on the ontological assumption that telework (reality) exists independently in the business world, independently. The research outcomes/results comprise of organisations that allow flexible work arrangements, have policies to regulate their teleworkers, who may encounter health and wellness problems if ergonomics are not applied and result in compensation claims. The outcomes/results were obtained objectively by using a questionnaire as instrument. On the epistemological question, distance, objectivity and independence from the participants in assessing the telework situation in the systematically selected sample was maintained. The invited participants remained anonymously in this

study. A contact person from the selected organisations distributed the online questionnaire via the organisations' intranets. As for the axiological issue, personal values were kept out of the study by omitting statements about values, using impersonal language and reporting the facts as collected through the questionnaire. The rhetoric assumption implies that impersonal and formal language with well-defined variables and accepted definitions were used in this study. As to the methodology, a deductive form of logic wherein theories were tested in a cause-and-effect order, for example: compliance with ergonomic policies could enhance workplace safety and prevent musculoskeletal disorders that could lead to compensation claims were used. Concepts and variables were chosen before the study commenced and remained fixed throughout the study. No ventures beyond the predetermined objectives were made. The aim was to develop generalisations that could contribute to the theory and enable predictions, explanations and understanding of the telework phenomenon, health and wellness aspects and ergonomics and regulatory compliance in the virtual environment. The aim was to ensure that the information and questionnaires used were valid and reliable so that the generalisations have more validity and carry more weight.

Creswell (1994:8; 2014:19-21) is of the opinion that the rationale for a single paradigm is based on such issues as the skills and the overall size of the project. The rationale for the paradigm of choice is based on the following:

- The worldview (comfortable with the characteristics of the quantitative paradigm and prefer the use of an objective survey);
- the training and personal experience (technical writing skills, computer statistical skills and library skills, highly systematic procedure, carefully worked out procedures and rules);
- the psychological attributes (comfortable with the rules and guidelines for conducting research, low tolerance for ambiguity and the time for the study is of a short duration);
- the nature of the problem (void in the literature, literature on overseas teleworking exists, however limited information available in South Africa, variables were determined through the review of literature on overseas telework practices) and

- the audience for the study that will accept the research (individuals accustomed to quantitative studies, conference attendees, journal editors and readers and colleagues in the telework field).

3.3 RESEARCH DESIGN

According to Creswell (2014:11-12), a researcher not only selects a qualitative, quantitative or mixed method study, but also decides on a type of study within these three choices. Research designs are types of inquiry within qualitative, quantitative and mixed methods approaches that provide specific direction for procedures in a research design. Within the parameters of applied research, a descriptive (what is going on) quantitative research design has been followed. Based on the holistic research framework (*cf.* Chapter 1, figure 1.1), a selection has been made to represent the quantitative design that has been planned as illustrated in Figure 3.2.

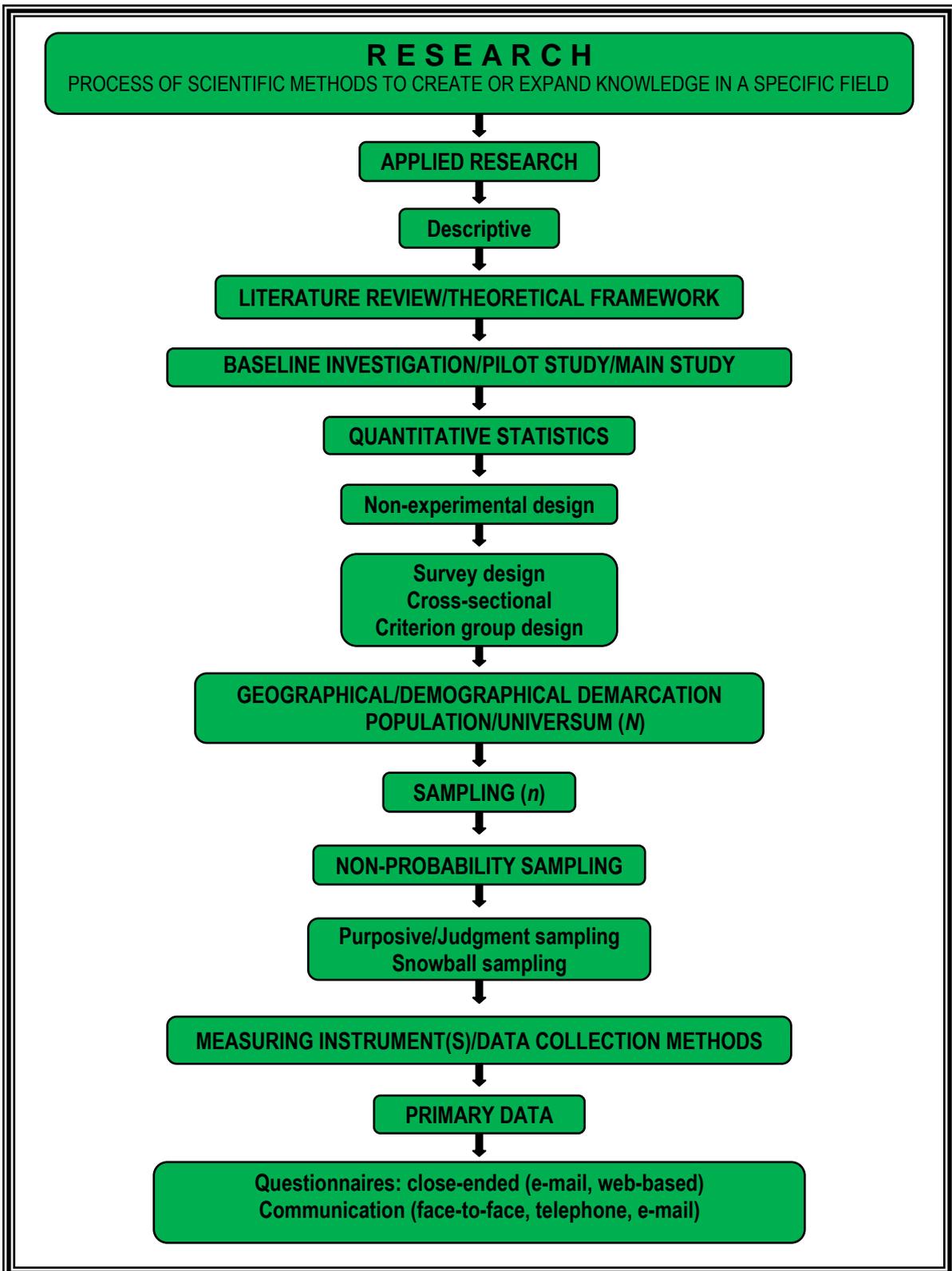


FIGURE 3.2: QUANTITATIVE RESEARCH DESIGN

(Based on the holistic research framework, *cf.* Chapter 1, figure 1.1)

(Adapted from Hoffmann, 2008; Welman, Kruger & Mitchell, 2005)

3.3.1 Literature review

According to Creswell (2014:25), the literature review helps to determine whether the topic is worth studying and it provides insight into ways in which the scope can be limited to a needed area of inquiry. However, before considering what literature to use, a topic to study has to be identified and described in a short phrase. This topic will become the central idea to explore the literature.

The topic for this study can be described as follows: Telework is possible due to all the technological developments and workers therefore need not be in the office to be productive. However, the teleworkers must apply ergonomics guidelines at the alternative workplaces to ensure that they remain healthy. If the application of policies is not adhered to, it could lead to health and wellness problems that could result in compensation claims. The costs resulting from teleworkers being on sick leave, as well as possible occupational compensation claims may cause the teleworker's organisation to be negatively impacted with reduced productivity, retraining and unnecessary financial losses. It is therefore necessary for organisations to ensure that they do have all the required health, safety and wellness policies, procedures, regulations and legislation in place and that they regulate the compliance with these by their teleworkers.

An extensive literature review has been conducted and has been reported on in Chapter 2. It focused on the variables in the title of this study, i.e.

- Information administration technologies enabling the virtual office (telework);
- health and wellness aspects (work-related musculoskeletal disorders);
- ergonomics; and
- regulatory compliance (Occupational Health and Safety Act, 1993 (Act 85 of 1993); Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act, (No. 130 of 1993), and Circular Instruction 180 regarding the Compensation of Work-related Upper Limb Disorders).

As suggested in the presented research framework, a literature review has been done at the beginning of the study to provide direction for the title and research questions. The literature has been used deductively as a framework for the research questions. The literature review also guided the baseline study to determine if work-related disorders, the

costs involved and workdays lost, were indeed a problem worth investigating. The baseline study findings are presented in paragraph 3.3.3.2. The literature review as presented in Chapter 2 introduced and described the theory that has been investigated with the survey. Furthermore, the literature assisted to define the terms and variables as identified in the title of this study (*cf.* Chapter 1.3). The literature will be revisited and cross referenced in Chapter 5 when comparisons will be made between the results obtained from the survey conducted and the existing literature findings (Creswell 2014:25-43).

3.3.2 Empirical main study

The third major element in the framework for research (*cf.* Figure 3.2) is the specific research methods that involve the questions, forms of data collection, analyses and interpretations that are proposed (Creswell, 2014:16).

The empirical main study has been planned and conducted to answer the research objectives and questions. The literature review and the baseline investigation confirmed the problem statement as stated in Chapter 1, paragraph 1.4. The selected research design will be discussed in this section. The baseline study will be discussed in paragraph 3.3.3.

3.3.2.1 Research design selected for main study

A standard classification of research divides projects into applied and basic research (Collis & Hussey, 2008:7). An applied research approach, as followed in this study, revolves around discovering, interpreting, and the subsequent development of methods and systems for the successful implementation of telework suitable for the South African context. The approach adopted can also differentiate research. A quantitative approach addresses the research question(s) and design of a study that involves collecting quantitative data and analysing those using statistical methods (Collis & Hussey, 2008:7).

According to Collis and Hussey (2008:5-6), descriptive research is conducted to describe phenomena as they exist. It is used to identify and obtain information on the characteristics of a particular problem or issue. Descriptive research has been employed to describe the current telework profile of the identified participants. Descriptive research has been used to identify the work-related musculoskeletal disorders, the cost thereof and the workdays lost due to medical interventions. It has also identified the risk factors that teleworkers are

exposed to and which ergonomics, regulations and policies are applied in these organisations.

Creswell (2014:4) maintains that quantitative research is an approach for testing theories by examining the relationship among variables. These variables can be measured by means of an instrument so that numbered data can be analysed using statistical procedures. A web-based survey using questionnaires (consisting of structured and close-ended questions) for data collection was selected. Due to the non-probability sampling techniques used, there is no intent to generalise from the sample of teleworkers to the teleworking population in South Africa. Communication (face-to-face, e-mail and telephonic) will also be used to establish contact with participating companies where primary data collection will be done.

3.3.2.2 Geographical and demographical demarcation of the population

The diffusion of telework in South Africa is unknown. There were no previous studies done from which a list of teleworking organisations could be demarcated. There were no sampling frames available of potential participants that could be used. Hoffmann (2000) completed a doctoral study on “Contextual implications of information technology on the administrative function”. In this study, Hoffmann (February, 1998) stated that “Telephone interviews have been conducted with Public Relations Officers or Human Resources Managers of fourteen large organisations, with only two confirming that teleworking is successfully practised in their organisations, namely IBM SA and Sasol”. This information was used as a starting point to identify possible participants. Both organisations were contacted to obtain consent to participate in this research project. One of these organisations was not willing to participate due to client confidentiality and the other organisation did not respond to correspondence sent.

The identification of organisations that implemented flexible working arrangements have been done informally through friends, word of mouth, business associates and through contact with industry members serving on Tshwane University of Technology’s Advisory Boards. Four organisations, namely ABSA, Grundfos, Telkom and Unisa were identified and contacted to participate in the survey (Annexure G). A Professional Body, Office Professionals South Africa (OPSA) was also contacted and requested to assist with the distribution of the hyperlink to the questionnaires used in the online survey (Annexure H).

OPSA publish a weekly newsletter, “Terrific Tuesday” for their subscribers who are office professionals who might be involved in telework.

The identified and participating organisations all have branches/departments/units/sections with managers/line-managers/supervisors that manage teleworkers and employees who telework. The managers and teleworkers of the four organisations were targeted to participate in the web-based questionnaires. OPSA also consented to publish the hyperlink to the questionnaire in their country-wide publication and invited their subscribers who might be involved in telework to participate in the survey (Annexure L).

3.3.2.3 *Universum* and sampling techniques

McMillan and Schumacher (2010:143) emphasise the importance of selecting the subjects (S) or individuals who will be participating in a study that will contribute to the data collection process. All the subjects who participate in a research project are referred to as a sample (n) and the sample is selected from a larger group of individuals, identified as the population (N). Researchers rarely survey the entire population for two reasons: the cost is too high, and the population is dynamic, for example, the component of population could change over time. Therefore, the three main advantages of sampling revolve around lower costs, faster data collection, and the possibility/probability to ensure homogeneity and improve the accuracy and quality of the data because the data set is smaller (Adèr, Mellenbergh & Hand, 2008; Bouma & Ling, 2006:10, 114-124).

In research, the *universum* is a precise group of people or objects that possesses the characteristic (criterion group design) that is questioned in a study. To be able to specify the target population, a researcher must identify all the specific qualities that are common to all the people or objects in focus. Population sampling is the process of taking a subset of subjects that is representative of the entire population. The sample must have sufficient size to warrant statistical analysis. Sampling is usually done because it is impossible to test every single individual in the population. It is also done to save time, money and effort while conducting the research (Castillo, 2009c and Babbie, 2008:121).

On the logic of sampling, Bouma and Ling (2006:114-124) state that samples are used to reduce the cost in time, energy and money of studying large populations. The way in which the sample is selected determines whether reliable conclusions about the larger group can

be drawn. There are probability sampling (simple random, systematic, stratified random, and cluster sampling) and non-probability sampling methods (judgmental, convenience, snowball, accidental, accidental quota and systematic matching sampling). In non-probability sampling, members of the population do not have an equal chance of being selected. Due to this, it is not safe to assume that the sample fully represents the target population (Castillo, 2009c and Babbie, 2008:204).

In this study, non-probability sampling has been employed in the following ways:

- **Purposive/Judgmental sampling**
Units of analysis were selected based on their knowledge and professional judgment. This type of sampling technique is also known as purposive sampling and authoritative sampling (Castillo, 2009b). Babbie (2008:204) states that the units to be observed are selected based on a researcher's judgment in terms of which ones will be the most useful or representative. The participating organisations were purposively selected from the population based on the knowledge that they were involved in telework. Only those managers and employees involved in flexible work arrangements were targeted to participate in the survey by completing the questionnaires (criterion group design). The distribution of the questionnaire hyperlink through a professional body (OPSA) can also be regarded as purposive sampling. Although no information existed on which readers may be involved in any form of flexible work arrangements, it was a convenient method to distribute the questionnaire hyperlinks to such a large number of potentially available participants. The subscribers to this publication are all Office Professionals, a likely population to be involved in telework. The purposive selection of medical practitioners, based on their type of practice and possible treatment of work-related disorders, is an example of this sampling technique as employed in the baseline study.
- **Convenience sampling**
According to Castillo (2009a) and Babbie (2008:205), subjects are selected because of their convenient accessibility and proximity to a researcher. The subjects are selected just because they are easiest to recruit for the study and a researcher did not consider selecting subjects that are representative of the entire population. A researcher inadvertently excludes a great proportion of the population. A convenience sample is either a collection of subjects that are accessible or a self-

selection of individuals willing to participate, which is exemplified by volunteers. The most obvious criticism about convenience sampling is sampling bias and that the sample is not representative of the entire population. This may be the biggest disadvantage when using a convenience sample because it leads to more problems and criticisms. Another significant criticism about using a convenience sample is the limitation in generalisation and inferential analyses about the entire population. Since the sample is not representative of the population, the results of the study cannot vouch for the entire population. This results in a low external validity of the study. Many researchers prefer this sampling technique because it is fast, inexpensive, easy and the subjects are readily available. For the baseline study, convenience and judgment sampling were used to select the medical practitioners. The medical town where all the medical practitioners have their consulting rooms was selected because it was convenient

The population were selected based on the flexible work arrangements that the organisations have in place. These arrangements did not have to be formal as it could be informally agreed upon between managers and teleworkers. The characteristics used in stratifying the selected population were their involvement in telework. Therefore, only Managers/Line-managers/Supervisors that managed employees who telework and employees that teleworked were sampled.

A single-stage sampling procedure was employed. The contact person in each organisation had access to the names of the teleworking employees in the organisation and therefore sampled all of them. Multi-stage sampling was not used due to the fact that there were only a small number of employees in each organisation that were involved in telework.

Before the sample could be selected, the assistance of a contact person in each organisation had to be secured. Telephone calls were made to either the Human Resource/Communication/Public Relations departments as indicated on the websites of the site population. The main aim of the telephone calls was to establish contact and to identify the correct persons within the organisations to be contacted with the request to conduct research within these organisations. It also sensitised these persons about the Participant's information letters that would be e-mailed to them. This telephone communication included a brief explanation of the research project and what was expected from the

organisations. After the telephonic conversations, e-mails were sent to these organisations. It consisted of a cover letter briefly explaining their role in the data collection process, a request to indicate the population sizes and to give consent to participate. The letter requesting permission to conduct research with the consent form (Annexure G) was attached to this e-mail. Follow up calls and e-mails were made and received if the person initially contacted was not the correct person. Consent to participate in the research was obtained from the contact persons on behalf of the organisations (Annexure I). If the contact person did not have the authority to complete the “consent to participate” the contact person offered to obtain consent from the relevant authorities. This contact person e-mailed the completed and signed ‘consent to participate’ form back. An indication of the population size had to be provided and the signed consent letters had to be submitted with the ethics application document in order to obtain ethical clearance from Unisa. The contact person was requested to send an e-mail with the ‘Participant’s information letter’ (as attachment) that contains both of the hyperlinks to the two questionnaires to all the managers/line-managers/supervisors and teleworkers on the organisations’ intranets. This e-mail consisted of a cover letter that indicates that the organisation consented to participate in the research and that the employees were therefore allowed to participate. The participants were requested to read the attached participant’s information letter and to click on the appropriate hyperlink to access the questionnaire. There was no burden on any managers/line-managers/supervisors to forward the hyperlink to their teleworkers. The contact person in the organisation was the only person involved in the distribution and data collection process.

The participant’s information letter explained the research project to the teleworking participants. It also contained the hyperlinks to the two questionnaires. In the questionnaires the participants were requested (Question 1) to consent to participate by ticking the appropriate choice. To ensure that only managers/line-managers/supervisors of teleworkers and employees who telework complete the questionnaire, Question 2 requested confirmation if telework was allowed or whether the employee has the flexibility to do telework in their environment. If the person ticked the “No” option, the questionnaires were developed to skip all the questions and to take the participants to the end of the questionnaire to the “Submit” option.

The site population and site target population were very difficult to determine. In the case of Unisa, for example, the questionnaires were distributed by e-mail on the intranet to 77 staff members that included Managers/Line-managers/Supervisors and Teleworkers. There was no burden on the contact person to furnish the number of Managers/Line-managers/Supervisors and Teleworkers separately. The reality was that the organisations participating in the research found it difficult to supply this detailed information. Another organisation indicated that there are no formal telework agreements in place and that telework is arranged informally between Managers/Line-managers/Supervisors and Teleworkers. It is also quite likely that a manager is also teleworking. As far as the OPSA sample size is concerned, it could not be determined or estimated how many of the 18 000 to 20 000 readers/subscribers were involved in telework, therefore the sample size of OPSA could not be determined.

For the purpose of the main survey investigation, the site population included Managers/Line-Managers/Supervisors of teleworkers in the organisation/department/branch/section involved with telework (N_1 - completing questionnaire one - Annexure A) and Teleworkers in the organisation/department/branch/section (N_2 - completing questionnaire two - Annexure B). For the baseline investigation, Medical practitioners (N_3) ($N_{30}= 30$ and $n_3 = 12$) were targeted as participants (Annexure C). The baseline investigation will be discussed in detail in paragraph 3.3.3.

The contact person in each organisation supplied the estimated number of managers and teleworking employees. Raosoft[®] was used for sample size calculation. The total target population was given as 323. The margin of error was fixed at 5% with the confidence interval of 95%. The response rate was set at 50% and the recommended sample size was found to be at least 176 (Hamburg, 1985). Table 3.2 indicates the total number of participants per organisation identified to be involved in telework.

TABLE 3.2: SAMPLE SIZE CALCULATION

Participants: Teleworkers(N_1) Managers of teleworkers (N_2)	Target population ($N_1 + N_2$)
ABSA	$N_1 + N_2 = 39$
Grundfos	$N_1 + N_2 = 37$
Telkom	$N_1 + N_2 = 170$
Unisa	$N_1 + N_2 = 77$
OPSA readers (18 000-20 000)	$N_1 + N_2 = \text{Unknown}$
TOTAL DISTRIBUTED (N)	$N_1 + N_2 = \mathbf{323}$
TOTAL RECEIVED (n)	$n_1 + n_2 = \mathbf{203}$

A total number of 145 responses were received back from teleworkers. A total number of 58 responses from managers of teleworkers were received back from the participating organisations.

3.3.2.4 Measuring instruments and data collection methods

The mode of enquiry followed in this research was a quantitative, non-experimental, criterion group survey design. Consistent with the methodology of a positivist framework, the data collection techniques were web-based questionnaires and communication was by e-mail and telephone. Because reality could be measured and existed the validity and reliability of the results were important. Through the careful design of data collection, it was attempted to eliminate bias and selected a representative sample from the population - all aspects of a positivist methodology.

Survey research provides a quantitative or numeric description of some fraction of the population - the sample - through the data collection process of asking people questions. The purpose of a survey design is to generalise the finding from a sample of responses to a population so that inferences can be made about some characteristic, attitude or behaviour of this population (Creswell, 2014:155). It should be noted that the findings collected from the participating organisations in this research is not a generalised perspective of the entire South African telework population. The reason for this statement is that with non-probability sampling techniques (purposive), the findings hold only for the sample itself, namely the four organisations from which the data has been collected. The intended

conceptual telework framework that will be designed might however be applicable to any organisation in South Africa that implements telework.

The advantages of the survey design are the economy of the design, the rapid turnaround in data collection and the ability to identify attributes of a population from a small group of individuals. The survey design was cross-sectional; the survey data has been collected at one point in time and not longitudinal; collected over a period of time from all the participants. The assistance received from a contact person in each of the organisations made it convenient and limited the costs for data collection. The data was collected by e-mailing the survey to the participants in the sample. The participants had fifteen working days to complete the questionnaires from the date when the e-mail was sent to them (Creswell, 2014:157).

Hofstee (2009:132-134) describes using a questionnaire as a manner of eliciting information directly from the participants who are presumed to have the required information. According to Hofstee, questionnaires are a form of structured interviewing where all the participants are asked the same questions and are often offered the same options in answering the questions. Usually, the use of open-ended questions has to be avoided. Hofstee's reasons for this argument are that people differ in their ability and willingness to provide answers and answers to open-ended questions can be difficult to interpret and analyse. Hofstee is of the opinion that questionnaires do not allow a researcher to interact or observe the participants. Questionnaires are also limited in the depth to which a researcher is able to probe participants and do not allow for digression from the set format. On the other hand, questionnaires have the advantage that they offer confidentiality to participants and are easier to analyse and turn into quantitative results. They also allow for more volume as more people can participate and that raises the confidence levels in the sample.

The questionnaires were developed from scratch based on the literature review and the findings from the baseline study. Hofstee's (2009:133-134) advice has been followed on the content of the questionnaires by keeping the questionnaire as consistent as possible to avoid confusing the participants. The length of the questionnaire for teleworkers was a concern, but after a thorough evaluation, it was decided that the questionnaire could not be shortened without forfeiting important data. The teleworkers questionnaire consisted of 22

questions and the questionnaire for managers/line-managers/supervisors of teleworkers consisted of 20 questions. Completion of the questionnaires took 15 to 20 minutes. The participants' information letter indicated that the length of the questionnaire may cause inconvenience and discomfort. All attempts were made to ensure directness and clarity in the formulation of questions so that participants would understand the questions easily. No abbreviations were used and definitions of the concepts like telework, ergonomics and work-related musculoskeletal disorders were provided in the questionnaire.

The medical terms used in the health and wellness section of the questionnaires were a concern raised by the College Research Ethics Review Committee of Unisa. To allay the concerns of the Ethics Review Committee, the following response was provided:

“The medical terms used in the questionnaire, represent the ‘common layman’s terms’ as used by medical practitioners when dealing with their patients. For example, the term ‘tennis elbow’ is the term used instead of the medical term ‘lateral epicondylitis’. It is assumed that if a participant has suffered from, received treatment or medical intervention for any of the listed work-related musculoskeletal disorders, they would be able to recognise the medical term. Furthermore, these are the most common disorders as identified during an extensive literature review on work-related musculoskeletal disorders. A short definition with each work-related musculoskeletal disorder can be provided, but due to the length of the questionnaire and even more complex medical terms, it was decided not to include the definitions in the questionnaire. The assumption is that participants will select only the recognisable disorders that they suffered from.”

The questions were formulated in a neutral manner to avoid pushing participants in any particular direction. The questions were also grouped into categories with headings to indicate the sections as follows: consent, demographic information, telework, regulatory compliance, work-related musculoskeletal disorders and ergonomics. Asking open-ended questions were avoided, except for the last question on the teleworkers questionnaire on reasons for not lodging a compensation claim. The questions that were personal in terms of identification of disorders suffered from, cost involved and workdays lost due to the disorders were at the end of the questionnaire. The Ethics Review Committee was concerned that the nature of questions of the last category on work-related musculoskeletal disorders could be sensitive. This concern was motivated as follows:

“It needs to be clarified that once a participant has submitted their answers, the data is captured by the SurveyMonkey™ database, where the participants are guaranteed anonymity and confidentiality. The data will be downloaded from the SurveyMonkey™ into a database in the form of an Excel file that will make it impossible to trace participant’s information. There is no real threat that participants will be exposed. At the beginning of the section on work-related musculoskeletal disorders in the questionnaire, a statement to re-assure participants of their anonymity and confidentiality was repeated. This will hopefully limit any discomfort to answer truthfully on these questions.”

Neutral response options that could allow participants an easy way out were avoided and the questionnaire design did not compel participants to answer every question. If participants preferred not to answer particular questions, they could proceed to the next question.

The two questionnaires were created with the aid of the SurveyMonkey™, an online survey and questionnaire design and management software package to which the faculty subscribed. By upgrading to an advanced option, the advantages of asking more questions and provide more compilation options, free data from completed surveys, downloading of data, and the option to create graphs and charts exist. The participating companies’ intranets were used to distribute the hyperlink to the questionnaire to the teleworking participants. Data has been instantly captured in the SurveyMonkey™ database and could be downloaded at any time without affecting the number of completed questionnaires. Figure 3.3 illustrates the software package used for this data collection instrument.

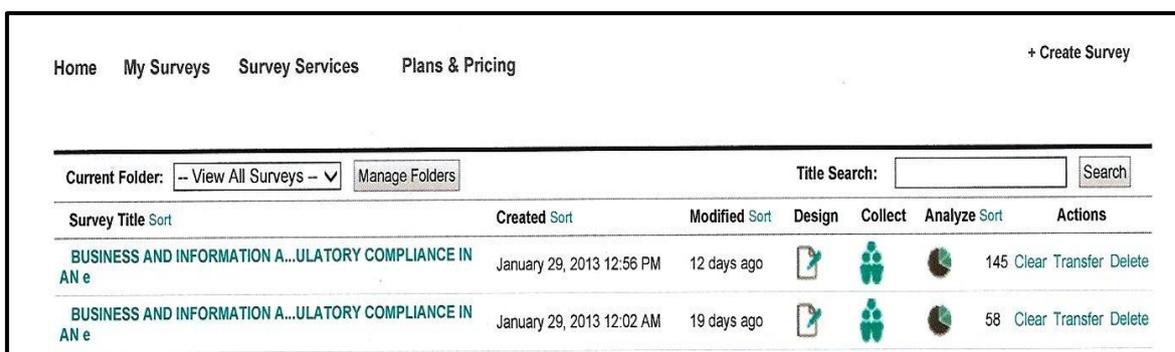


FIGURE 3.3: SURVEYMONKEY™ WEBPAGE
(SurveyMonkey™, 2013)

The above SurveyMonkey™ webpage indicates the total number of questionnaires submitted by the participants. All the responses were captured in one Excel database. It was possible to determine the number of responses received back per organisation based on the selection of the industry sector (V4) to which the participants belong. The number of responses or population groups received back from the readers of OPSA's publication could also be determined. It represented all the participants from other industry sectors, excluding those participants who selected ABSA, Grundfos, Telkom and Unisa.

The major content sections in the instrument as prescribed by the Ethics Review Committee and Creswell (2014:161) are listed below:

- The cover letter:
Each participant received an e-mail from the contact person with the "Participant's information letter" attached (Annexure J). The following topics were explained in this cover letter:
 - The identities, positions and academic connections of the research team appointed for the study as well as the intended qualification to be obtained after completion.
 - The purposes for which the information was collected. This referred to the aim and purpose of the study.
 - The reason why the participant has been selected and the procedures for selection of participants. This referred to the limited number of organisations involved in telework.
 - The participant's actual (physical) role in the study. This referred to the request to click on the hyperlink to enable the participant to complete the web-based questionnaire.
 - The expected duration of participation. This made reference to the estimated time it would take the participants to complete the questionnaires as well as the total number of days the data collection process would run in that organisation, were explained.
 - A statement was added that participation was voluntary and that there was no penalty or loss of benefit for non-participation.
 - The benefits to the participant and others. The benefits were that feedback would be provided to the participating organisations on the outcome of the research.

- The potential risks/discomfort/inconvenience for participants. Some personal information in terms of identification of work-related musculoskeletal disorders was required from participants. This was however not deemed as sensitive information due to the confidential and anonymous nature of the questionnaire. At the beginning of the section on work-related musculoskeletal disorders in the questionnaire, the participants were reassured of their anonymity and confidentiality. This was intended to limit any discomfort to answer these questions truthfully. A minimal inconvenience for participants could be as a result of time spent completing the questionnaire due to its length.
 - A statement that the participant could withdraw at any time without an obligation to provide reasons for withdrawal and that there would be no punitive measures taken against the participant for withdrawing was included.
 - Compensation/gifts/services for participants; it was stated that there will be no incentives or rewards for participating.
 - The period for which the records relating to the participants would be kept was indicated.
 - The steps taken to ensure confidentiality and secure storage of data; how privacy will be protected in any publication of the information; and how feedback will be provided was indicated.
- The items covered in the questionnaires:
 - a statement of consent;
 - statement that flexible work arrangements were allowed;
 - demographic information;
 - preferred kind of telework from a South African context;
 - the extent to which organisations in trade and industry were aware of and comply with the required policies and regulations in terms of ergonomics and technology in the administrative workplace;
 - the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers; and
 - closing instructions.
- The type of scales that were used to measure the items in the questionnaires included rating scales (strongly agree to strongly disagree, never to always), categorical scale (yes/no) and multiple choice (select, specify).

The questionnaires were tested in a pilot study that was conducted over three days to establish the content validity (did the items measure the content they were intended to measure), the concurrent validity (did the scores predict criterion measure that would be able to be correlated with other results in future) and construct validity (did the items measure the hypothetical concepts). The pilot study of the questionnaires resulted in the improvement of the questions, the format and the scales. A total number of 15 participants from industry and three educational institutions participated in the pilot. Ten of the participants completed the teleworkers' questionnaire and five managers of teleworkers completed the relevant questionnaire. The participants were personally contacted by e-mail and invited to participate based on the knowledge that the participants were involved in telework. The participants were also requested to comment on the questions and to indicate the time that it took them to complete the questionnaire. The assistance of a statistician was obtained in order to apply the necessary steps to ensure internal validity of the questionnaires. It was a requirement from the Ethics Review Committee that the pilot study had to be conducted with a minimum of 10 participants. The final questionnaires had to be submitted together with the application documents before final ethical approval could be obtained.

3.3.2.5 Variables in the study

Creswell (2014:161) suggests that a researcher needs to relate the variables to the survey instrument. This was done by means of a table that cross-references the variables, the research questions and specific survey items as indicated in Table 3.3 (adapted from Creswell, 2014:162).

TABLE 3.3: VARIABLES, RESEARCH OBJECTIVES/QUESTIONS AND ITEMS ON QUESTIONNAIRES

VARIABLE NAME	DESCRIPTIVE RESEARCH OBJECTIVES	ITEM ON QUESTIONNAIRE 1 Managers of telework	ITEM ON QUESTIONNAIRE 2 Teleworkers
Independent variable 1: The e-environment (virtual office/ telework)	Secondary objective 1: What are the different types of virtual offices, how are they implemented and managed	See questions: 2, 3, 4, 5, 7, 8, 9, 10, 11, 12	See questions: 2, 3, 4, 5, 6, 7, 8, 9, 10
Independent variable 2: Organisational policies, regulations and legislation	Secondary objective 4: Are the necessary organisation policies/procedures and government legislation implemented and how are regulatory compliance ensured in e-environments?	See questions: 13, 14, 15, 19, 20	See questions: 11, 12, 13, 19, 20, 21, 22
Dependent variable 1: Information administration technologies/furniture/ services	Secondary objective 2: What are the technology applications (equipment), furniture and services required for virtual offices?	See question: 6	See questions: 9, 10
Dependent variable 2: Ergonomics	Primary objective: Are the ergonomic guidelines and regulations applicable to information and communication technologies effective and adhered to in the virtual office?	See questions: 15, 16, 17	See questions: 14, 16
Dependent variable 3: Health and wellness aspects (work-related musculoskeletal disorders)	Secondary objective 3: What types of health and wellness risk factors exist that could cause work-related musculoskeletal disorders in the e-environment and what are the consequences for organisations and teleworkers?	See questions: 17, 18, 19	See questions: 14, 15, 16, 17, 18, 19, 20
Dependent variable: 4 Telework framework	Secondary objective 5 What are the elements that need to be in place to implement a telework program successfully?	See questions: 13, 14, 15, 16	See questions: 11, 12, 13, 17

Based on the literature review and identified research questions, the purpose of the survey has been to determine the existence of policies, regulations and legislation applicable to employers and employees in the virtual environment (independent variables) and the compliance with the requirements for ergonomics of business and information administration technologies to avoid compensation claims and other legal actions due to health and wellness aspects (dependent variables).

Data collection for managers/line-managers/supervisors of teleworkers and employees that telework were planned to answer the research objectives and questions. The questionnaires respectively covered the following:

- Managers/line-managers/supervisors of teleworkers:
 - Consent and a confirmation that flexible work arrangements were allowed;
 - biographical data;
 - types of virtual offices in operation in their business;
 - knowledge and compliance with health and safety legislation promulgated in South Africa;
 - responsibilities of the employer to ensure compliance to these policies and legislation;
 - knowledge of specifications of the ergonomic and technology applications for each virtual office employed;
 - the existence of organisation policies and regulations that could serve as ergonomic guidelines for teleworkers to work productively and effectively in these e-environments;
 - types of occupational health, safety and wellness hazards encountered due to incorrect virtual office ergonomics for the relevant technologies in use; and
 - legal and other financial claims made against employers or the compensation fund.
- Teleworkers:
 - Consent and a confirmation that the participant is allowed to telework;
 - biographical data;
 - type of telework embarking upon;
 - awareness and knowledge of health and safety legislation promulgated in South Africa;

- awareness and knowledge of organisation policies and regulations to work productively and effectively in these e-environments;
- compliance with these policies and legislation;
- application of ergonomics in the type of virtual office;
- types of health, safety and wellness hazards encountered due to incorrect virtual office ergonomics;
- types of work-related injuries sustained; and
- legal and other financial claims made against employers or the compensation fund.

3.3.2.6 Validity and reliability

Validity encompasses the entire experimental concept, establishes whether the results obtained meet all of the requirements of the scientific research method, and accurately reflects the concept it is intended to measure (Shuttleworth, 2008; Babbie, 2008:157, 160 and Bouma and Ling, 2006:83-84). The idea behind reliability is that any significant results must be more than a once-off finding and be inherently repeatable. Other researchers must be able to perform exactly the same experiment, under the same conditions and generate the same results. This will reinforce the findings and ensure that the wider scientific community will accept the research objectives or hypotheses. According to Welman, Kruger and Mitchell (2005:142, 145), validity is the extent to which the research findings accurately represent what is really happening in a specific situation. Reliability therefore involves the credibility of the findings.

Cronbach's alpha was not applied because the instrument (questionnaires) used multiple response items. Therefore the use of Cronbach's alpha was not plausible since it requires the items to be strictly independent of each other; that is, each item can be answered with only one option. Therefore, guided by the experience (in the field of study) and theory (literature review), item analysis was performed to guide the importance of items to keep and/or to delete after the pilot study.

- The internal validity of the selected research design has been ensured as follows:
The internal validity is the extent to which its design and the data it yields allow a researcher to draw accurate conclusions about cause-and-effect and other relationships according to the data obtained (Leedy & Ormrod: 2010:97). To ensure

that the data actually express the reality of the telework environment and fit the telework population, the questionnaires have been piloted prior to the main data collection process, thus ensuring that the questions were clear, objective and understandable. The questionnaires were also submitted to subject specialists and a statistician to verify its content and relevance. After the pilot study has been done, the statistician cleaned the data in order to refine the questionnaires. Item analysis was performed for validation and reliability, since the used instrument mainly had multiple response items.

- External validity of the research design has been ensured as follows:
External validity of a research design is the extent that its results apply to situations beyond the study itself - the extent that the conclusions drawn can be generalised to other contexts (Leedy & Ormrod: 2010:99). External validity refers to the fit with the wider world. Although the data could not be generalised to the wider telework population, it is believed that the data collected will provide an indication of what the wider teleworking environment could profile.
- Validity of the data gathering instrument (questionnaire) has been ensured as follows:
Measurement validity refers to the extent that the constructs in the research question are successfully operationalised. The pilot study was done to confirm that the research questions will be answered by the two sets of questionnaires.
- Content validity of the measuring instruments have been ensured as follows:
The content validity of the questionnaires was tested after a study of the available literature. The subjective but expert opinion and judgement of the research team will have to be relied upon for content validity.
- Reliability of the data collection instrument has been ensured as follows:
The data collection instrument (questionnaires) designed for this study should be consistent and stable, predictable and accurate. The pilot study enhanced the reliability of the data collecting instruments. Any problems that have been identified were solved after the pilot study. Questions that were vague or did not measure the real problem and variables at stake were rephrased and changed after the pilot study.

3.3.2.7 Data analysis and interpretation

The type of data analysed was numeric information collected on scales from the survey questionnaires. The statistical results were used to analyse and interpret and will be covered in Chapter 4.

The services of a Tshwane University of Technology statistician were used to oversee the statistical methods and software requirements for appropriate capturing and processing of data. An independent data encoder was utilised for data management i.e., data was downloaded from SurveyMonkey™ in Excel format and converted to Stata V11 by Stata Transfer, where statistical analysis was performed.

Descriptive statistics such as frequencies (counts) and proportions (percentages) for each categorical variable were presented. The results were presented in both graphical and tabular formats. Where inferential statistics were required; the interpretation was performed at $\alpha = 0.05$. The Pearson's Chi-square test was employed to test for association between two categorical variables. However, the test for association could not be performed for all data due to the nature of the data where the p-values were greater than 0.05. The collected data is mainly multiple-response in nature. Therefore, inference could mainly be achieved "qualitatively" as the results generated are descriptive (Jann, 2005). Multiple response analysis was employed to create frequency and cross tabulation tables for user-defined "multiple response sets". In order to assess whether the observed differences between the levels of industry sectors (participating organisations) were significant or not, an adjusted Pearson chi-square test was conducted. The Cochran's statistics defined by $Q = \frac{c(c-1)\sum_j(T_j - \bar{T})^2}{c\sum_i u_i - \sum_i \mu_i^2}$, where all parameters are well defined (Jann, 2005:92-112), was used to evaluate the significance of the differences among the proportions of the single response categories. The proportions among the industry sectors were compared using hierarchical models (Letsoalo & Lesaoana, 2012; Jann, 2005). The interpretation is performed at a 95% confidence limit.

3.3.3 Baseline investigation

A baseline investigation has been conducted in order to substantiate initial assumptions and perceptions revolving around the selected research topic and to pre-test the main study questionnaires. It was needed to obtain clarity whether work-related musculoskeletal

disorders were indeed an issue, what caused these disorders, what were the costs involved and how many workdays were lost due to these disorders.

3.3.3.1 Baseline demographical demarcation, *universum* and sampling techniques, measuring instrument, data collection, capturing and processing

The population included medical practitioners (N) in a medical “town” opposite a large hospital in Pretoria, Gauteng. The sampling techniques were purposive and convenience sampling. The N and n frameworks have been planned as $N = 30$ and $n = 12$. The 30 medical practitioners purposively targeted in the baseline investigation consisted of general practitioners; orthopaedic surgeons; psychologists; physiotherapists; chiropractors, and bio-kineticists.

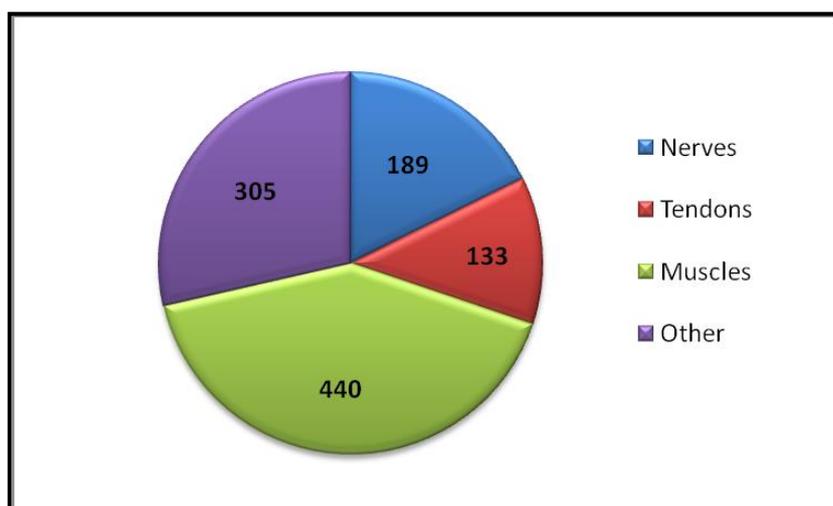
The questionnaire used in the baseline investigation was developed and distributed to collect data on work-related disorders that employees sustained that resulted in sick leave. Data was collected on the cause or reason for the illness/injury (especially whether it is work-related, or not); an estimate of the medical cost involved for treatment and surgery; and the number of workdays lost due to medical intervention and recovery.

The analysis of data focused on the current situation with regard to the various types of work-related disorders, its causes, the approximate costs and workdays lost due to such disorders. For the purpose of data collection, a structured questionnaire (Annexure C) was delivered to 30 medical practitioners in Pretoria. Where it was possible to interview the medical practitioner, a brief explanation on the purpose of the baseline study was provided and their consent to participate was obtained. If personal contact was not possible, the medical practitioner’s personal assistant was requested for support. Follow-up telephone calls to the personal assistants were made and the questionnaires were collected over a period of three weeks. The number of respondents amounted to 12 that represent a response of 40% (Strydom & Hoffmann, 2010).

The findings of the baseline investigation aimed to ascertain the viability and approach that should be followed in the main investigation.

3.3.3.2 Baseline study findings

The 12 medical practitioners who participated consisted of one psychologist and one chiropractor; two general practitioners; orthopaedic surgeons; and bio-kineticists and four physiotherapists. The medical practitioners provided data on specific medical conditions and the number of patients diagnosed and treated on a monthly basis, who suffered from work-related disorders or injuries. Consequently, a total of 1 067 injuries or disorders have been reported that have been categorised in four groups representing problems with nerves, tendons, muscles and other (Miller, 2001:1). This categorisation is indicated in Figure 3.4:



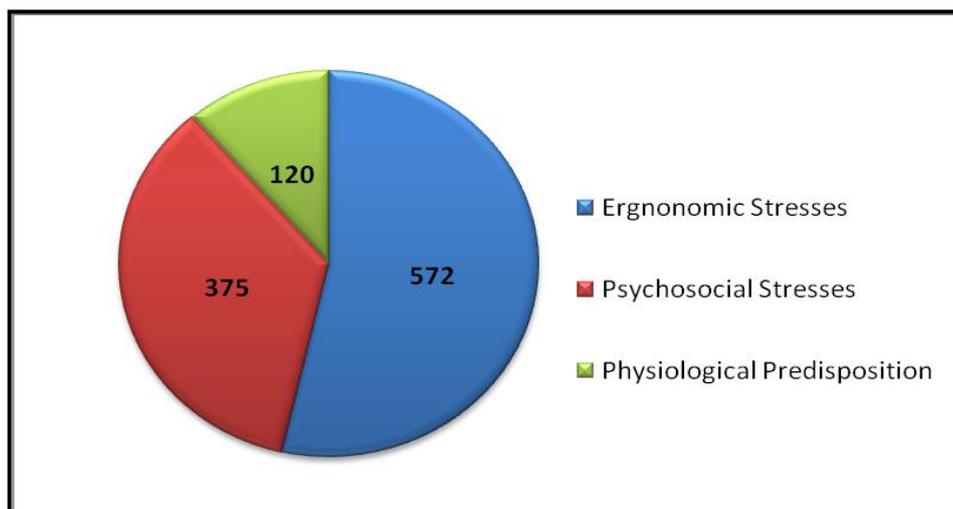
**FIGURE 3.4: WORK-RELATED DISORDERS
CATEGORISED PER GROUP**

From the medical practitioner's feedback, the four groups representing problems with muscles, tendons, nerves and other, identified the following disorders:

- Muscle problems (440 reported)
 - Myalgia (a general term for muscle pain); and
 - Myofascial pain syndrome ((irritation of the membrane around muscles).
- Tendon problems (133 reported)
 - Tendinitis (irritation of a tendon);
 - Tenosynovitis (irritation of the sheath around a tendon);
 - DeQuervain's disease (tenosynovitis at the base of the thumb);
 - Epicondylitis (irritation of the tendon attachments at the elbow; includes tennis elbow and golfer's elbow); and
 - Trigger finger (a type of extreme tenosynovitis, leading to locked fingers).

- Nerve problems (189 reported)
 - Carpal tunnel syndrome (damage to a nerve passing through the wrist);
 - Guyon’s canal syndrome (damage to another of the three nerves passing through the wrist; similar to carpal tunnel syndrome but involving a different nerve);
 - Cubital tunnel syndrome (damage to a nerve passing through the elbow);
 - Thoracic outlet syndrome (compression of the nerves and vessels between the neck and shoulder); and
 - Hypothenar hammer syndrome (nerve damage resulting from repeated impacts at the base of the palm).
- other (305 reported)
 - stress;
 - depression;
 - arthritis; and
 - deep vein thrombosis.

From the synopsis of verbatim feedback received from the sample of medical practitioners (*cf.* Table 3.4), it was concluded that these work-related disorders could be caused by a complex set of conditions relating to job activities, individual physiology, the work environment, technology, management, sociology, as well as non-work activities and environments. These risk factors for musculoskeletal work-related disorders can be split into three general groups as indicated in Figure 3.5:



**FIGURE 3.5: WORK-RELATED DISORDERS
CATEGORISED PER RISK FACTOR**

These three groups of risk factors include the following:

- Ergonomic stresses (572 reported)

Ergonomic stresses refer to the interaction between the body and the physical environment, for example:

- repetitive activity;
- holding a position without movement;
- use of force or strength;
- localised pressure; and
- awkward positions.

- Psychosocial stresses (375 reported)

Psychosocial stresses refer to the effects of the organisational or social environment on the worker. Psychosocial factors include:

- fear of job loss;
- lack of job control (including workload and pace);
- lack of social support; and
- computer breakdowns.

Psychosocial factors cause two types of stress:

- Emotional stress includes:
depression; frustration; anxiety; lack of fulfilment and insecurity.
- Physical factors include:
fatigue; increased heart rates; sweating and sleeplessness.

Psychosocial stress is a two-way street:

- the employer has a responsibility to recognise when a problem exists; and
- the employee has the responsibility to communicate his/her needs and help solve the problem.

- Physiological predisposition (120 reported), refers to some musculoskeletal disorder risk factors arising from the individual worker's physiology. The causes of musculoskeletal disorders are extremely complex and not completely predictable. Many people with ergonomic risk factors do not develop musculoskeletal disorders; others get musculoskeletal disorders for no obvious external reason. There is some evidence that workers new to a job are more prone to developing musculoskeletal disorders. One possible reason for this is that new workers are not physically conditioned for the particular activities that the job requires. Some research has also

found an apparent correlation between certain physical conditions and musculoskeletal disorders.

Some of these conditions are:

- Vitamin B-6 deficiency;
- diabetes;
- obesity;
- rheumatoid arthritis;
- taking oral contraceptives;
- gynaecological surgery; and
- small or square wrists (Miller, 2001:6).

Table 3.4 provides a synopsis of verbatim feedback received from the sample of medical practitioners.

TABLE 3.4: VERBATIM SYNOPSIS OF FEEDBACK: MEDICAL PRACTITIONERS

Work-related disorders	Approximate number of patients per month	Cause/Reason for disorders (% work-related causes/reasons)	Approximate costs for possible compensation claims (treatment and surgery)	Average workdays lost (treatment and surgery)
Nerve related				
Carpal/Guyon's/ Cubital Tunnel Syndrome	21 patients	70% work and office related Overuse / tiredness / computer work / repetitive strain	R15 500	17 days
Thoracic Outlet Syndrome	8 patients	25% work and office related Other reasons: posture	R600	4 days
Sciatica	160 patients	40% work and office related Computer overuse / work stress and strain/ ergonomics Other reasons: age / posture / injuries / arthritis / weight / trauma / degeneration / disc diseases	Up to R120 000	Up to 3 months
Tendon related				
Tendonitis	20 patients	85% work and office related Overuse of computer mouse / wrong data capturing techniques / stress in work environment	R10 400	20 days
Tenosynovitis/ DeQuervain's Syndrome	5 patients	90% work and office related Overuse of computer and mouse	R10 750	19 days
Epicondylitis	15 patients	55% work and office related Overuse / computer / physical tiredness	R15 750	30 days

Work-related disorders	Approximate number of patients per month	Cause/Reason for disorders (% work-related causes/reasons)	Approximate costs for possible compensation claims (treatment and surgery)	Average workdays lost (treatment and surgery)
Rotator Cuff Syndrome	63 patients	40% work and office related Work strain / stress / overuse Other reasons: trauma / sport / posture	R31 500	47 days
Bursitis	30 patients	45% work and office related Overuse in work environment Other reasons: sport/ old age / sepsis / inflammation	R16 000	15 days
Muscle related				
Myofacial Pain Syndrome	15 patients	50% work and office related Ergonomics / overuse / computer Other reasons: posture / chronic inflammation	R1 500	4 days
Neck Pain	140 patients	55% work and office related Stress and strain at work / ergonomics / computer Other reasons: posture / whiplash	R1 000	5 days
Myalgia	75 patients	40% work and office related Physical tiredness / computer overuse / work strain and stress Other reasons: age / inflammation / sport / trauma / posture	R1 500	5 days
Headache/ Migraine	190 patients	35% work and office related Work stress / computer overuse / ergonomics Other reasons: posture / spasm / age / eyes / neck dysfunction / stress	R750	2-4 days
Eye Strain	20 patients	50% work and office related Computer work Other reasons: old age	R300	1 day
Other				
Arthritis	120 patients	10% work and office related stress in work environment / ergonomics Other reasons: old age / tissue disorder / trauma / degenerative / injury / posture	R1 000	3-5 days
Stress	160 patients	60% work and office related Pressure and strain at work / conflict and emotional stress at work Other reasons: stress at home /	R750	6 days

Work-related disorders	Approximate number of patients per month	Cause/Reason for disorders (% work-related causes/reasons)	Approximate costs for possible compensation claims (treatment and surgery)	Average workdays lost (treatment and surgery)
		trauma / posture/ emotional stress / general conflict		
Depression	25 patients	50% work related Stress at work / high demands in working situation Other reasons: Trauma / home situation / economic situation / political situation	R900	Up to 6 months

Regarding the costs specified (that could result in compensation claims) the amounts have been calculated in terms of medical expenses of only one patient and in some cases only involve once-off treatment by a medical practitioner. The same applies to the workdays calculated in terms of lost productivity.

3.3.3.3 Baseline study conclusions and recommendations

The results of the baseline investigation (*cf.* Figures 3.4; 3.5 and Table 3.4) confirm that the occurrence of musculoskeletal work-related disorders is indeed unacceptably high. The results further indicate that these disorders are primarily caused by administrative work, overuse, repetition and deficient ergonomic conditions pertaining to especially telework environments. The costs involved and workdays lost suggest a viable problem worthy of further investigations in terms of justifiable claims against employers, loss of productivity and compliance with the national occupational health and safety regulations. As for the costs specified (that could result in compensation claims) the amounts have been calculated in terms of medical expenses of only one patient and in some cases only involved once-off treatment by a medical practitioner. The same applies to the workdays calculated in terms of lost productivity.

Finally, the information obtained from the baseline investigation summarises the reality and significance of the problem under investigation. Interpreting these findings significantly emphasises the areas of concern in terms of productivity levels, costs, occupational health, safety and wellness of employees, ergonomics in e-environments and finally the overall impact on organisations and the economy *per se*. The results of the

baseline investigation therefore confirmed the viability of the problem statement and objectives as formulated, as well as the reliability of questionnaire content.

3.4 ETHICS

Bouma and Ling (2006:192-200) provide the following basic principles of research ethics:

- Researchers must treat participants with dignity and respect.
- Research must be based on knowledge of the work of others in the area and be conducted and/or supervised by persons qualified to do the work. The safety of participants must also be ensured.
- The potential benefits of a research project must substantially outweigh the potential harm to participants.
- Participants in research must be able to make a voluntary, informed decision to participate.
- Research is a public activity, conducted openly and accountably to both the researcher's community and to the participants in the research.

In order to obtain ethical clearance for the research project, an application for ethical approval has been made by submitting the prescribed application documents. These documents were reviewed in compliance with the Unisa Policy on Research Ethics by the Research Ethics Review Committee of the College of Economic and Management Sciences. An invitation was extended to attend an Ethics committee meeting where the committee members obtained clarification on their questions and concerns. The following feedback from the Ethics committee was received:

“The ethics application for the research project was reviewed by the Research Ethics Review Committee of the College of Economic and Management Sciences in compliance with the Unisa Policy on Research Ethics. Final ethics approval depends on permission from the participating organisations, including the Senate Research and Innovation Committee, Unisa, clarification of the aspects raised by this committee and the submission of the final questionnaire (after the pilot study was conducted).”

After all the questions/concerns raised by this committee in their feedback document were addressed, the amended application documents were re-submitted. The ethics committee had another meeting after which conditional approval was granted (Annexure D) to start

the data collection process amongst the three industry participating organisations. The organisations were contacted to finalise the distribution process of the survey to the managers and teleworkers. The e-mail cover letter (Annexure K) and the participant's information letter (Annexure J) were e-mailed to the contact persons who undertook to e-mail it to the organisation's managers and teleworkers. The participants were allowed fifteen working days to complete the survey on-line.

To involve the academic employees (professors who are allowed to work at home) of Unisa, further final ethical approval was required. The "conditional ethical clearance certificate" and the formal request (Annexure F) to involve Unisa employees had to be submitted to the Senate Research, Innovation and Higher Degrees Committee. Final ethical approval from this committee has been received (Annexure E). The same procedure for the distribution of the survey amongst industry participants was followed with Unisa.

During the process to obtain ethical clearance from the College Research Ethics Review Committee of the College of Economic and Management Sciences, the committee raised their concern with regard to the personal nature of the questions in the work-related musculoskeletal disorders section of the questionnaire for teleworkers. Although these questions were personal in nature, it was not deemed sensitive information due to the confidential and anonymous nature of the questionnaire. At the beginning of the section on musculoskeletal disorders in the questionnaire, a statement to re-assure participants of their anonymity and confidentiality were repeated. This was deemed to limit any discomfort to answer these questions truthfully. It was clarified to the College Research Ethics Review Committee that once the participants had submitted their answers, the data was immediately captured by the SurveyMonkey™ database, where the participants were guaranteed anonymity and confidentiality. The data was downloaded from the SurveyMonkey™ into a database in the form of an Excel file that made it impossible to trace participant's information. There was no threat that participants could be exposed.

The College Research Ethics Review Committee requested a revision of the question dealing with financial expenditure (costs) on work-related musculoskeletal disorders (Question 19). This question was deemed to be personal and the participants might feel uncomfortable to answer truthfully. The committee recommended that categories should be provided for the cost of the medical intervention related to the disorders. The committee

reasoned that this would ensure that the responses were more accurate. The following argument was provided: The answers to Question 19 could, for example range from a single consultation fee of ± R350 to ± R50 000 for a rotator cuff injury to the shoulder that includes surgery and rehabilitation expenses. The financial implication of work-related musculoskeletal disorders medical interventions could differ from person to person and that made it difficult to provide categories. The question to be answered was what the “range” of these categories should be to make provision for the minimum and maximum costs. The aim with this question was to determine the actual cost per disorder so that the amount for a possible compensation claim could be established per work-related musculoskeletal disorder. The statistician’s advice was not to make use of categories in the questionnaire, but rather to determine if the exact information provided in the questionnaires can be categorised afterwards.

The research did not represent complex ethical or privacy issues or any harm to the participants. The questionnaire length might have triggered a sense of discomfort/inconvenience to the participants as they could not have anticipated a timely exercise. There was minimal anticipated risk involved based on the nature of the research in terms of a web-based questionnaire to be completed by the selected participants. Due to the anonymity and confidentially guaranteed to the participants, the questionnaire did not present a threat to the participants although the questions on the work-related musculoskeletal disorders could create a sense of discomfort.

3.5 SUMMARY

Chapter 3 described the rationale for the selected research approach. The philosophical worldview, the research design and the research methods were discussed. Various steps in the research method were discussed according to the research framework. The survey design, population and sampling procedures were examined. The measuring instruments used for data collection as well as the variables to be measured were described. The procedures that were followed to collect data, processing of the raw data and data analyses were covered. A thorough discussion of the baseline investigation conducted was given. The chapter concluded with the process followed to obtain ethical approval for the research project to protect the ethical rights of the participants.

Chapter 4 will cover the analyses and interpretation of the findings of the empirical study.

CHAPTER 4

EMPIRICAL STUDY RESULTS

4.1	INTRODUCTION
4.2	ANALYSIS OF THE DATA FROM MANAGERS OF TELEWORKERS
4.3	ANALYSIS OF THE DATA FROM TELEWORK EMPLOYEES
4.4	SUMMARY

CHAPTER 4

EMPIRICAL STUDY RESULTS

4.1 INTRODUCTION

Chapter 3 described the research approach followed according to a research framework (*cf.* Chapter 3, figure 3.2). All the elements in the framework were clarified to reveal the research methodology followed for this study. Chapter 4 deals with the discussion of the empirical findings generated from the questionnaire used for managers/line-managers/supervisors of teleworkers and from the questionnaire used for telework employees. The questionnaires have been distributed to four teleworking organisations, ABSA, Grundfos, Telkom and Unisa. The hyperlinks to these questionnaires have also been published in the weekly newsletter of OPSA. Distribution of the questionnaires was done over a period of three weeks. A total number of 323 participants received the questionnaires and 203 (63%) responded. The data was analysed and the results and findings obtained are discussed in this chapter. This discussion is concurrent with the relevant research objectives/questions outlined in Chapter 1, paragraph 1.5.

4.2 ANALYSIS OF THE DATA FROM MANAGERS OF TELEWORKERS

Data was collected that was directed specifically at the employers or managers/line-managers/supervisors of teleworkers (referred to as managers for the remainder of this discussion). This questionnaire has been distributed to 56 managers known to be managing teleworkers in ABSA, Grundfos, Telkom and Unisa. It was not possible to determine how many of the readers of the OPSA newsletter were managers of teleworkers. A total of 39 participants (73.6%) completed the questionnaire.

Descriptive data will be reflected as frequencies and percentages in tables and graphs, and will be discussed in this chapter. Pearson's Chi-square test is used to test for associations between two categorical variables. The results are regarded as significant if the p-value is below the 0.05 level of significance. The figures in brackets (for all cross-tabulations) indicate the proportion of participants under each subcategory. Where the Manufacturing industry sector (representing the organisation Grundfos) is missing from the test for association, it implies that the industry sector did not take part in the particular item. The

Cochran's statistics defined by $Q = \frac{c(c-1)\sum_j(T_j - \bar{T})^2}{c\sum_i u_i - \sum_i \mu_i^2}$, where all parameters are well defined (Jann, 2005:92-112), was used to evaluate the significance of the differences amongst the proportions of the single response categories; and the proportions among the industry sectors were compared using hierarchical models (Letsoalo & Lesaoana, 2012; Jann, 2005). The interpretation is performed at a 95% confidence limit. In this study, the words 'industry sector' and 'organisation' are used interchangeably.

4.2.1 Consent and confirmation that flexible work arrangements were allowed

In line with ethics recommendations, participants were requested to indicate whether they consent to participate in this study. A total of 53 (96.3%) participants consented to participate while two (3.6%) preferred not to participate.

In order to participate, the organisations should have flexible work arrangements in place that allowed employees to telework. A definition of telework was supplied in the questionnaire to enable the participants to provide an informed response. Figure 4.1 indicates the responses.

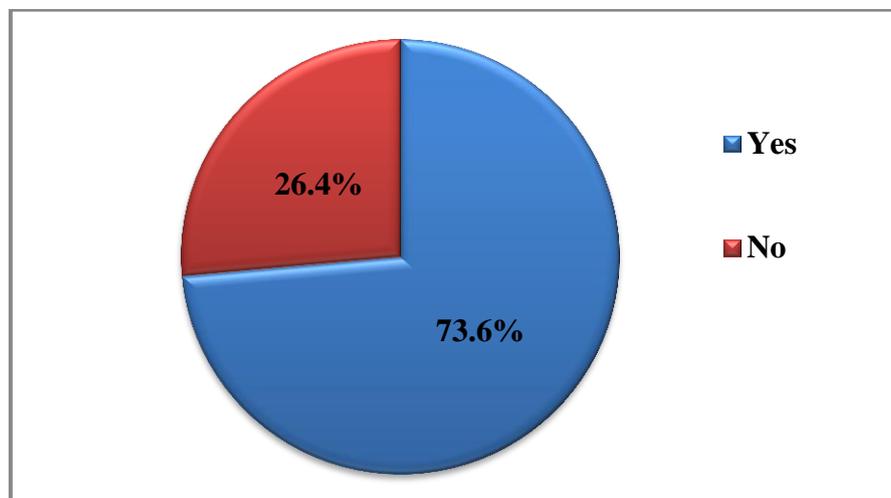


FIGURE 4.1: ORGANISATION ALLOWS FLEXIBILITY TO TELEWORK

A total of 73.6% of the participants indicated that their organisations allowed flexible work arrangements while 26.4% did not allow employees the flexibility to perform officially assigned duties at home or at other work sites that were geographically convenient to the residence of the particular employee. The participants who indicated 'No' could therefore not continue with the rest of the questions and were excluded from the questionnaire. Therefore, the active number of manager participants for this study was 39 (73.6%).

4.2.2 Demographic information

This section regarding the demographic information focused on the participant's managerial position, industry sector, the total number of knowledge workers and electronic devices used by teleworkers. These questions will be analysed in this section.

As part of the demographic information, participants were required to indicate their managerial position in the organisation. Figure 4.2 illustrates the responses received.

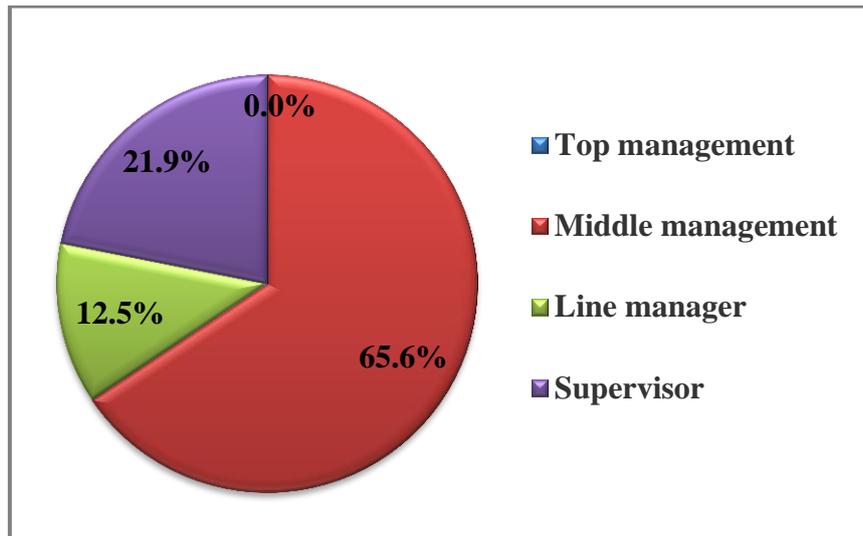


FIGURE 4.2: MANAGEMENT POSITION

None of the participants were in top management positions. The largest number of the participants (65.6%) was part of the middle management group, followed by supervisors at 21.9% and the remaining 12.5% were line managers.

From this data, it is clear that middle management (65.6%) were primarily responsible to implement and manage the flexible work arrangements of these organisations. The lower levels of management (supervisors, 21.9%) were not assigned with this task; they were probably managing employees who spend their working hours behind a desk under the watchful eye of the supervisors.

From a given list of industry sectors, participants were requested to choose the option that best described their organisations. The various options represented the division of industry sectors as used by Statistics South Africa to measure economic growth (Bouwer, 2011). Education was added as a variable because of the inclusion of Unisa which is an open-distance learning institution that did not match any of the supplied industry sector

variables. Figure 4.3 indicates the detailed stratification of the industry sectors in percentages.

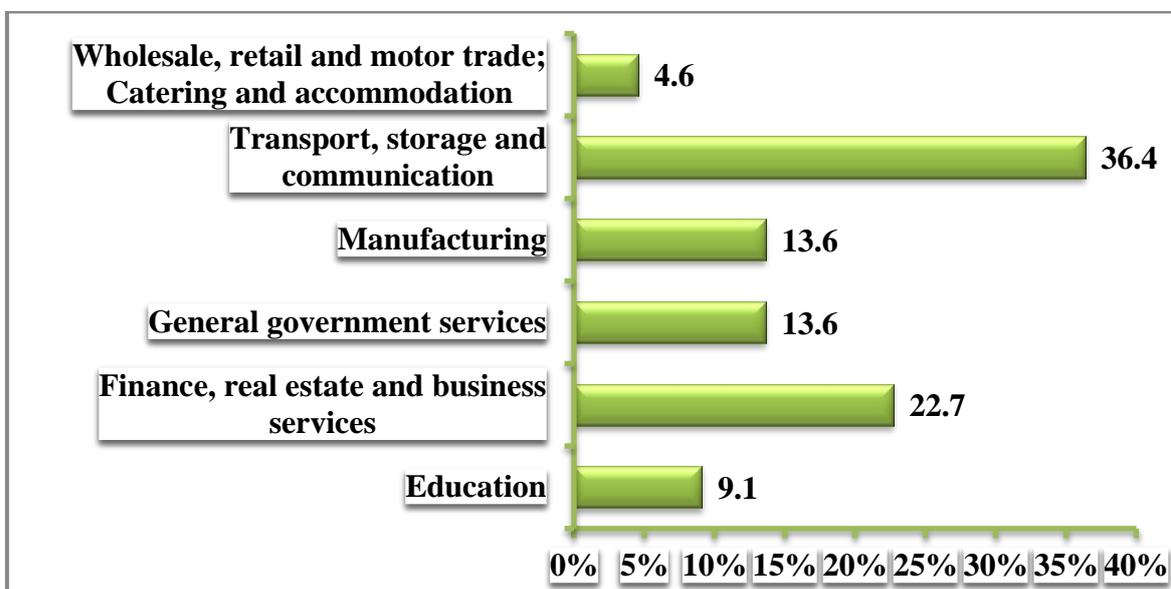


FIGURE 4.3: INDUSTRY SECTOR DISTRIBUTION OF MANAGERS

The largest number of the participants was from the transport, storage and communication sector (36.4%); followed by finance, real estate and business services (22.7%). General government services and the manufacturing sector each represented by 13.6% of the participants followed by the education sector (9.1%) and then wholesale, retail and motor trade; catering and accommodation, represented by 4.6%.

Of the 12 participants that preferred to list an industry sector under the option ‘Other’, ten indicated that they were in telecommunications, one participant listed administration and one listed pharmaceuticals. To obtain a more accurate representation, these telecommunication responses were added to the transport, storage and communication sector representing a total of 52.9% for this industry sector.

The four organisations that consented to participate in the research represented the industry sectors as follows: the largest number of the participants were from the transport, storage and communication sector represented by Telkom; followed by finance, real estate and business services represented by ABSA; followed by the manufacturing sector represented by Grundfos, and education represented by Unisa. All the other industry sectors that responded probably read the OPSA newsletter and decided to participate by following the

hyperlinks to the questionnaires. All these other industry sectors will be categorised under OPSA and will be referred to as OPSA in the tests for associations that will be presented in this chapter. OPSA will refer to the industry sectors: general government services; wholesale, retail and motor trade; catering and accommodation, and ‘other’ that do not fit any of the 11 industry sectors.

Managers were required to indicate the total number of full-time knowledge workers in the organisations. A definition of a knowledge worker was provided in the questionnaire (*cf.* Chapter 2, paragraph 2.1.4). The 30 managers who responded, indicated a minimum of one and a maximum of 400 knowledge workers and that represented an average of 22 knowledge workers per participating organisation.

The managers were requested to indicate the number of various electronic devices used by knowledge workers in their organisations. Figure 4.4 represents the average distribution per device.

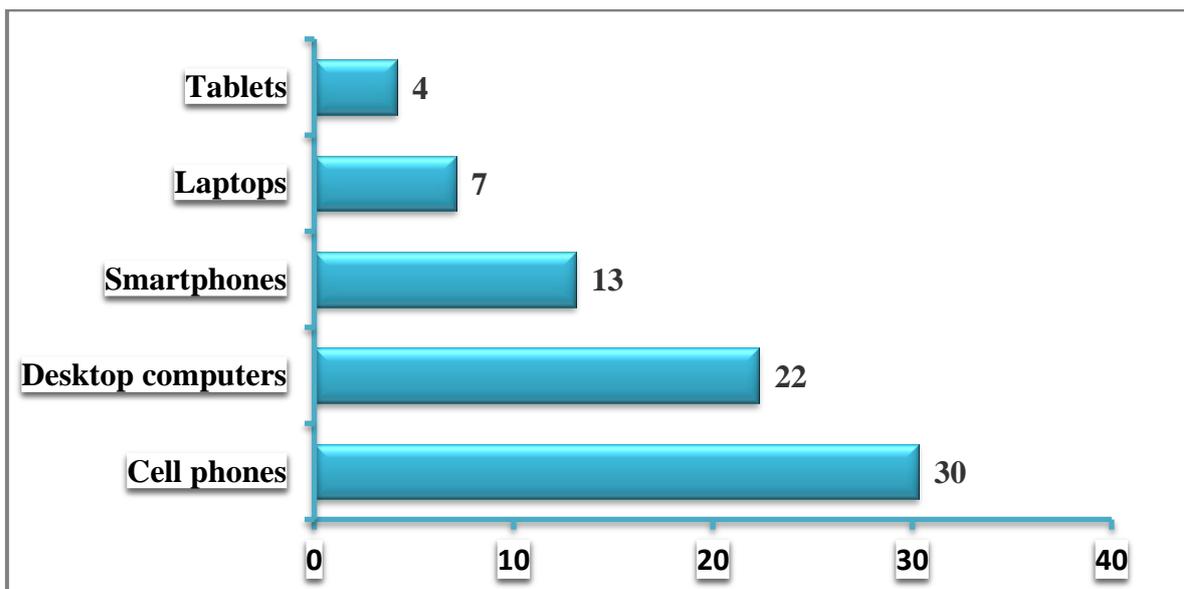


FIGURE 4.4: AVERAGE NUMBER OF ELECTRONIC DEVICES USED BY KNOWLEDGE WORKERS

Cell phones were the most popular electronic device followed by desktop computers, smartphones, laptops and lastly, tablets that were the least popular device. The response frequency and average response per device are displayed in Table 4.1.

TABLE 4.1: ELECTRONIC DEVICES USED BY KNOWLEDGE WORKERS

Electronic devices	Number of devices used	Response frequency	Average response
Tablets	30	24	4
Laptops	30	29	7
Smartphones	120	25	13
Desktop computers	300	28	22
Cell phones	400	22	30

Table 4.1 reflected that 22 managers indicated that cell phones (maximum 400) were the most popular device used by knowledge workers with an average of 30 cell phones per organisation that participated. The second popular variable (device) was desktop computers (maximum 300) as indicated by 28 managers with an average of 22. Smartphones (maximum 120) were indicated next by 25 managers with an average of 13 followed by laptops (maximum 30) representing an average of seven per organisation. The least popular device was tablets (maximum 30) as indicated by 24 managers with an average response of four tablets per organisation.

Taking the time line of the development of these electronic devices into consideration, it is clear that the “older” technology (cell phones and desktop computers) were predominantly used by teleworkers. The latest technological developments (smartphones and tablets) were not indicated to be the preferred devices used by the teleworkers. This corresponds with the assumption that the e-environment (virtual office) is a relatively new concept in South Africa and also with the indicated number of years that these organisations implemented telework (see telework section below). The “first” teleworkers (those that indicated that they were involved in telework for up to five years) indicated that desktop computers were supplied by the organisations. Five years ago, desktop computers were less costly than laptops. One of the questions on the ownership of equipment indicated that cell phones mostly belonged to the teleworkers. Taken the cost aspects of smartphones and tablets into consideration, it may be the reason why cell phones and desktop computers were the most popular devices used by teleworkers.

4.2.3 Telework

This section of the questionnaire dealt with the types of telework arrangements, the number of years it had been in operation, how many teleworkers were engaged in telework and the

telework arrangement applicable. It also attempted to establish the methods used to monitor teleworkers and to determine the ownership of the furniture, equipment and services used when teleworking.

4.2.3.1 Types of telework/alternative workplace arrangements applied

Various types of telework/alternative workplace arrangements were supplied from which participants could select more than one option. Figure 4.5 reflects the percentages of alternative workplace arrangements as selected by the participants.

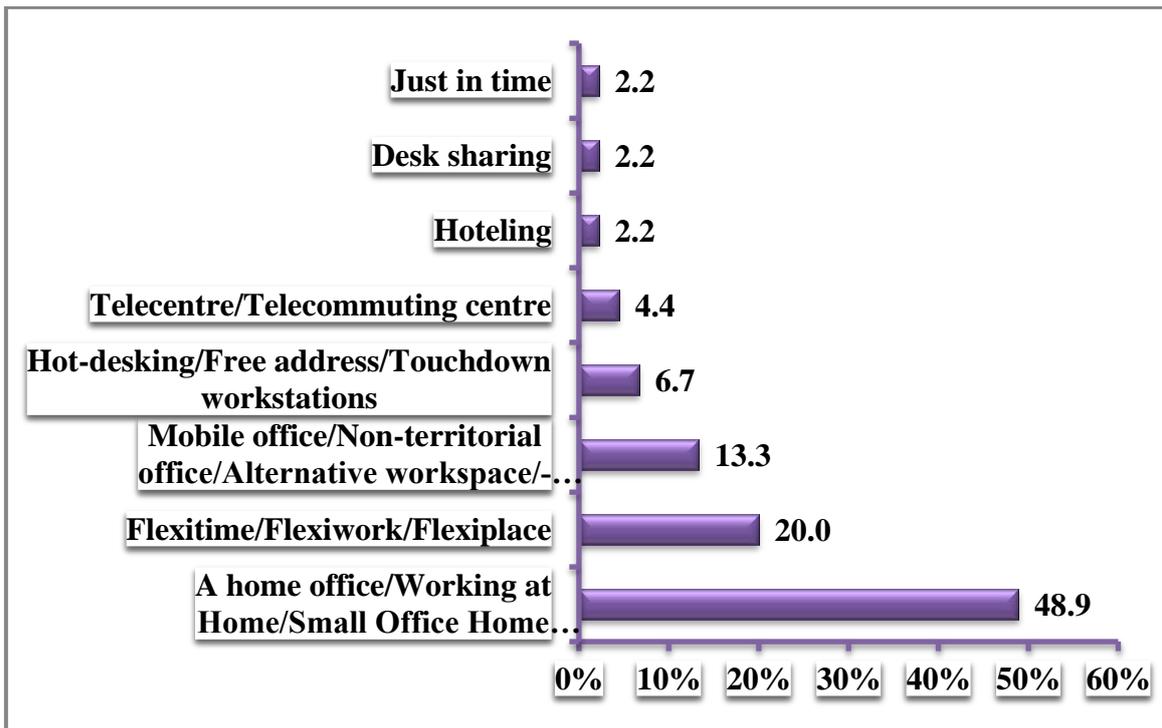


FIGURE 4.5: ALTERNATIVE WORKPLACE ARRANGEMENTS APPLIED

The home office/working at home/small office home office represented the most popular type of telework arrangement with a response percentage of 48.9%, followed by flexitime/flexiwork/flexiplace with a response of 20%. A mobile office/non-territorial/unassigned office represented 13.3%, followed by hot-desking/free address/touchdown workstations with 6.7%. Telecentre/telecottage/televillage obtained 4.4% followed by hoteling, desk sharing and just in time with 2.2% each.

The data indicated that the home office/working at home/small office home office was the most popular alternative place of work. This fact supports the assumption that the e-environment is a relatively new concept in South Africa. The infrastructure required for

telework in South Africa (telecentres/telecottage/televillage and hoteling) is not yet as developed as in the international e-environment. It seems as if organisations rely on the teleworkers to provide the alternative workplaces themselves, for example a home office, a mobile office, an unassigned office. The telework facilities are mostly not provided by the organisations themselves.

The Cochran's statistics and hierarchical logistic regression (crude estimates generated from unadjusted models) were employed to evaluate the significance of the differences among the proportions of the single response categories (Jann, 2005:92-112). That is, the comparison of the proportions of responses in a single multiple response item is performed. Adjusted hierarchical models were fitted to compare the participating industry sectors.

Tables 4.2, 4.3 and 4.4 present the results on the distribution of responses regarding item V7.

TABLE 4.2: TEST FOR EQUALITY OF PROPORTIONS: APPLICATION OF TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	25
Cochran's $\chi^2_{(7)}$	84.55187
P-value	< 0.001

Table 4.2 shows that the differences in proportions of the various responses regarding types of telework/alternative workplace arrangements are highly significant ($Q = 84.55187; P < 0.001$). Therefore, managers differed significantly on how they responded to multiple response items regarding the selection of the types of telework/alternative workplace arrangements applied in their respective organisations.

Table 4.3 shows the crude estimates and their respective 95% confidence intervals that is the result from application of hierarchical logistic regression on how the participants responded to item V7.

**TABLE 4.3: COMPARISON OF MANAGERS ACCORDING TO SELECTION OF
TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS
APPLIED: CRUDE ESTIMATES**

Outcome variable: _q7, n = 200

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-3.145	0.819	<0.001	(-4.751 to -1.539)
3	-4.435	1.134	<0.001	(-6.658 to -2.212)
4	-2.568	0.751	0.001	(-4.040 to -1.095)
5	-3.985	0.826	<0.001	(-5.603 to -2.367)
6	-5.170	1.175	<0.001	(-7.474 to -2.867)
7	-5.170	1.175	<0.001	(-7.474 to -2.867)
8	-5.170	1.175	<0.001	(-7.474 to -2.867)
Constant	1.992	0.628	0.002	(0.761 to 3.224)

* Baseline category

The unadjusted hierarchical model was fitted to the crude estimates to compare the possible choices or responses of the item regarding the selection of the types of telework/alternative workplace arrangements applied. Various responses are significantly different, that is managers differed significantly with respect to selection of the types of telework/alternative workplace arrangements applied in their respective organisations.

Adjusting for a number of possible responses, Table 4.4 reflects on the comparison of industry sectors with respect to how they responded to all possible alternatives of question 7.

**TABLE 4.4: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR
RESPONSES TO SELECTION OF TYPES OF TELEWORK/
ALTERNATIVE WORKPLACE ARRANGEMENTS APPLIED:
HIERARCHICAL REGRESSION MODEL**

Outcome variable: _q7, n = 128

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-18.745	0.787	<0.001	(-20.288 to -17.202)
3	-20.726	1.218	<0.001	(-23.113 to -18.340)
4	-17.912	0.642	<0.001	(-19.171 to -16.653)
5	-19.454	1.001	<0.001	(-21.416 to -17.491)
6	-20.726	1.081	<0.001	(-22.844 to -18.608)
7	-20.726	1.415	<0.001	(-23.500 to -17.952)
8	-20.726	1.039	<0.001	(-22.763 to -18.690)
V4				
Unisa*	0			
ABSA	-1.389	1.512	0.358	(-4.352 to 1.575)
OPSA	-1.089	1.770	0.538	(-4.558 to 2.379)
Telkom	(dropped)			
Constant	-0.488	1.409	0.729	(-3.250 to 2.273)

* Baseline category

Organisations (V4) are not significantly different, for their respective p-values are more than 0.05. In particular, ABSA, OPSA and Telkom are not statistically different from Unisa. Therefore, managers in the different industry sectors responded relatively the same to items regarding application of types of telework/alternative workplace arrangements when controlling for possible response choices. Thus, the application of types of telework/alternative workplace arrangements was not significantly different between organisations.

4.2.3.2 Period of telework program

Participants were requested to indicate the number of years that the organisation's telework programme has been in operation. The participants responded as reflected in Figure 4.6.

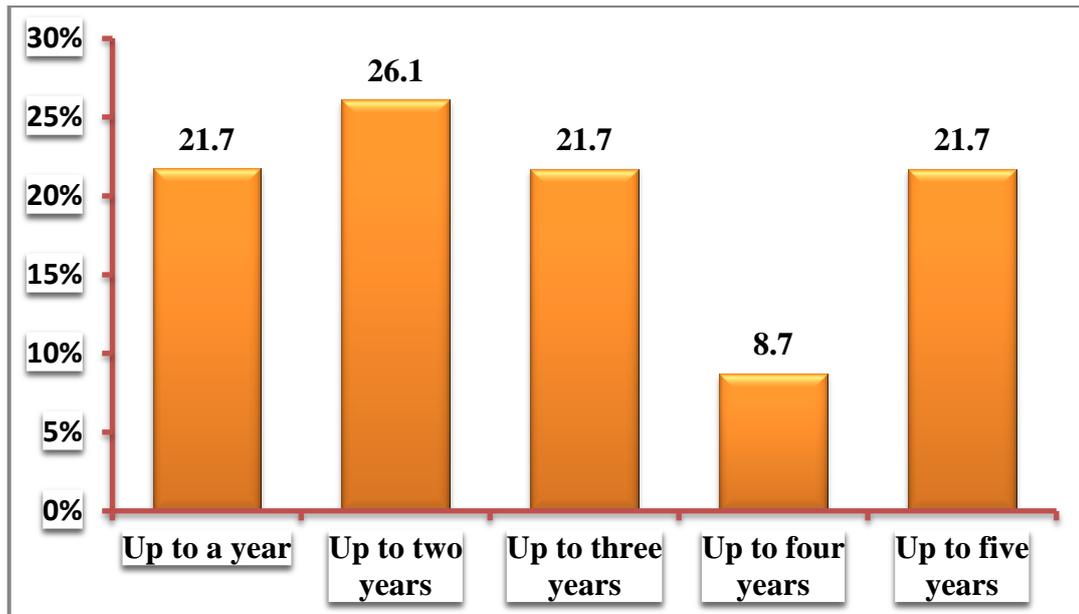


FIGURE 4.6: PERIOD OF TELEWORK PROGRAMME

Up to two years with 26.1%, was the period selected by the largest number of participants. The up to one year, up to three years and up to five years variables all represented 21.7%. Up to four years has attracted 8.7% of the participants. Under the ‘Other’ option, two participants indicated a period of 15 and 20 years each.

From this data, it is evident that the implementation of telework is in an escalating phase. The slight increase in up to two years (26.1%) indicates significant growth. The low response for up to four years, were probably due to the fact that the very same people who started to telework five years ago, stayed the same and only a small number (8.7%) were also allowed to telework in the fourth year. The stable tendency indicated respectively by up to five, three and one year (21.7% each) and growth in up to two years (26.1%), could be regarded as a positive indicator that telework was recognised as a favourable work arrangement by these organisations.

The adjusted Pearson’s Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors are significant or not, with the interpretation being performed at $\alpha = 0.05$ error. Table 4.5 indicates the results of the test for association between the period of telework programme (V8) and participating industry sectors (V4).

**TABLE 4.5: ASSOCIATION BETWEEN PERIOD OF TELEWORK PROGRAMME
AND INDUSTRY SECTORS**

V8 Period of telework programme	V4				Total
	Unisa	ABSA	OPSA	Telkom	
Up to a year	0 (0.00)	1 (33.33)	1 (33.33)	1 (33.33)	3 (100.00)
Up to five years	0 (0.00)	2 (66.67)	0 (0.00)	1 (33.33)	3 (100.00)
Up to four years	0 (0.00)	0 (0.00)	1 (50.00)	1 (50.00)	2 (100.00)
Up to three years	1 (33.33)	0 (0.00)	0 (0.00)	2 (66.67)	3 (100.00)
Up to two years	1 (33.33)	1 (33.33)	0 (0.00)	1 (33.33)	3 (100.00)
Total	2 (14.29)	4 (28.57)	2 (14.29)	6 (42.86)	14 (100.00)

Pearson's Chi-square (12) = 10.111 Pr = 0.606

Table 4.5 explicitly shows that the differences in proportions among the four participating organisations with respect to the period of the telework programme are not significant (their respective p-value are greater than 0.05). Therefore organisations do not differ significantly with respect to the period of the telework programme.

4.2.3.3 Full-time knowledge workers and telework arrangement applied

Managers were requested to indicate how many of their full-time knowledge workers were engaged in telework on a regular and recurring basis. The responses ranged from a minimum of zero to a maximum of 46 knowledge workers engaged in telework on a regular basis in the organisations that participated in this study. The average number of knowledge workers was seven as indicated by the 25 managers who responded to this question. Table 4.6 indicates the responses.

TABLE 4.6: NUMBER OF FULL-TIME KNOWLEDGE WORKERS

Observations	Mean	Minimum	Maximum
25	6.68	0	46

Managers had to specify the number of teleworkers according to the alternative telework arrangements as supplied. Figure 4.7 summarises the responses of the participants.

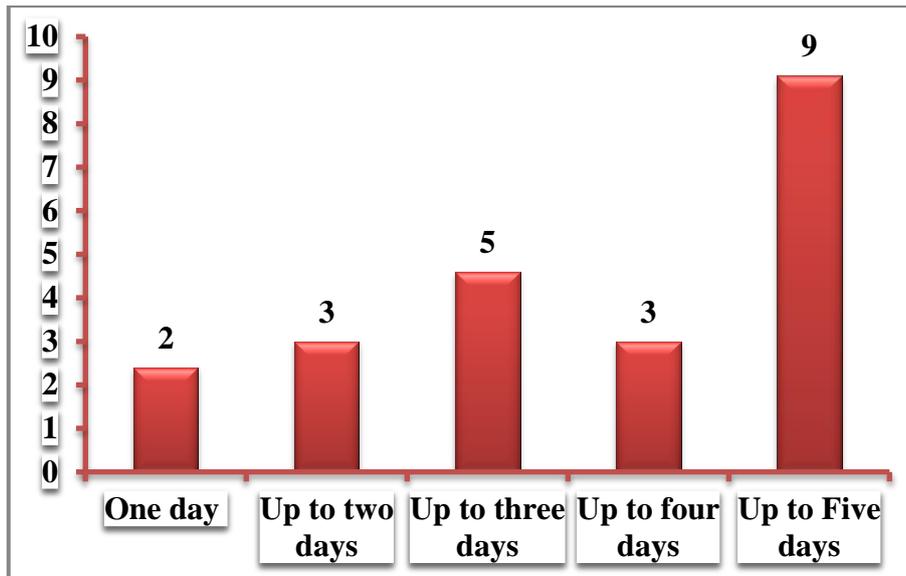


FIGURE 4.7: NUMBER OF TELEWORKERS ACCORDING TO TELEWORK ARRANGEMENTS

As indicated by the managers, an average of nine teleworkers was on the ‘up to five days per week’ telework arrangement. There was an average of five workers on the ‘up to three days’ per week. The options ‘up to two day’s and ‘up to four days’ per week each represented three workers respectively. The ‘one day a week’ telework arrangement represented an average of two teleworkers.

It should be noted that the participants from Unisa (academic staff members, mainly senior professors) do not have offices at the main campus of the university. They all have permission to work at home five days per week. This might be the reason why the ‘five days per week’ option indicated the highest number of teleworkers. Taking this into account, the ‘up to three days per week’ with an average of five employees, are probably a more accurate representation of the number of teleworkers in the business environment. The ‘one day per week’ arrangement reported the smallest number of teleworkers.

4.2.3.4 Monitoring of teleworkers

Participants had to indicate the methods used to monitor teleworkers by selecting any of the options provided. Figure 4.8 reflects the responses of the participants.

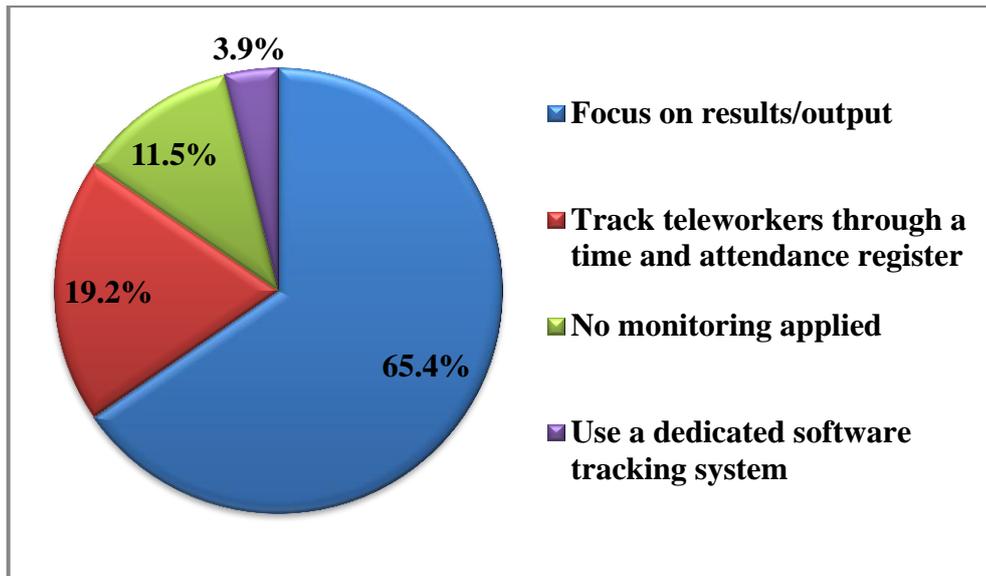


FIGURE 4.8: MONITORING OF TELEWORKERS BY MANAGERS

The largest number of managers (65.4%) indicated that they monitor their teleworkers by focusing on results/output. The next method used was to track teleworkers through a time and attendance register (19.2%). A group of managers (11.5%) indicated that no monitoring was applied at all. The use of a dedicated software tracking system was selected by 3.8% of the managers.

The monitoring of teleworkers by means of a focus on the results/output (65.4%) is significant in terms of the trust that the largest number of managers have in the teleworkers. This implies that managers believe that their teleworkers have the necessary skills, knowledge and experience to work independently and that teleworkers do not have to be watched and guided to perform according to set standards. The teleworkers were allowed to work where and when they preferred as long as due dates and standards were met. It implies that face time and hours spent behind a desk was not regarded as important but rather that the focus was on the output delivered by the employees. This focus on results/output was also supported by the 11.5% of managers that did not monitor the teleworkers at all. However, the indication that 19.2% of managers tracked their employees through a time and attendance register could be a reflection on the relative “newness” of telework and the autocratic and bureaucratic management styles of the older managers, as opposed to participative and free reign management styles. It could refer to an unwillingness of managers to let go of the idea that employees must be visibly busy behind desks.

An adjusted Pearson's Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors (V4) and monitoring of teleworkers (V11) were significant or not. Table 4.7 indicates the results.

TABLE 4.7: ASSOCIATION BETWEEN MONITORING OF TELEWORKERS AND INDUSTRY SECTORS

V11 Monitoring of teleworkers	V4				Total	Pearson's Chi- square*
	Unisa	ABSA	OPSA	Telkom		
Software tracking system	0 (0.00)	0 (0.00)	0 (0.00)	1 (16.67)	1 (6.67)	1.607 1.000
No monitoring	0 (0.00)	0 (0.00)	1 (33.33)	1 (16.67)	2 (20.00)	2.019 1.000
Track teleworkers through a time and attendance ...	1 (50.00)	0 (0.00)	2 (66.67)	0 (0.00)	3 (43.75)	7.708 0.210
Focus on results	2 (100.00)	4 (100.00)	1 (33.33)	4 (66.67)	11 (73.33)	4.773 0.757
Total	3 (150.00)	4 (100.00)	4 (133.33)	6 (100.00)	17 (133.33)	
Cases	2	4	3	6	15	

* Pearson's Chi-square / Bonferroni-adjusted p-values

The results indicate that the differences among the four participating organisations regarding all levels or categories of monitoring of teleworkers are not significant since their respective p-value are greater than 0.05. Therefore, organisations do not differ significantly with respect to the monitoring of teleworkers in these organisations.

Tables 4.8, 4.9 and 4.10 present the results on the distribution of responses regarding item V11.

**TABLE 4.8: TEST FOR EQUALITY OF PROPORTIONS:
MONITORING OF TELEWORKERS**

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	24
Cochran's $\chi^2_{(7)}$	35.13725
P-value	0.0000

Table 4.8 indicates that the differences in proportions of the various responses regarding monitoring of teleworkers are highly significant ($Q = 35.13725; P < 0.001$). Therefore,

managers differed significantly on how they responded to multiple response items regarding the monitoring of teleworkers in their respective organisations.

Table 4.9 presents how managers responded to item V11, which had five possible options (multiple response item).

TABLE 4.9: COMPARISON OF MANAGERS ACCORDING TO MONITORING OF TELEWORKERS: CRUDE ESTIMATES

Outcome variable: _q11, n = 120

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-1.800	1.211	0.137	(-4.174 to 0.573)
3	2.222	0.799	0.005	(0.657 to 3.788)
4	-0.611	0.887	0.491	(-2.349 to 1.127)
5	-1.800	1.211	0.137	(-4.174 to 0.573)
Constant	-1.335	0.513	0.009	(-2.341 to -0.329)

* Baseline category

Table 4.9 shows the crude estimates together with their respective 95% confidence intervals. The comparison indicates that various responses are not significantly different, that is managers did not differ significantly with respect to monitoring of teleworkers in their respective organisations. However the choice of ‘track teleworkers through a time and attendance register’ as compared with ‘telework policies and guidelines’ was significantly different.

**TABLE 4.10: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR
RESPONSES TO MONITORING OF TELEWORKERS:
HIERARCHICAL REGRESSION MODEL**

Outcome variable: _q11, n = 80

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-1.256	1.340	0.349	(-3.883 to 1.370)
3	2.305	1.048	0.028	(0.251 to 4.358)
4	-0.487	1.127	0.666	(-2.696 to 1.723)
5	-1.256	1.340	0.349	(-3.883 to 1.370)
7				
V4				
Unisa*	0			
ABSA	-0.803	0.540	0.137	(-1.861 to 0.256)
OPSA	-0.244	0.665	0.713	(-1.547 to 1.058)
Telkom	(dropped)			
Constant	-0.803	0.540	0.137	(-1.861 to 0.256)

* Baseline category

The results from the adjusted model are given by Table 4.10, indicating that organisations are not significantly different. In particular, ABSA, OPSA and Telkom are not statistically different from Unisa. Therefore, managers in the different industry sectors responded relatively the same to items regarding the monitoring of teleworkers for possible response choices. Thus, the monitoring of teleworkers was not significantly different between organisations.

4.2.3.5 Ownership of furniture/equipment/services used by teleworkers

The aim of this section was to determine the ownership of furniture/equipment/services used by teleworkers. Participants had to indicate whether the furniture/equipment/services were provided/purchased by the organisation, whether the teleworkers were requested to purchase it themselves or share the expenses with the organisation, or whether the organisation agreed to pay for it as used at an alternative work site. Figure 4.9 illustrates the participants' choices.

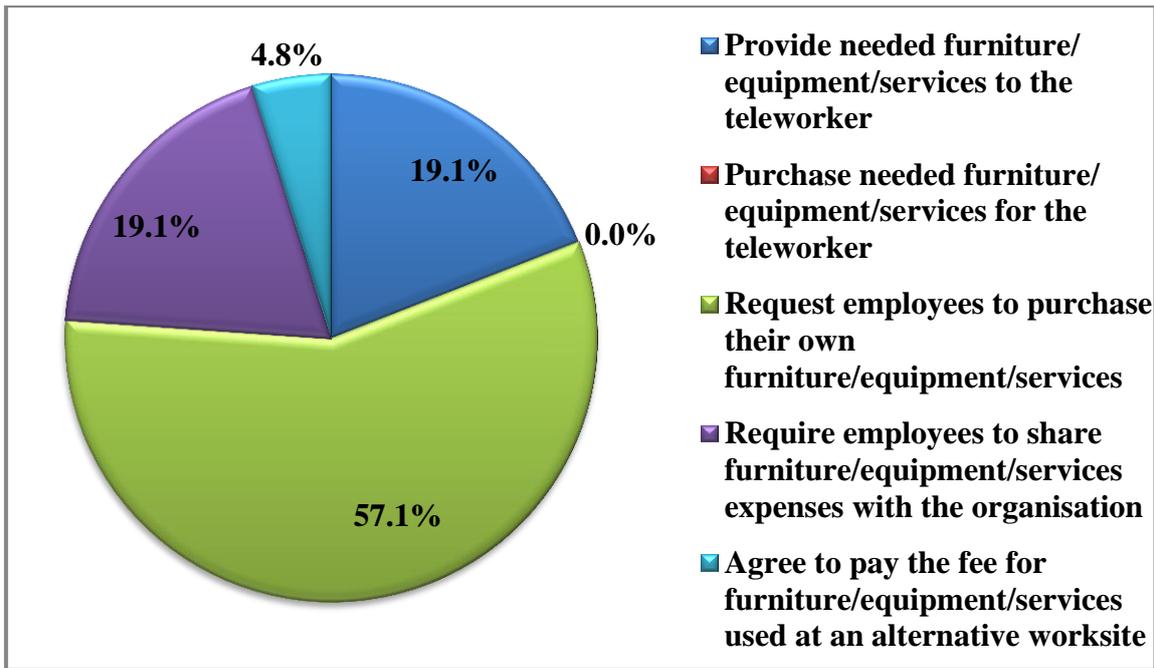


FIGURE 4.9: OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES

The largest number of managers (57.1%) indicated that organisations requested teleworkers to purchase their own furniture/equipment/services. A percentage of managers (19.1%) indicated that employees were required to share the expenses with the organisation. The same percentage of managers (19.1%) indicated that the needed furniture/equipment/services were provided to the teleworkers. A small percentage of managers (4.8%) indicated that the organisation agreed to pay the fee for furniture/equipment/services used at an alternative work site. None of the managers indicated that the organisation was willing to purchase the needed furniture/equipment/services for the teleworker. Eight managers chose the ‘Other’ option and seven reported as follows: equipment such as computer equipment, laptops and smartphones were provided by the organisation, but teleworkers were required to provide the furniture used by the teleworker; one manager indicated that the organisation reimburses the teleworker’s telephone bill.

From this data, it was evident that the organisations expected the teleworkers to supply and pay for the fixed assets (furniture) used while teleworking. Organisations were willing to supply equipment but the running costs were the responsibility of the teleworkers. The supply of resources and the costs involved should be agreed upon by the teleworker and

the organisation. The telework policy and the formal telework agreement must make provision for these issues.

An adjusted Pearson's Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors (V4) and ownership of furniture/equipment/services used by teleworkers (V12) are significant or not. Table 4.11 indicates the results.

TABLE 4.11: ASSOCIATION BETWEEN OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES USED BY TELEWORKERS AND INDUSTRY SECTORS

Ownership of furniture/ equipment/services used by teleworkers	V12		V4				Pearson's Chi- square*
	Unisa	ABSA	OPSA	Telkom	Total		
Agree to pay the fees ...	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (8.33)	1.527 1.000	
Provide needed furniture	0 (0.00)	1 (20.00)	0 (0.00)	1 (33.33)	2 (16.67)	1.440 1.000	
Require of employees to share ...	1 (50.00)	0 (0.00)	0 (0.00)	1 (33.33)	2 (16.67)	3.600 1.000	
Request employees to purchase	1 (50.00)	3 (60.00)	2 (100.00)	1 (33.33)	7 (58.33)	2.263 1.000	
Total	2 (100.00)	5 (100.00)	2 (100.00)	3 (100.00)	12 (100.00)		
Cases	2	5	2	3	12		

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.11 explicitly shows that the differences in proportions amongst the four participating organisations with respect to ownership of furniture/equipment/services used by teleworkers, are not significant (their respective p-value are greater than 0.05). Therefore, organisations do not differ significantly with respect to the ownership of furniture/equipment/services used by teleworkers in these organisations.

The distribution of responses according to how participants responded to item V12 was examined. The results are presented by Tables 4.12, 4.13 and 4.14.

**TABLE 4.12: TEST FOR EQUALITY OF PROPORTIONS:
OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES**

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	25
Cochran's $\chi^2_{(7)}$	35.36842
P-value	0.0000

The differences in proportions of the various responses regarding ownership of furniture/equipment/services are highly significant ($Q = 35.36842; P < 0.001$). Therefore, managers differed significantly on how they responded to the item regarding the ownership of furniture/equipment/services in their respective organisations.

Table 4.13 makes this explanation more explicit.

**TABLE 413: COMPARISON OF MANAGERS ACCORDING TO OWNERSHIP
OF FURNITURE/EQUIPMENT/SERVICES: CRUDE ESTIMATES**

Outcome variable: _q12, n = 200

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-1.792	1.206	0.137	(-4.155 to 0.572)
3	1.466	0.691	0.034	(0.112 to 2.821)
4	-0.272	0.833	0.744	(-1.905 to 1.361)
5	-1.056	0.969	0.276	(-2.956 to 0.844)
6	-1.792	1.206	0.137	(-4.155 to 0.572)
7	-1.792	1.206	0.137	(-4.155 to 0.572)
8	-1.792	0.955	0.061	(-3.663 to 0.079)
Constant	-1.386	0.510	0.007	(-2.386 to -0.386)

* Baseline category

The crude estimates, as presented by Table 4.13, are such that various responses are significantly different, that is, managers differed significantly with respect to ownership of furniture/equipment/services in their respective organisations. However, the managers did not differ significantly with regard to 'request employees to purchase their own furniture/equipment/services' (3).

The comparison of organisations for responses on the item for ownership of furniture/equipment/services is reflected in Table 4.14.

TABLE 4.14: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q12, n = 96

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	1.244	1.326	0.348	(-3.842 to 1.355)
3	1.471	0.904	0.104	(-0.300 to 3.243)
4	-0.481	1.114	0.666	(-2.664 to 1.703)
5	-0.481	1.114	0.666	(-2.664 to 1.703)
7	(dropped)			
V4				
Unisa*	0			
ABSA	-1.244	1.326	0.348	(-3.842 to 1.355)
OPSA	(dropped)			
Telkom	0.265	0.238	0.265	(-0.201 to 0.731)
Constant	-0.000	0.000	1.000	(-0.000 to 0.000)

* Baseline category

The statistical findings as given by Table 4.14, are that ABSA, OPSA and Telkom are not statistically different from Unisa. Therefore, managers in the different industry sectors responded relatively the same to items regarding ownership of furniture/equipment/services when controlling for possible response choices. Therefore, the ownership of furniture/equipment/services was not significantly different between organisations.

Tables 4.12, 4.13 and 4.14 indicate that even though organisations are not significantly different in the ownership of furniture/equipment/services, their respective managers differ significantly on how they responded to the item regarding ownership of furniture/equipment/services.

4.2.4 Regulatory compliance

This section of the questionnaire focused on the application of and compliance with promulgated policies/procedures/government acts. It also focused on the creation of knowledge through training and the topics to be included in training programmes.

4.2.4.1 Organisational policies/procedures and government acts applied and regulated
 Participants were requested to indicate the organisational policies/procedures/government acts applied in the organisations. The participants could select more than one option provided. Figure 4.10 illustrates the percentage of responses per policy/procedure/act to this question.

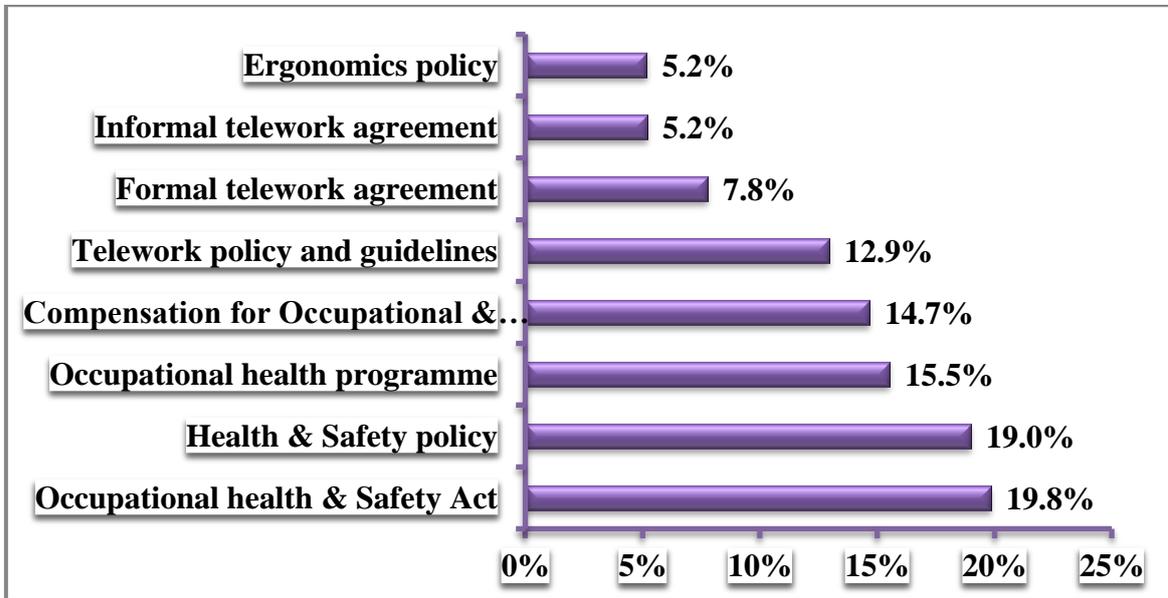


FIGURE 4.10: ORGANISATIONAL POLICIES/PROCEDURES AND GOVERNMENT ACTS APPLIED

The Occupational Health and Safety Act (No 85 of 1993) was applied by 19.8% followed by the Health and Safety policy (19%) and an Occupational Health program (15.5%). These three options (government acts, organisational policies, and organisational procedures/programmes) should correlate as indicated by the data since the acts inform the organisational policies and these policies were executed by means of organisational procedures/programmes. The Compensation for Occupational and Disease Act (No 130 of 1993) was applied by 14.7%. The application of a Telework policy was selected by 12.9%. Formal telework agreements (7.8%) and informal telework agreements (5.2%) with teleworkers were very low but in correlation with the application of a Telework policy (12.9%). During initial conversations with the contact persons of the participating organisations, it became clear that not all the organisations had formal telework agreements with their teleworkers. The indication was that a telework policy was in place, but that each manager informally arranged with his/her teleworkers how and when they would telework and under what conditions. This was reflected by the low response rate for formal telework agreements (7.8%). The application of an ergonomics

policy received a low response rate of 5.2%. This is an alarming situation as work-related musculoskeletal disorders may develop if the correct ergonomic principles are not applied by teleworkers.

In order to assess whether the observed differences between the levels of industry sectors are significant or not, an adjusted Pearson's Chi-square test was conducted. Table 4.15 indicates the results of the test for association between organisational policies/procedures/government acts applied (V13) and participating industry sectors (V4).

TABLE 4.15: ASSOCIATION BETWEEN ORGANISATIONAL POLICIES/ PROCEDURES/GOVERNMENT ACTS APPLIED AND INDUSTRY SECTORS

Policies/Procedure/Acts Applied	V13		V4			Total	Pearson's Chi-square*
	Unisa	ABSA	OPSA	Telkom			
Ergonomic policy	0 (0.00)	0 (0.00)	0 (0.00)	4 (66.67)	4 (25.00)	8.889 0.246	
Informal telework agreement	0 (0.00)	1 (20.00)	1 (33.33)	3 (50.00)	5 (31.25)	2.192 1.000	
Formal telework agreement	1 (50.00)	3 (60.00)	0 (0.00)	3 (50.00)	7 (43.75)	2.997 1.000	
Telework policy and guidelines	2 (100.00)	4 (80.00)	0 (0.00)	5 (83.33)	11 (68.75)	8.398 0.308	
Compensation for Occupational Injuries...	1 (50.00)	3 (60.00)	1 (33.33)	6 (100.00)	11 (68.75)	4.984 1.000	
Occupational Health Programme	2 (100.00)	3 (60.00)	1 (33.33)	6 (100.00)	12 (75.00)	6.044 0.876	
Health & Safety policy	2 (100.00)	4 (80.00)	2 (66.67)	6 (100.00)	14 (87.50)	2.590 1.000	
Occupational Health & Safety Act ...	1 (50.00)	5 (100.00)	3 (100.00)	6 (100.00)	15 (93.75)	7.467 0.467	
Total	9 (450.00)	23 (460.00)	8 (266.67)	39 (650.00)	79 (493.75)		
Cases	2	5	3	6	16		

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.15 explicitly shows that the differences in proportions among the four participating organisations with respect to organisational policies/procedures/government acts applied are not significant (their respective p-value are greater than 0.05). Therefore organisations do not differ significantly with respect to the organisational policies/procedures/government acts applied in these organisations.

Tables 4.16, 4.17 and 4.18 present the results on the distribution of responses regarding item V13.

TABLE 4.16: TEST FOR EQUALITY OF PROPORTIONS: APPLICATION OF ORGANISATIONAL POLICIES/PROCEDURES/GOVERNMENT ACTS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	25
Cochran's $\chi^2_{(7)}$	56
P-value	< 0.001

Table 4.16 indicates that the differences in proportions of the various responses regarding application of organisational policies/procedures/government acts are highly significant ($Q = 56; P < 0.001$). Therefore, managers differed significantly on how they responded to multiple response items regarding the application of policies/procedures/government acts in their respective organisations.

Table 4.17 presents how managers responded to item V13, which had eight possible options (multiple response item).

TABLE 4.17: COMPARISON OF MANAGERS ACCORDING TO ORGANISATIONAL POLICIES/PROCEDURES/GOVERNMENT ACTS APPLIED: CRUDE ESTIMATES

Outcome variable: _q13, n = 200

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-1.048	0.513	0.041	(-2.053 to -0.043)
3	-3.145	0.706	<0.001	(-4.529 to -1.761)
4	1.587	0.680	0.020	(-2.921 to -0.253)
5	-2.568	0.751	0.001	(-4.040 to -1.095)
6	-3.145	0.706	<0.001	(-4.529 to -1.761)
7	0.450	1.031	0.663	(-1.571 to 2.471)
8	-1.239	0.762	0.104	(-2.732 to 0.254)
Constant	1.992	0.628	0.002	(0.761 to 3.224)

* Baseline category

Table 4.17 shows the crude estimates together with their respective 95% confidence intervals. The comparison of the Health and safety policy (1) and Occupational Health and

Safety Act (7) indicates that the responses are not significantly different. Therefore managers did not differ significantly with respect to the choices application of this organisational policy and Act. However the choice of 'health and safety policy' as compared with the choices of the rest organisational policies/procedures/government acts was significantly different.

Table 4.18 indicates the comparison of industry sectors for responses regarding application of policies/procedures/government acts.

TABLE 4.18: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO THE APPLICATION OF ORGANISATIONAL POLICIES/PROCEDURES/GOVERNMENT ACTS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q13, n = 128

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-1.011	0.633	0.110	(-2.252 to 0.229)
3	-3.820	0.860	<0.001	(-5.506 to -2.134)
4	-1.402	1.033	0.175	(-3.426 to 0.623)
5	-2.751	1.125	0.014	(-4.956 to -0.547)
6	-3.438	1.021	0.001	(-5.439 to -1.438)
7	0.845	1.550	0.586	(-2.192 to 3.882)
8	-1.402	1.034	0.175	(-3.429 to 0.626)
V4				
Unisa*	0			
ABSA	0.077	0.914	0.933	(-1.714 to 1.868)
OPSA	-1.406	1.098	0.200	(-3.557 to 0.746)
Telkom	(dropped)			
Constant	1.724	0.891	0.053	(-0.022 to 3.469)

* Baseline category

The adjusted model, as presented by Table 4.18, indicates that Unisa, ABSA and OPSA are not significantly different regarding the application of organisational policies/procedures/government acts. Therefore, managers in the different industry sectors responded relatively the same to items regarding application of policies when controlling for possible response choices. Thus, the application of policies was not significantly different between organisations.

The next section dealt with how the organisations ensured compliance to these policies/procedures/government acts. Participants could choose more than one option. Figure 4.11 indicates the responses of the participants.

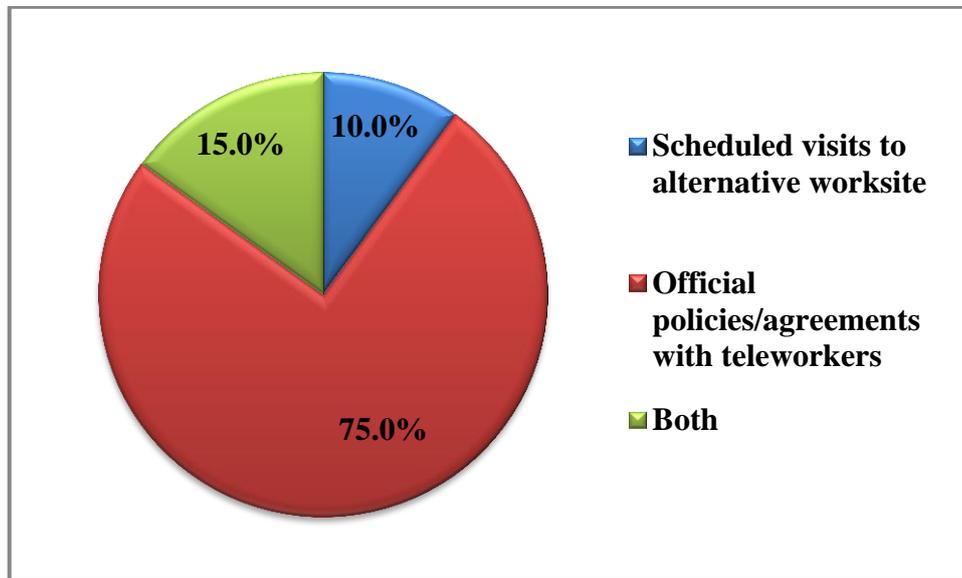


FIGURE 4.11: REGULATORY COMPLIANCE

The largest number of managers (75%) indicated that their organisations relied on official policies and agreements with teleworkers to regulate teleworkers compliance with the acts and policies applicable to teleworkers. This relates positively with the section on the monitoring of teleworkers that indicated that 65.4% of managers preferred to focus on the results/output. It seems that the application of official telework policies and agreement with teleworkers were regarded as sufficient to regulate compliance with the acts. Hence, scheduled visits to alternative work sites (10%) were not a commonly used method employed to ensure regulatory compliance. Some managers (15%) indicated that both these methods were applied to ensure compliance.

4.2.4.2 Training programmes and topics to be included

This section focused on the creation of knowledge through training programmes and on the topics that should be included in the training programmes. This section also investigated whether the participating organisations supplied training to managers and to teleworking employees. Figure 4.12 indicates the feedback.

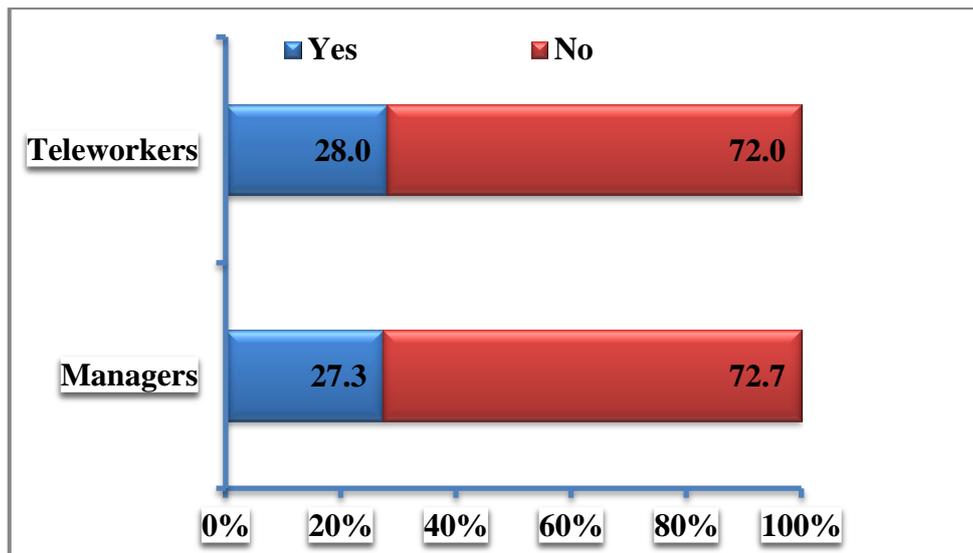


FIGURE 4.12: TRAINING PROVIDED TO MANAGERS AND TELEWORKERS

The largest number of the participants indicated that their organisations did not provide training for managers (72.7%) or teleworkers (72%). Organisations that did provide training for managers and teleworkers were 27.3% and 28% respectively. This again signals an alarming situation for the successful implementation, sustainability and growth of telework. Training provided to managers and teleworkers are regarded as important because it ensures the health and wellness of teleworkers and that could enhance the productivity in the organisations. Training in ergonomics will not only protect the teleworker against work-related disorders but may also protect the organisations against claims for work-related disorders.

Managers were requested to indicate which topics should be included in telework training programmes. More than one option could be selected by the participants. Figure 4.13 displays the results.

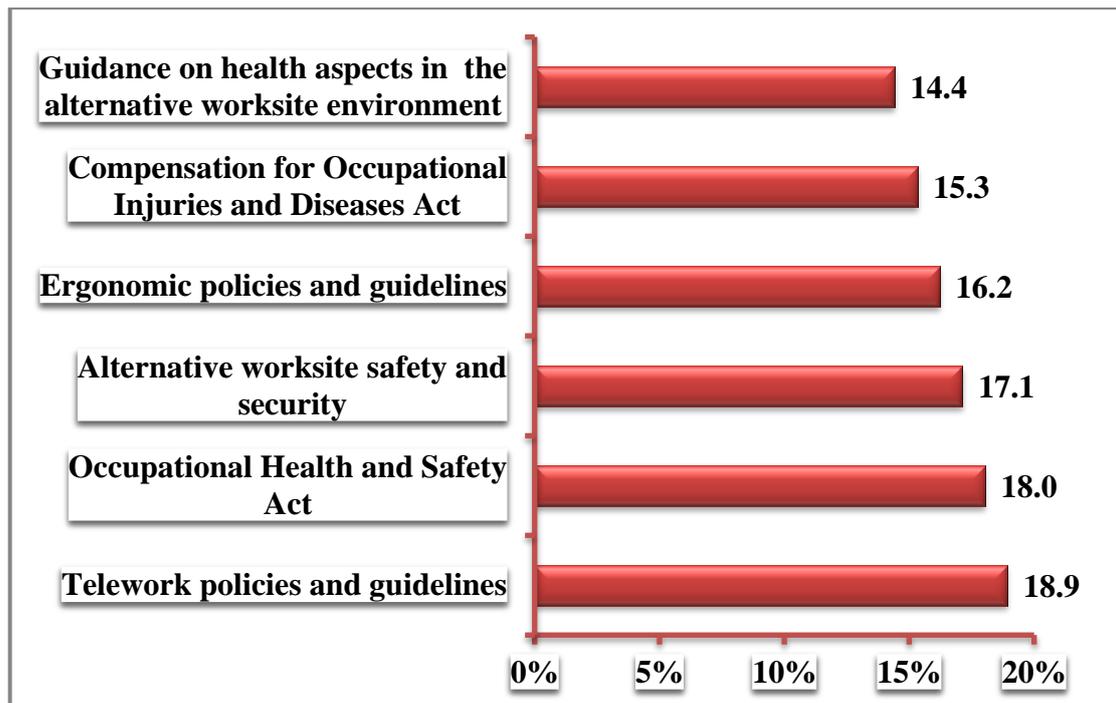


FIGURE 4.13: TOPICS TO BE INCLUDED IN A TELEWORK TRAINING PROGRAMME

The most desired topic to be included in a telework training programme was telework policies and guidelines (18.9%) followed by the Occupational Health and Safety Act (No 85 of 1993) 18%, followed by alternative work site safety and security, 17.1% and then ergonomic policies and guidelines, 16.2%. The Compensation for Occupational Injuries and Diseases Act (No 130 of 1993) obtained 15.3%. The least preferred topic to be included in a training programme was guidance on health aspects in the alternative work site environment (14.4%). Occupational injuries and diseases together with health aspects in the alternative work site environment focused on the health and wellness of employees. Being the last to be included in training programmes, it does not seem to be considered a burning issue to these participants. The relation between ergonomics training and the prevention of work-related musculoskeletal disorders were not recognised by managers of teleworkers as highlighted in this section.

Table 4.19 indicates the results of the test for association between topics to be included in a telework training programme (V16) and participating industry sectors (V4).

TABLE 4.19: ASSOCIATION BETWEEN TOPICS TO BE INCLUDED IN A TELEWORK TRAINING PROGRAMME AND INDUSTRY SECTORS

Topics to be included in a telework training programme	V16				V4		Pearson's Chi-square*
	Unisa	ABSA	OPSA	Telkom	Total		
Compensation for Occupational Injuries...	1 (50.00)	2 (40.00)	1 (50.00)	6 (100.00)	10 (66.67)		5.100 0.988
Ergonomic policy	1 (50.00)	3 (60.00)	1 (50.00)	6 (100.00)	11 (73.33)		3.750 0.246
Guidance on health aspect in the alternative work...	1 (50.00)	4 (80.00)	1 (50.00)	5 (83.33)	11 (73.33)		1.534 1.000
Occupational Health & Safety Act ...	2 (100.00)	4 (80.00)	0 (0.00)	6 (100.00)	15 (93.75)		10.000 0.111
Alternative work site safety and security	2 (100.00)	3 (60.00)	1 (50.00)	6 (100.00)	12 (80.00)		4.375 1.000
Telework policy and guidelines	2 (100.00)	4 (80.00)	2 (100.00)	6 (100.00)	14 93.33		2.143 1.000
Total	9 (450.00)	20 (400.00)	6 (300.00)	35 (583.00)	70 (466.67)		
Cases	2	5	2	6	15		

* Pearson's Chi-square / Bonferroni-adjusted p-values

The results indicate that the differences in proportions among the four participating organisations with respect to topics to be included in a telework training programme are not significant since their respective p-value are greater than 0.05. Therefore organisations do not differ significantly with respect to the topics to be included in a telework training programme in these organisations.

Tables 4.20, 4.21 and 4.22 present the results on the distribution of responses regarding item V16.

TABLE 4.20: TEST FOR EQUALITY OF PROPORTIONS: TOPICS TO BE INCLUDED IN A TELEWORK TRAINING PROGRAMME

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	24
Cochran's $\chi^2_{(7)}$	5.769231
P-value	0.3293

The differences in proportions of the various responses regarding topics to be included in a telework training programme are not significant ($Q = 5.769231$; $P = 0.3293$). Therefore, managers did not differ significantly on how they responded to the item regarding the topics to be included in a telework training programme in their respective organisations.

Table 4.21 presents how managers responded to item V16, which had six possible options (multiple response item).

TABLE 4.21: COMPARISON OF MANAGERS ACCORDING TO TOPICS TO BE INCLUDED IN A TELEWORK TRAINING PROGRAMME: CRUDE ESTIMATES

Outcome variable: _q16, n = 144

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-0.722	0.647	0.264	(-1.990 to 0.545)
3	0.336	0.594	0.571	(-0.828 to 1.501)
4	-0.511	0.637	0.423	(-1.759 to 0.738)
5	-0.274	0.626	0.661	(-1.502 to 0.953)
6	-0.916	0.656	0.163	(-2.202 to 0.370)
Constant	1.609	0.560	0.004	(0.513 to 2.706)

* Baseline category

Table 4.21 shows the crude estimates together with their respective 95% confidence intervals. Various responses are not significantly different, that is managers did not differ significantly with respect to topics to be included in a telework training programme in their respective organisations.

**TABLE 4.22: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR
RESPONSES TO TOPICS TO BE INCLUDED IN A TELEWORK TRAINING
PROGRAMME: HIERARCHICAL REGRESSION MODEL**

Outcome variable: _q16, n = 90

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*				
2	-0.880	0.908	0.332	(-2.659 to 0.898)
3	1.398	1.008	0.166	(-0.579 to 3.374)
4	-0.461	0.832	0.579	(-2.092 to 1.169)
5	0.000	0.729	1.000	(-1.428 to 1.428)
6	-0.461	1.080	0.669	(-2.578 to 1.655)
V4				
Unisa*	0			
ABSA	-0.434	0.656	0.508	(-1.720 to 0.852)
OPSA	-1.194	1.171	0.308	(-3.490 to 1.101)
Telkom	(dropped)			
Constant	2.522	1.050	0.016	(0.465 to 4.580)

* Baseline category

The adjusted model, as presented by Table 4.22, indicates that ABSA, OPSA and Telkom are not statistically different from Unisa. Therefore, managers in the different organisations responded relatively the same to items regarding topics to be included in a telework training programme when controlling for possible response choices. Thus, the topics to be included in a telework training programme were not significantly different between organisations.

4.2.5 Work-related musculoskeletal disorders and ergonomics

The last section of this questionnaire focused on the types of occupational health, safety and wellness hazards encountered due to incorrect virtual office ergonomics for the relevant technologies in use. Both work-related musculoskeletal disorders and ergonomics were defined to ensure a better understanding of this section of the questionnaire. This section also determined the consequences/costs resulting from disorders and, how the organisation responded if teleworkers lodged compensation fund claims.

4.2.5.1 Exposure to risk factors

This section requested managers to identify occupational risk factors to which teleworkers have been exposed to while teleworking. The responses of the participants are reflected in Figure 4.14.

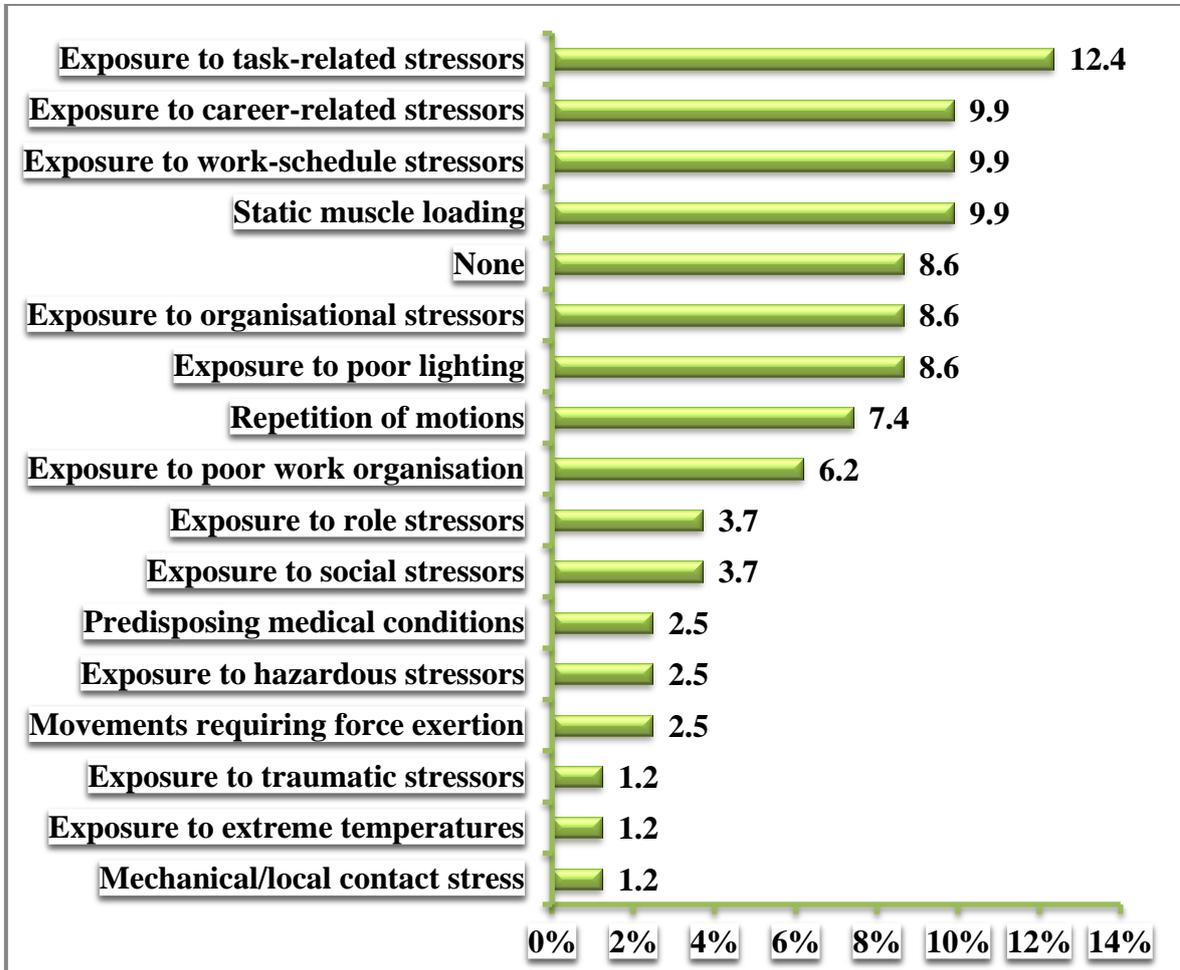


FIGURE 4.14: EXPOSURE TO OCCUPATIONAL RISK FACTORS

For interpretation purposes the occupational risk factors could be categorised into three groups as follows:

- Ergonomic stressors refer to ergonomic stress factors that involve the interaction between the body and the physical environment. The following results were observed: static muscle loading (holding the body in a single position for a long period), 9.9%; repetitions of motions, 7.4%; movements requiring force exertion (2.5%); mechanical/local contact stress (1.2%); poor lighting (glare, dim/sharp light), 8.6%; exposure to extreme temperatures (1.2%); exposure to hazardous stressors (2.5%).

- Psychosocial stressors refer to the effects of the organisational or social environment on the employee. The results are as follows: exposure to task-related stressors (time pressure, work overload, work complexity, monotonous work, and disruptions), 12.4%; exposure to work-schedule stressors (long hours, overtime, night and shift work), 9.9%; career-related stressors (job insecurity, poor career opportunities), 9.9%; organisational stressors (8.6%); exposure to poor work organisation (low level of control over work rate), 6.2%; exposure to social stressors (3.7%); exposure to role stressors (3.7%); exposure to traumatic stressors (1.2%).
- Physiological predisposition refers to some musculoskeletal disorder risk factors arising from the individual employee's physiology (for example: obesity, diabetes, rheumatoid and arthritis): predisposing medical conditions (2.5%).

From the above categorisation and the exposure rates as indicated, it became evident that the managers rated exposure to psychosocial stressors higher than exposure to ergonomic stressors. This emphasises again that the ergonomic factors (interaction between the teleworkers and the physical environment) were not recognised or realised to be critically important to prevent the development of work-related musculoskeletal disorders. This is an alarming observation since the teleworker's work site and working habits are not in the normal office environment where it is visible on a daily basis to the managers. When the monitoring of teleworkers was reported on, it was also indicated that visits to the alternative work site was not the preferred method used. Psychosocial stressors were also considered more important; it was evidenced where managers had to indicate which organisational policies/procedures and government Acts were applied in their organisations and the Ergonomics policy received the lowest percentage of 5.2%. Where managers had to indicate what should be included in a training program, ergonomic policies and guidelines (16.2%) was the third last to be included and regarded as important in training programmes. Physiological predisposition was not regarded as a problem in terms of exposure. Another alarming indication of the lack of knowledge and training to managers on occupational risk factors (especially the physical ergonomics) is that 8.9% of managers indicated that none of their teleworkers were exposed to occupational risk factors.

An adjusted Pearson's Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors are significant or not.

Table 4.23 indicates the results of the test for association between V17 and V4.

TABLE 4.23: ASSOCIATION BETWEEN EXPOSURE TO OCCUPATIONAL RISK FACTORS AND INDUSTRY SECTORS

V17 Exposure to occupational risk factors	V4				Total	Pearson's Chi- square*
	Unisa	ABSA	OPSA	Telkom		
6	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (6.67)	2.143 1.000
8	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (6.67)	2.143 1.000
11	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (6.67)	2.143 1.000
16	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (6.67)	2.143 1.000
17	0 (0.00)	1 (20.00)	0 (0.00)	0 (0.00)	1 (6.67)	2.143 1.000
12	1 (50.00)	1 (20.00)	0 (0.00)	0 (0.00)	2 (13.33)	3.750 1.000
1	1 (50.00)	2 (40.00)	0 (0.00)	0 (0.00)	3 (20.00)	4.375 1.000
13	1 (50.00)	2 (40.00)	0 (0.00)	0 (0.00)	3 (20.00)	4.375 1.000
18	0 (0.00)	0 (0.00)	2 (100.00)	2 (33.33)	4 (26.67)	8.182 0.678
3	2 (100)	1 (20.00)	0 (0.00)	2 (33.33)	5 (33.33)	5.400 1.000
7	1 (50.00)	1 (20.00)	0 (0.00)	3 (50.00)	5 (33.33)	2.400 1.000
14	2 (100.00)	1 (20.00)	0 (0.00)	2 (33.33)	5 (33.33)	5.400 1.000
15	1 (50.00)	2 (40.00)	0 (0.00)	2 (33.33)	5 (33.33)	1.350 1.000
4	2 (100.00)	2 (40.00)	0 (0.00)	2 (33.33)	6 (40.00)	4.444 1.000
9	2 (100.00)	2 (40.00)	0 (0.00)	2 (33.33)	6 (40.00)	4.444 1.000
10	2 (100.00)	4 (80.00)	0 (0.00)	2 (33.33)	8 53.33	6.429 1.000
Total	15 (750.00)	23 (460.00)	2 (100.00)	17 (283.33)	57 (380.00)	
Cases	2	5	2	6	15	

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.23 explicitly shows that the differences in proportions among the four participating organisations with respect to exposure to occupational risk factors are not significant since their respective p-value are greater than 0.05. Therefore organisations do not differ significantly with respect to exposure to occupational risk factors in these organisations.

The distribution of responses according to how participants responded to item V17 was examined. The results are presented by tables 4.24, 4.25 and 4.26.

TABLE 4.24: TEST FOR EQUALITY OF PROPORTIONS: EXPOSURE OF TELEWORKERS TO OCCUPATIONAL RISK FACTORS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	25
Cochran's $\chi^2_{(7)}$	56
P-value	< 0.001

The differences in proportions of the various responses regarding exposure of teleworkers to occupational risk factors are highly significant ($Q = 56; P < 0.001$). Therefore, managers differed significantly on how they responded to the item regarding exposure of teleworkers to occupational risk factors in their respective organisations.

Table 4.25 presents how teleworkers responded to item V17, which had seventeen possible options (multiple response item).

TABLE 4.25: COMPARISON OF MANAGERS ACCORDING TO EXPOSURE OF TELEWORKERS TO OCCUPATIONAL RISK FACTORS: CRUDE ESTIMATES

Outcome variable: _q17, n = 391

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	0.856	0.645	0.185	(-0.409 to 2.121)
3	1.269	0.674	0.060	(-0.052 to 2.589)
4	-1.194	1.266	0.346	(-3.675 to 1.288)
5	-1.194	0.875	0.172	(-2.908 to 0.520)
6	1.070	0.661	0.105	(-0.225 to 2.365)
7	-0.454	0.806	0.573	(-2.033 to 1.125)
8	1.635	0.698	0.019	(0.267 to 3.003)
9	1.269	0.674	0.060	(-0.052 to 2.589)
10	-0.000	0.784	1.000	(-1.536 to 1.536)
11	-0.000	0.784	1.000	(-1.536 to 1.536)
12	1.269	0.780	0.104	(-0.260 to 2.797)
13	0.616	0.626	0.325	(-0.611 to 1.843)
14	1.070	0.775	0.167	(-0.449 to 2.590)
15	-1.194	0.875	0.172	(-2.908 to 0.520)
16	-0.454	0.806	0.573	(-2.033 to 1.125)
17	1.070	0.875	0.221	(-0.645 to 2.786)
Constant	-1.897	0.633	0.003	(-3.138 to -0.656)

* Baseline category

The unadjusted hierarchical model was fitted to the crude estimates to compare the possible choices or responses of the item regarding the exposure of teleworkers to occupational risk factors. Various responses are not significantly different that is managers did not differ significantly with respect to the exposure of teleworkers to occupational risk factors. However the choice of ‘exposure to hazardous stressors’ (8) as compared with the choices of the rest is significant since the p-value is 0.019.

Adjusting for a number of possible responses, Table 4.26 reflects on the comparison of industry sectors with respect to how they responded to all possible alternatives of question 17.

TABLE 4.26: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO EXPOSURE OF TELEWORKERS TO OCCUPATIONAL RISK FACTORS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q17, n = 240

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	0.772	0.789	0.328	(-0.775 to 2.319)
3	1.099	0.827	0.184	(-0.522 to 2.719)
5	dropped			
6	-1.337	0.982	0.173	(-3.261 to 0.588)
7	0.772	0.783	0.324	(-0.763 to 2.308)
8	-1.337	0.982	0.173	(-3.261 to 0.588)
9	1.099	0.832	0.187	(-0.533 to 2.730)
10	1.715	0.892	0.055	(-0.034 to 3.464)
11	-1.337	0.982	0.173	(-3.261 to 0.588)
12	-0.527	0.937	0.574	(-2.363 to 1.310)
13	-0.000	0.947	1.000	(-1.855 to 1.855)
14	0.772	0.789	0.328	(-0.775 to 2.319)
15	0.772	0.976	0.429	(-1.141 to 2.685)
16	-1.337	0.982	0.173	(-3.261 to 0.588)
17	-1.337	0.982	0.173	(-3.261 to 0.588)
V4				
Unisa*	0			
ABSA	0.415	1.146	0.717	(-1.831 to 2.661)
OPSA	-0.956	1.003	0.341	(-2.923 to 1.010)
Telkom	-2.943	0.244	<0.001	(-3.422 to -2.464)
Constant	(dropped)			

* Baseline category

ABSA and OPSA are not statistically different from Unisa. Therefore, managers in these industry sectors responded relatively the same to items regarding the exposure of teleworkers to occupational risk factors when controlling for possible response choices. Thus, the exposure of teleworkers to occupational risk factors was not significantly different between these organisations. The opposite is applicable to Telkom.

4.2.5.2 Work-related musculoskeletal disorders reported

This section enquired whether any work-related musculoskeletal disorders have been reported by teleworkers and, if so, how many were reported. Figure 4.15 indicates the responses.

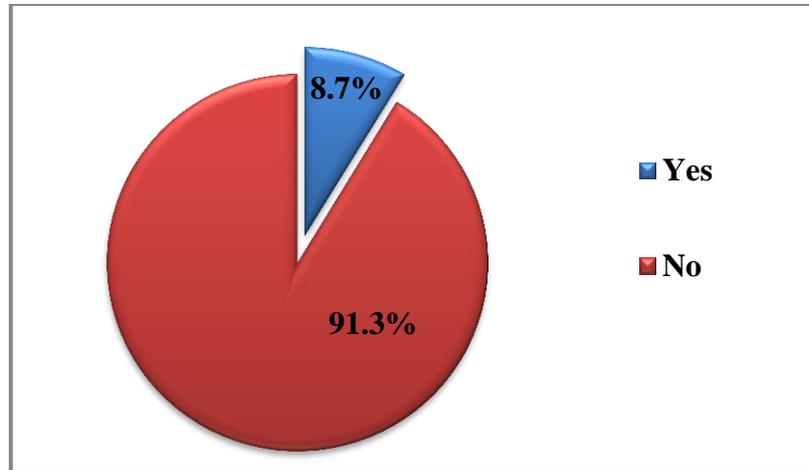


FIGURE 4.15: WORK-RELATED DISORDERS REPORTED

The majority of the managers (91.3%) indicated that no work-related musculoskeletal disorders were reported, while 8.7% indicated that disorders were reported by their teleworkers. However, none of the managers indicated the total number of work related disorders that have been reported.

The non-reporting of work-related musculoskeletal disorders could be attributed to ignorance and a lack of knowledge by the teleworkers. The development of work-related musculoskeletal disorders is related to the duration and intensity of exposure to risk factors. Taking into account that telework was not practised for a very long period (up to 5 years) it could also be the reason why disorders were not reported. Teleworkers might simply not suffer from work-related musculoskeletal disorders after a relatively short period of teleworking. The 8.7% that reported disorders may be ascribed to the lack of knowledge on the procedure to report disorders or to a lack of knowledge on work-related disorders as training to teleworkers were indicated to be low.

4.2.5.3 Consequences/costs resulting from disorders reported

This section investigated the consequences or costs for the organisation resulting from disorders that have been reported by teleworkers (8.7%). More than one option could be selected as reflected by Figure 4.16.

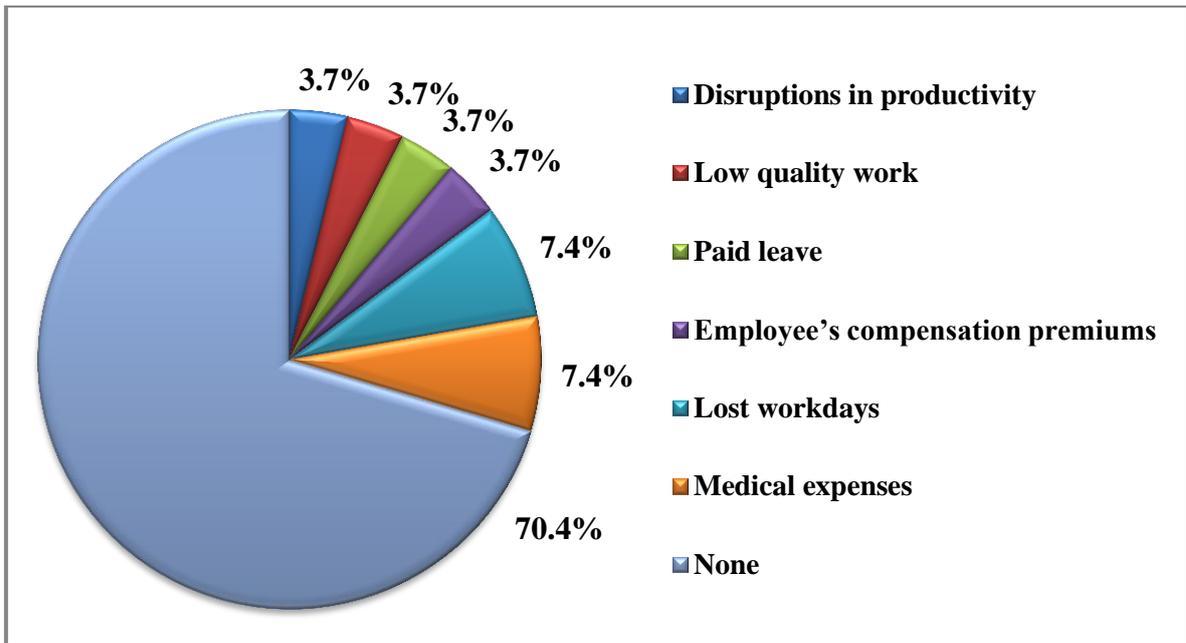


FIGURE 4.16: CONSEQUENCES/COSTS RESULTING FROM DISORDERS REPORTED

The managers of the 8.7% of teleworkers that reported disorders, had to indicate the consequences and costs that resulted from these disorders reported. A large group of these managers, 70.4% indicated that the consequences and costs due to the disorders reported were none. Medical expenses and workdays lost were indicated by 7.4% of the managers as the result of disorders reported by teleworkers. The rest of the possible consequences and costs (disruption in productivity, low quality work, paid leave and employees compensation premiums) were indicated by 3.7% of the managers as a direct consequence or cost due to the disorders reported. The managers indicated that there were no costs involved for replacement of workers, training, direct compensation or litigation processes due to disorders reported by teleworkers.

It could be considered alarming that 70.4% of the managers whose teleworkers (8.7%) reported disorders indicated that no consequences and costs resulted from disorders reported. Those teleworkers who did report disorders (8.7%) would have medical expenses (7.4%) and the organisations would lose workdays (7.4%) due to the teleworkers' absence. A large number of managers (91.3%) indicated that no work-related musculoskeletal disorders were reported. These statistics may look differently after a longer period of telework involvement as it is a known fact that disorders develop and increase the longer an employee is exposed to the risk factors.

The distribution of responses according to how participants responded to item V19 was examined. The results are presented by Tables 4.27, 4.28 and 4.29.

TABLE 4.27: TEST FOR EQUALITY OF PROPORTIONS: TYPE OF CONSEQUENCES/COSTS RESULTING FROM REPORTED WORK-RELATED MUSCULOSKELETAL DISORDERS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	23
Cochran's $\chi^2_{(7)}$	72.48
P-value	< 0.001

The differences in proportions of the various responses regarding the type of consequences/costs resulting from reported work-related musculoskeletal disorders are highly significant ($Q = 56; P < 0.001$). Therefore, managers differed significantly on how they responded to the item regarding the type of consequences/costs resulting from reported work-related musculoskeletal disorders in their respective organisations.

Table 4.28 presents how managers responded to item V19.

TABLE 4.28: COMPARISON OF MANAGERS ACCORDING TO THE TYPE OF CONSEQUENCES/COSTS RESULTING FROM REPORTED WORK-RELATED MUSCULOSKELETAL DISORDERS: CRUDE ESTIMATES

Outcome variable: _q19, n = 161

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	0.000	1.120	1.000	(-2.195 to 2.195)
3	0.000	0.792	1.000	(-1.552 to 1.552)
4	-0.740	1.330	0.578	(-3.347 to 1.868)
5	-0.740	0.757	0.328	(-2.223 to 0.743)
6	0.000	0.792	1.000	(-1.552 to 1.552)
7	3.910	1.209	0.001	(1.540 to 6.279)
Constant	-2.351	0.757	0.002	(-3.834 to -0.868)

* Baseline category

Table 4.28 shows the crude estimates together with their respective 95% confidence intervals. Various responses are not significantly different, that is managers did not differ

significantly with respect to the type of consequences/costs resulting from reported work-related musculoskeletal disorders. The item ‘employee’s compensation premiums’ (7) are significant since the p-value is less than 0.05. Managers differed significantly on their choices of this item.

Adjusting for a number of possible responses, Table 4.29 reflects on the comparison of industry sectors with respect to how they responded to all possible alternatives of question 19.

TABLE 4.29: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO TYPE OF CONSEQUENCES/COSTS RESULTING FROM REPORTED WORK-RELATED MUSCULOSKELETAL DISORDERS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q19, n = 105

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-0.000	1.639	1.000	(-3.212 to 3.212)
3	-0.000	1.159	1.000	(-2.271 to 2.271)
4	-1.001	1.791	0.576	(-4.512 to 2.509)
5	-1.001	0.987	0.311	(-2.936 to 0.934)
6	-0.000	1.159	1.000	(-2.271 to 2.271)
7	3.511	1.520	0.021	(0.532 to 6.489)
V4				
Unisa*	0			
ABSA	-3.027	0.522	<0.001	(-4.051 to -2.003)
OPSA	-3.027	0.522	<0.001	(-4.051 to -2.003)
Telkom	(dropped)			
Constant	-3.027	0.522	<0.001	(-4.051 to -2.003)

* Baseline category

Adjusting for a number of possible responses (Table 4.29), organisations are significantly different. In particular, ABSA, OPSA and Telkom are statistically different from Unisa. Therefore, managers in the different industry sectors responded relatively different to items regarding the type of consequences/costs resulting from reported work-related musculoskeletal disorders when controlling for possible response choices. Thus, the type of consequences/costs resulting from reported work-related musculoskeletal disorders was significantly different between organisations.

4.2.5.4 Actions taken by an organisation if compensation claims were lodged

This section investigated the actions taken by an organisation if a teleworker lodged a compensation fund claim due to disorders suffered. The responses are displayed in Figure 4.17.

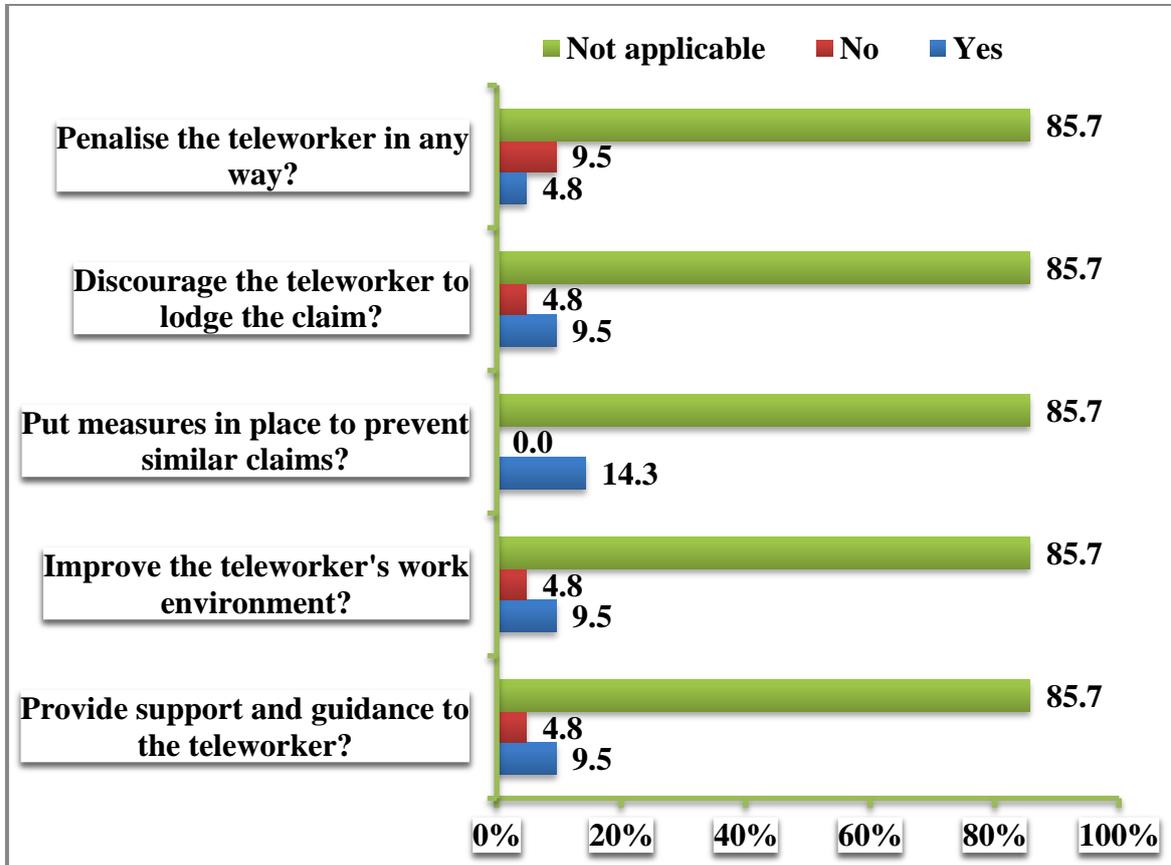


FIGURE 4.17: ACTIONS TAKEN WITH LODGED COMPENSATION FUND CLAIMS DUE TO DISORDERS

A group of managers (85.7%) indicated that the options were not applicable to them, probably because their teleworkers did not lodge any compensation fund claims. The organisations whose teleworkers did lodge a compensation fund claim and who responded positively (9.5%) indicated that the organisation Provided support and guidance and improved the work environment of the teleworker. A further 14.3% indicated that they have put measures in place to prevent similar claims. On the negative side there were managers that indicated that they discouraged teleworkers to lodge claims (9.5%) and 4.8% penalised the teleworker. Some managers (4.8%) indicated that no support, improvement, prevention or discouragement was given to teleworkers that lodged compensation fund claims.

If the focus shifts from the not applicable option, there seems to be more positive responses indicated by managers whose teleworkers did lodge compensation fund claims than negative responses. The positive actions included support and guidance provided; improvement of the work environment and measures that were put in place to prevent similar claims.

4.3 ANALYSIS OF THE DATA FROM TELEWORK EMPLOYEES

Data was collected that was directed at telework employees. From a population of 267, a total of 145 (54.3%) participants started to complete the questionnaire. This questionnaire consisted of various sections that corresponded with the outlined research objectives as specified in Chapter 1.

4.3.1 Consent and confirmation that the participant was allowed to telework

In line with ethics recommendations, participants were requested to indicate whether they consented to participate in this study. Figure 4.18 indicates the responses.

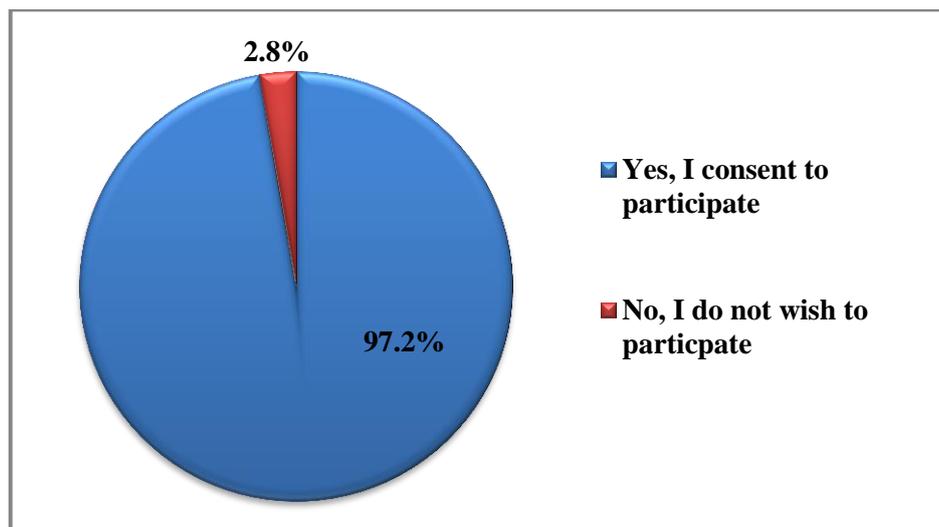


FIGURE 4.18: TELEWORKER'S CONSENT TO PARTICIPATE

Potentially, there were 145 participants involved in this study. The majority of teleworking participants (97.2%) consented to participate while 2.8% preferred not to participate.

To ensure that the participants were eligible to participate, they were requested to indicate whether flexible work arrangements were allowed in their organisations. Table 4.3 shows the distribution of participants according to whether they had the flexibility to do telework in their environment.

TABLE 4.30: TELEWORK FLEXIBILITY

Telework flexibility	Frequency	Percentage
No	17	12.1
Yes	124	87.9
Total	141	100.00

Table 4.30 indicates that 87.9% of the participants had telework flexibility while 12.1% did not have the flexibility to perform officially assigned duties at home or other work sites that were geographically convenient to the residence of these employees. The participants who indicated ‘No’ could therefore not participate in the questionnaire and were excluded from the rest of the study. Therefore, the active number of participants for this study was 124 that indicate a response rate of 87.9%.

4.3.2 Demographic information

This section represented the distributions of demographic information such as the age, gender and industry sectors of the participants.

4.3.2.1 Age and gender distribution of teleworkers

Participants were requested to indicate their age in years. Figure 4.19 reflects the distribution of the age categories of the participants.

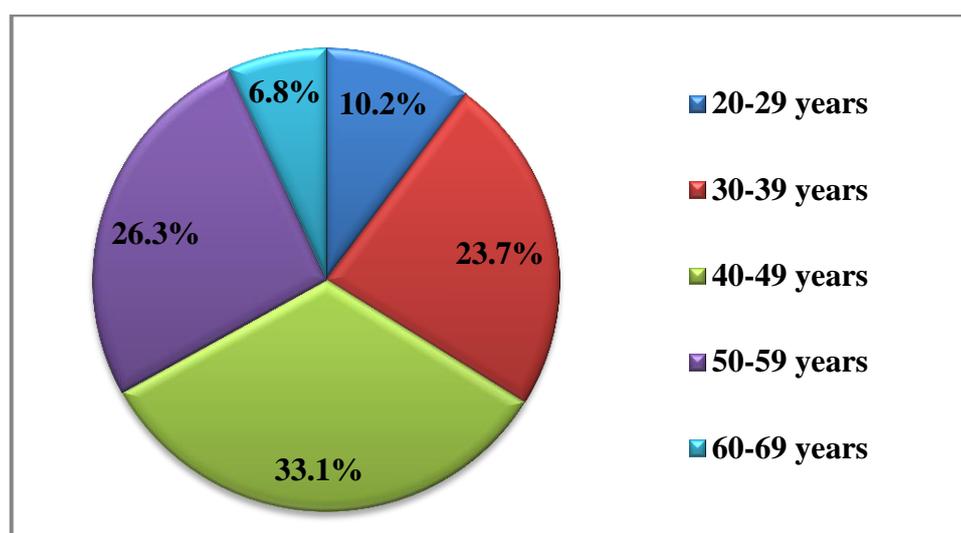


FIGURE 4.19: AGE DISTRIBUTION OF TELEWORKERS

The largest number of teleworkers (33.1%) was represented by the age category 40-49 years, followed by 50-59 years (26.3%), and then 30-39 years (23.7%). The age-group 20-29 years represented 10.2% and the age group with the lowest representation (6.8%) was 60-69 years.

From the data on age distribution, it was evident that the more experienced, older and settled employees (aged 40-60 years) were allowed to telework. It is assumed that these employees were regarded as responsible adults that did not need direct supervision and, that managers could monitor the teleworkers by focusing on the results and output. Telework policies and agreements were regarded sufficient methods to ensure compliance to Acts, policies and procedure. The data indicated that telework was less popular amongst the 60-69 year age group. This might be due to the retirement age (60-65) implemented by organisations. It might also be that the older and experienced employees are in managerial positions in these organisations. The reason for the relatively low popularity of the 20-29 year old employees might be ascribed to their lack of knowledge and experience and their competency to work independently.

The gender of the participants was requested and Figure 4.20 shows the distribution of participants according to their gender.

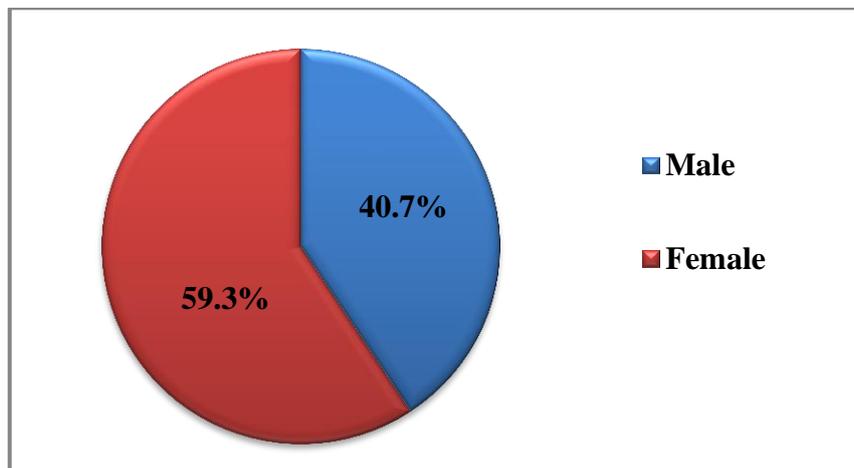


FIGURE 4.20: GENDER DISTRIBUTION OF TELEWORKERS

The largest number of teleworking participants, 59.3%, was female while 40.7% was male. This finding is significant in terms of the fact that females are more in favour of telework arrangements than their male counterparts. The advantages of telework are that it allows flexibility to work at times and places convenient to the teleworker and that it allows a

better work-life balance. Traditionally females are regarded as the care-takers of children and older family members. Telework therefore allows the females the freedom to take care of these responsibilities. Since it was also indicated that managers focused on results, females could arrange their working hours in a manner that would allow them to meet their due dates and targets.

4.3.2.2 Industry sector distribution of teleworkers

Teleworkers were requested to choose an option that best described the industry sector in which they were working. Figure 4.21 indicates the detailed stratification of the sectors and the distribution of 63.7% of the participants that selected from the industry sector options supplied. The rest of the participants (36.3%) chose to list their industry sector under the ‘Other’ option.

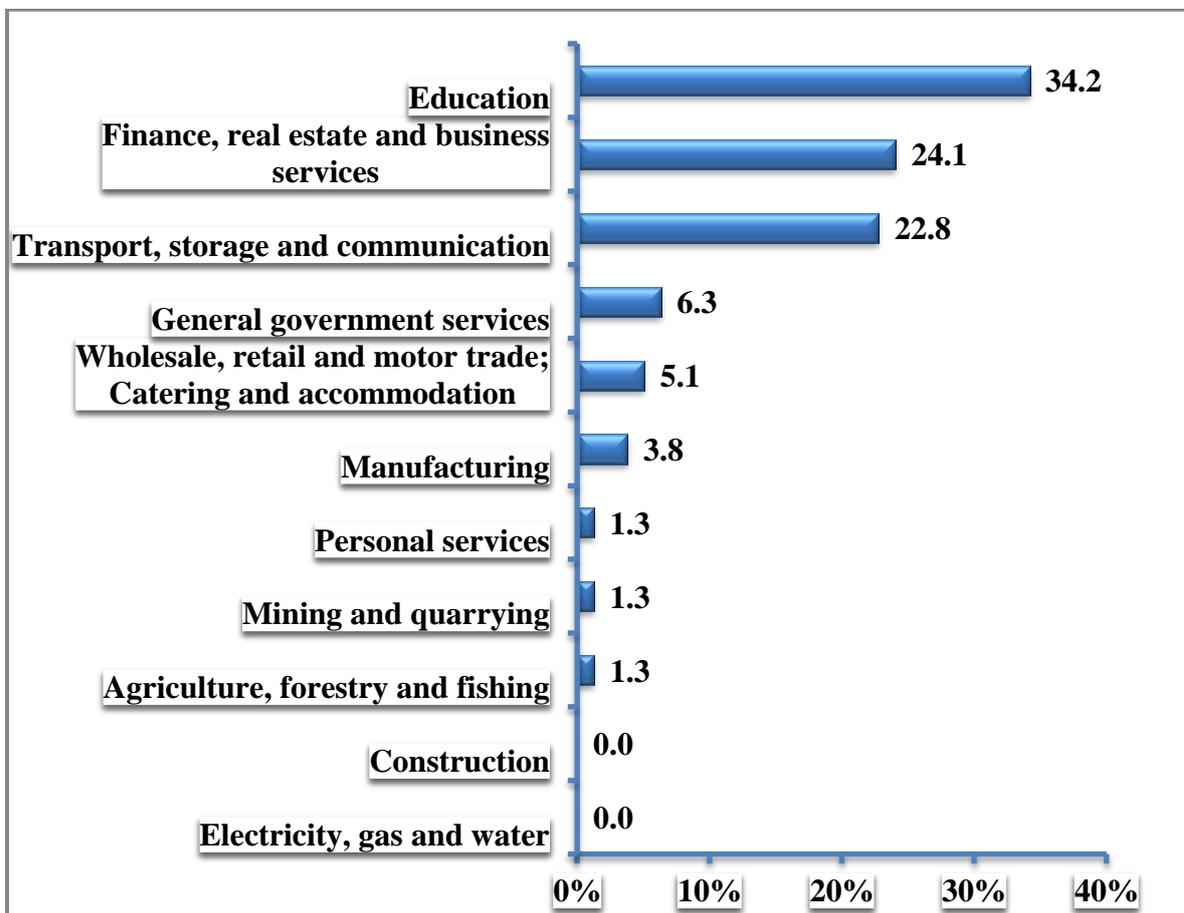


FIGURE 4.21: INDUSTRY SECTOR DISTRIBUTION OF TELEWORKERS

Most of the teleworkers were from the education sector (34.2%), followed by finance, real estate and business services (24.1%) and then transport, storage and communication sectors (22.8%). Manufacturing attracted 3.8% and agriculture, personal services and

mining, 1.3%. There were no teleworkers from the construction and electricity, gas and water sectors.

Of those teleworkers (36.3%) who chose to list their industry sector under the 'Other' option, 75.5% indicated that they were in communication/telecommunication/Telkom/information and communication technology. Another 7.5% indicated call centres; 3.8% each were indicated by banking, information technology and customer liaison/customer services. One teleworker each (1.8%) indicated media, administration, sales support, and design of learning material.

From the analysis of the data it became evident that the participants of the four selected organisations known to be teleworking were represented in the industry sectors as follows: Unisa (education), ABSA (finance, real estate and business services), Telkom (transport, storage and communication) and Grundfos (manufacturing). The distribution amongst the other variables was probably a representation of the teleworkers who read OPSA's publications. The reason why there have been no responses from a number of industry sectors is simply because they did not form part of the target population to whom the questionnaires were directed. However, it should be noted that certain industries might not offer flexible work arrangements because their employees' physical presence were required on site all the time.

4.3.3 Telework

This section of the questionnaire focused on telework, the frequency of telework, the years involved in telework, furniture/equipment/services used and who supplied it. The questionnaire provided a definition of telework to ensure that participants have a background of what the questions in this section would cover.

4.3.3.1 Types of telework

Participants were requested to select the types of telework/alternative workplace arrangement applicable to them from a list of various options provided. Respondents could select more than one applicable option. Figure 4.22 indicates the types of telework arrangements selected by the teleworkers.

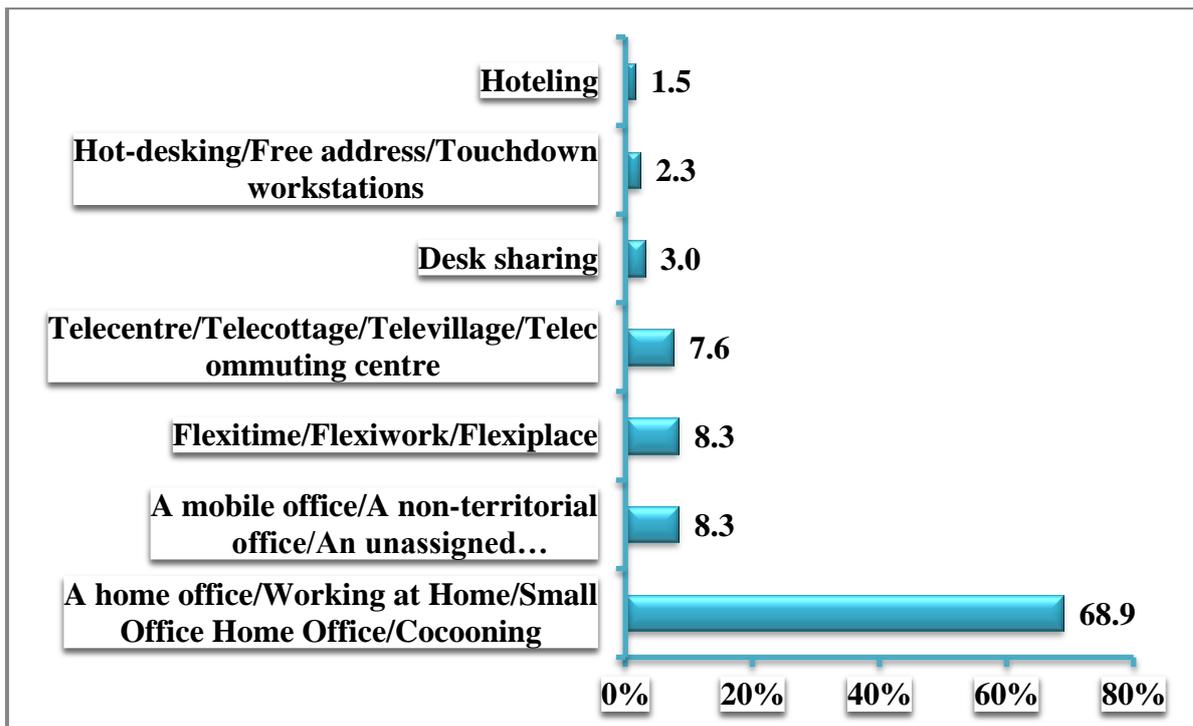


FIGURE 4.22: TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS

The most popular telework type was found to be a home office/working at home/small office home office/cocooning with 68.9% of the participants selecting this option. The next most popular options selected with 8.3% each, were a mobile office/non-territorial office/unassigned office/alternative workspace/-place/-site and flexitime/flexiwork/flexiplace. The next telework type selected was telecentre/telecottage/televillage/telecommuting centre, 7.6%; then desk sharing 3%; followed by hot desking (2.3%). The least popular telework arrangement was hoteling (1.5%).

From the data it was evident that organisations relied on the teleworkers to provide the facilities that enabled them to telework (home office, mobile office, flexitime/flexiwork/flexiplace). The infrastructure needed in an e-environment (telecentre/telecottage/televillage/telecommuting centre, desk sharing and hoteling) does not seem to be in place as in countries that have been involved in telework for many years.

Pearson's Chi-square test was used to test for associations between two categorical variables, types of telework and gender. Table 4.31 represents the association.

TABLE 4.31: ASSOCIATION BETWEEN GENDER AND TYPES OF TELEWORK

Types of telework	Female	Male	Total	Pearson's Chi-square
Hoteling	0 (0.0)	2 (4.17)	2 (1.80)	2.673 0.714
Hot desking	2 (3.17)	1 (2.08)	3 (2.70)	0.123 1.000
Desk sharing	4 (6.35)	0 (0.00)	4 (3.60)	3.162 0.528
Telecentre	10 (15.87)	0 (0.00)	10 (9.01)	8.373 0.027
A mobile office	6 (9.52)	5 (10.42)	11 (9.91)	0.024 1.000
Flexitime	6 (9.52)	5 (10.42)	11 (9.91)	0.024 1.000
A home office	46 (73.02)	43 (89.58)	89 (80.18)	4.705 0.210

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.31 reflects the relationship between gender and the types of telework. The figures in brackets indicate the proportion of participants under each subcategory. The statistical results indicate there is a significant association between the type of telework, telecentre and gender (p-value = 0.027). That is at a 95% confidence limit - gender and type of telework are significantly associated. The type of telework does seem to have an influence on the gender type as female teleworkers are marginally more than male teleworkers who selected telecentres.

The Cochran's statistics and hierarchical logistic regression (crude estimates generated from unadjusted models) were employed to evaluate the significance of the differences among the proportions of the single response categories (Jann, 2005:92-112). That is, the comparison of the proportions of responses in a single multiple response item is performed. Adjusted hierarchical models were fitted to compare the participating industry sectors. Tables 4.32, 4.33 and 4.34 present the results on the distribution of responses regarding item V6.

TABLE 4.32: TEST FOR EQUALITY OF PROPORTIONS: TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	113
Cochran's $\chi^2_{(7)}$	346.9705
P-value	0.0000

Table 4.32 shows that the differences in proportions of the various responses regarding types of telework/alternative workplace arrangements are highly significant ($Q = 346.9705; P < 0.001$). Therefore, teleworkers differed significantly on how they responded to multiple response items regarding the types of telework/alternative workplace arrangements in their respective organisations.

Table 4.33 shows the crude estimates and their respective 95% confidence intervals that is the result from application of hierarchical logistic regression on how the participants responded to item 13.

TABLE 4.33: COMPARISON OF TELEWORKERS ACCORDING TO TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS: CRUDE ESTIMATES

Outcome variable: _q6, n = 791

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-3.647	0.463	<0.001	(-4.554 to -2.740)
3	-3.752	0.506	<0.001	(-4.743 to -2.761)
4	-3.647	0.424	<0.001	(-4.478 to -2.816)
5	-5.022	0.647	<0.001	(-6.290 to -3.754)
6	-5.436	0.778	<0.001	(-6.962 to -3.911)
7	-4.725	0.570	<0.001	(-5.842 to -3.608)
Constant	1.420	0.239	<0.001	(0.952 to 1.888)

* Baseline category

The unadjusted hierarchical model was fitted to the crude estimates to compare the possible choices or responses of the item regarding types of telework/alternative workplace arrangements. Various responses are significantly different, that is teleworkers differed

significantly with respect to the types of telework/alternative workplace arrangements in their organisations.

Adjusting for a number of possible responses, Table 4.34 reflects on the comparison of industry sectors with respect to how they responded to all possible alternatives of question 6.

TABLE 4.34: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO TYPES OF TELEWORK/ALTERNATIVE WORKPLACE ARRANGEMENTS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q6, n = 791

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-3.654	0.467	<0.001	(-4.569 to -2.739)
3	-3.759	0.508	<0.001	(-4.754 to -2.764)
4	-3.654	0.428	<0.001	(-4.492 to -2.816)
5	-5.029	0.650	<0.001	(-6.303 to -3.756)
6	-5.444	0.775	<0.001	(-6.963 to -3.925)
7	-4.733	0.569	<0.001	(-5.849 to -3.616)
V4				
OPSA*	0			
Unisa	-0.199	0.288	0.488	(-0.763 to 0.365)
ABSA	-0.186	0.324	0.566	(-0.820 to 0.448)
Telkom	(dropped)			
Constant	-0.267	0.247	0.281	(-0.751 to 0.218)

* Baseline category

Organisations (V4) are not significantly different, for their respective p-values are more than 0.05. In particular, ABSA (P = 0.566) and Unisa (0.488) are not statistically different from OPSA. Therefore, teleworkers in the different industry sectors responded relatively the same to question 6.

The above tables 4.32, 4.33 and 4.34 indicate that even though organisations are not significantly different in the types of telework/alternative workplace arrangements, their respective teleworkers differ significantly on how they responded to the items regarding types of telework/alternative workplace arrangements.

4.3.3.2 Frequency of telework arrangement

Telework participants had to indicate the frequency of the telework arrangement applicable as illustrated with Figure 4.23.

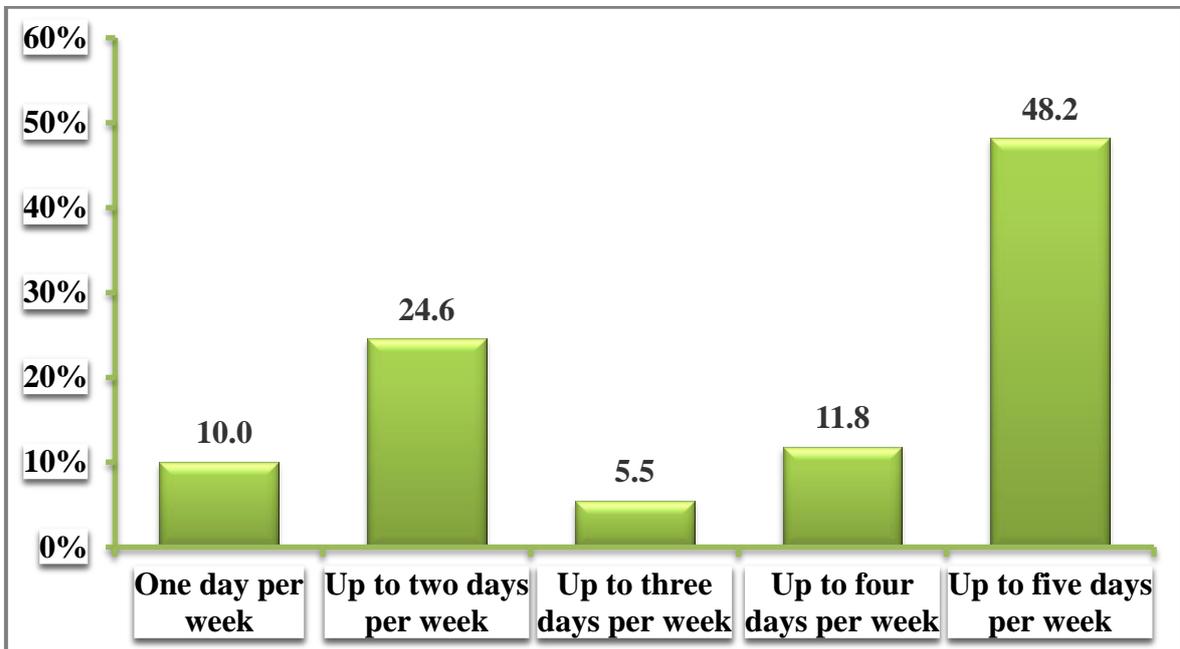


FIGURE 4.23: FREQUENCY OF TELEWORK ARRANGEMENT

The largest number of the participants' telework arrangement was as follows: up to five days per week (48.2%), followed by up to two days per week (24.6%); up to four days per week (11.8%); one day per week, 10%. The least favourable telework arrangement was indicated as up to three days per week (5.5%). Under the 'Other' option three participants indicated the telework arrangement applicable to them as not very often, once a month and catching up with work from home.

It should be noted that the teleworking participants from Unisa (academic staff members, mainly senior professors) do not have offices at the main campus of the university. Therefore they all have permission to work at home five days per week. That might be the reason why the five day per week option was reported to be the most popular option. The up to two days per week could be regarded as a more accurate indication of what the telework reality is in the business and industry sectors.

The Pearson's Chi-square test was used to test for association between the frequency of telework arrangement and gender. Table 4.35 represents the association.

TABLE 4.35: ASSOCIATION BETWEEN TELEWORK ARRANGEMENTS AND GENDER

Telework Arrangement	Female	Male	Total
One day per week	6 (54.55)	5 (45.45)	11 100.00
Up to two days per week	14 (53.85)	12 (46.15)	26 100.00
Up to three days per week	3 (50.00)	3 (50.0)	6 100.00
Up to four days per week	6 (50.00)	6 (50.0)	12 100.00
Up to five days per week	31 (60.78)	20 (39.22)	51 100.00

* Pearson's Chi-square / Bonferroni-adjusted p-values

(Pearson Chi2 = 0.7819, Pr = 0.941)

Table 4.35 reflects the relationship between the frequency of telework arrangement and gender. Pearson's Chi-square measured 0.7819 with an observed probability of 0.941. At the 95% level of significance, the observed probability (p-value) is 0.941, which is greater than 5% ($p < 0.05$) and thus implying that there is no significant association (relationship) between gender and the frequency of telework arrangement. Thus, the proportion of males to the proportion of females in the frequency of telework arrangement is not significantly different. Therefore it can be said that males and females are not different with regard to the frequency of telework arrangements.

The adjusted Pearson's Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors are significant or not, with the interpretation being performed at $\alpha = 0.05$ error. Table 4.36 indicates the results of the test for association between the frequency of telework arrangements (V7) and participating industry sectors (V4).

TABLE 4.36: ASSOCIATION BETWEEN FREQUENCY OF TELEWORK ARRANGEMENTS AND INDUSTRY SECTORS

V4 Frequency of telework arrangement	V7					Total	Pearson's Chi- square*
	One day per week	Up to five days per week	Up to four days per week	Up to three days per week	Up to two days per week		
ABSA	32 (36.36)	56 (13.73)	24 (23.08)	0 (0.00)	32 (14.81)	144 (16.67)	40.333 0.000
OPSA	16 (18.18)	112 (27.45)	0 (0.00)	16 (33.33)	32 (14.81)	176 (20.37)	48.557 0.000
Unisa	8 (9.09)	136 (33.33)	32 (30.77)	0 (0.00)	8 (3.70)	184 (21.30)	101.533 0.000
Telkom	32 (36.36)	104 (25.49)	48 (46.15)	32 (66.67)	144 (66.67)	360 (41.67)	113.691 0.000
Total	88 (100.00)	408 (100.00)	104 (100.00)	48 (100.00)	216 (100.00)	864 (100.00)	
Cases	88	408	104	48	216	864	

* Pearson's Chi-square / Bonferroni-adjusted p-values

The statistical results indicate that the differences among the participating organisations Unisa, ABSA, OPSA and Telkom concerning all levels or categories of frequency of telework arrangements are significant since their respective p-values are not greater or equal to 0.05. The proportions of respondents within each organisation are significantly different. Therefore, organisations differ significantly with respect to the frequency of telework arrangements.

4.3.3.3 Number of years involved in a telework programme

In the next section participants were requested to indicate the number of years they had been on a regular and recurring basis involved in the telework program of their organisation/department/unit/section. Figure 4.24 indicates the responses.

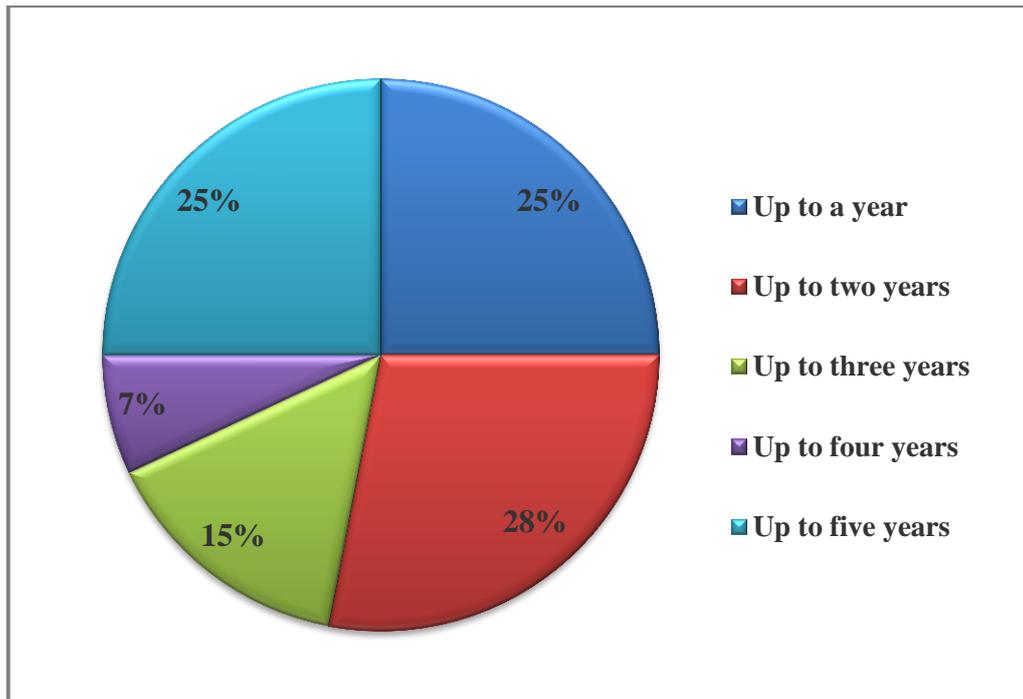


FIGURE 4.24: NUMBER OF YEARS INVOLVED IN TELEWORK

The largest number of the teleworkers, 28%, indicated that they were up to two years involved with the telework programme in their organisation. Up to a year and up to five years were selected as the second most popular number of years, 25% each. Up to three years was selected by 15% and up to four years by 7% of the teleworkers.

The percentages indicated once again that telework is a new concept with the largest number of teleworkers in the up to two years involved in telework. Up to five years and up to a year both indicate that telework is not declining, but stable with growth indicated by the up to two years data. The assumption is that the eligible employees were allowed to telework five years ago and then only a small number (7%) were added to those employees already teleworking in the year thereafter (up to four years) and another group (15%) was allowed the next year (up to three years).

The Pearson's Chi-square test was used to test for association between the number of years involved in telework and gender. Table 4.37 represents the association.

TABLE 4.37: ASSOCIATION BETWEEN NUMBER OF YEARS INVOLVED IN TELEWORK AND GENDER

Number of years	Female	Male	Total
Up to a year	14 (58.33)	10 (41.67)	24 100.00
Up to two years	13 (46.43)	15 (53.57)	28 100.00
Up to three years	5 (35.71)	9 (64.29)	14 100.00
Up to four years	6 (85.71)	1 (14.29)	7 100.00
Up to five years	15 (60.00)	10 (40.00)	25 100.00

(Pearson Chi2 = 5.9101, Pr = 0.206)

Table 4.37 explicitly shows that the differences in proportions among the number of years involved in telework and gender are not significant (their respective p-value are greater than 0.05). Thus, the proportion of males to the proportion of females in the number of years involved in telework and gender is not significantly different.

An adjusted Pearson Chi-square test was conducted to assess whether the observed differences between the levels of industry sectors (V4) and period of the telework programme (V8) was significant or not. Table 4.38 indicates the results.

**TABLE 4.38: ASSOCIATION BETWEEN PERIOD OF TELEWORK
PROGRAMME AND INDUSTRY SECTORS**

V4 Frequency of telework arrangement	V8					Total	Pearson's Chi- square*
	Up to a year	Up to five years	Up to four years	Up to three years	Up to two years		
ABSA	16 (8.00)	40 (20.00)	0 (0.00)	0 (0.00)	56 (25.00)	112 (14.00)	63.123 0.000
OPSA	56 (28.00)	8 (4.00)	32 (57.14)	0 (0.00)	56 (25.00)	152 (19.00)	126.093 0.000
Unisa	40 (20.00)	48 (24.00)	16 (28.57)	48 (40.00)	32 (14.29)	184 (23.00)	31.298 0.000
Telkom	88 (44.00)	104 (52.00)	8 (14.29)	72 (60.00)	80 (35.71)	352 (44.00)	43.970 0.000
Total	200 (100.00)	200 (100.00)	56 (100.00)	120 (100.00)	224 (100.00)	800 (100.00)	
Cases	200	200	56	120	224	800	

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.38 indicates that the differences among the participating organisations Unisa, ABSA, OPSA and Telkom concerning all levels or categories of period of telework programme are significant since their respective p-values are less than 0.05. The proportions of respondents within each organisation are significantly different. Thus, organisations differ significantly with respect to the period that their telework programmes are implemented.

4.3.3.4 Furniture/equipment/services used for teleworking

This section determined the types of furniture, equipment and services used for teleworking. Figure 4.25 illustrates the responses where participants could choose more than one option.

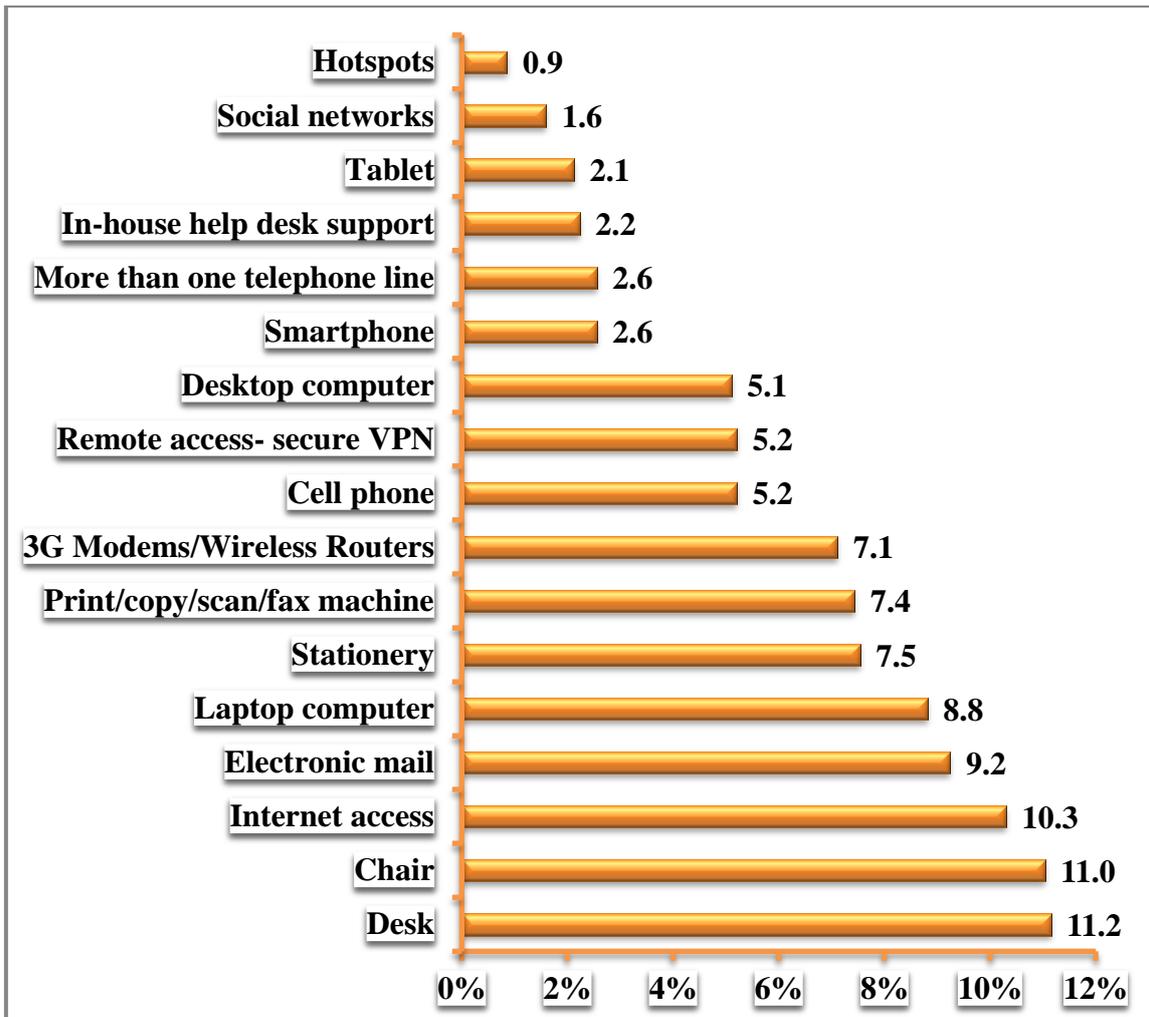


FIGURE 4.25: FURNITURE/EQUIPMENT/SERVICES USED FOR TELEWORKING

The most popular furniture indicated was a desk (11.2%) followed by a chair (11%). The most popular *services* indicated were internet access (10.3%); electronic mail (9.2%) followed by 3G modems/wireless routers (7.1%). The most popular *equipment* indicated was laptop computers (8.8%); print/copy/scan/fax machine (7.4%); cell phones and remote access provided by a secure virtual private network, 5.2% each followed by the desktop computer (5.1%). Stationery (7.5%) was indicated to be important for telework.

The telework policy and the written telework agreement make provision for the supply of resources, equipment, services. It includes an equipment inventory, clarifying what the employee will supply; what the organisation will supply, and what will be shared. These issues must be negotiated and agreed upon between the teleworker and the organisation.

With regard to furniture/equipment/services used (cf. Figure 4.26) for teleworking, participants were requested to indicate whether these belonged to the teleworker, the organisation or to an alternative work site. Figure 4.26 indicates the frequency of ownership of furniture, equipment, and services.

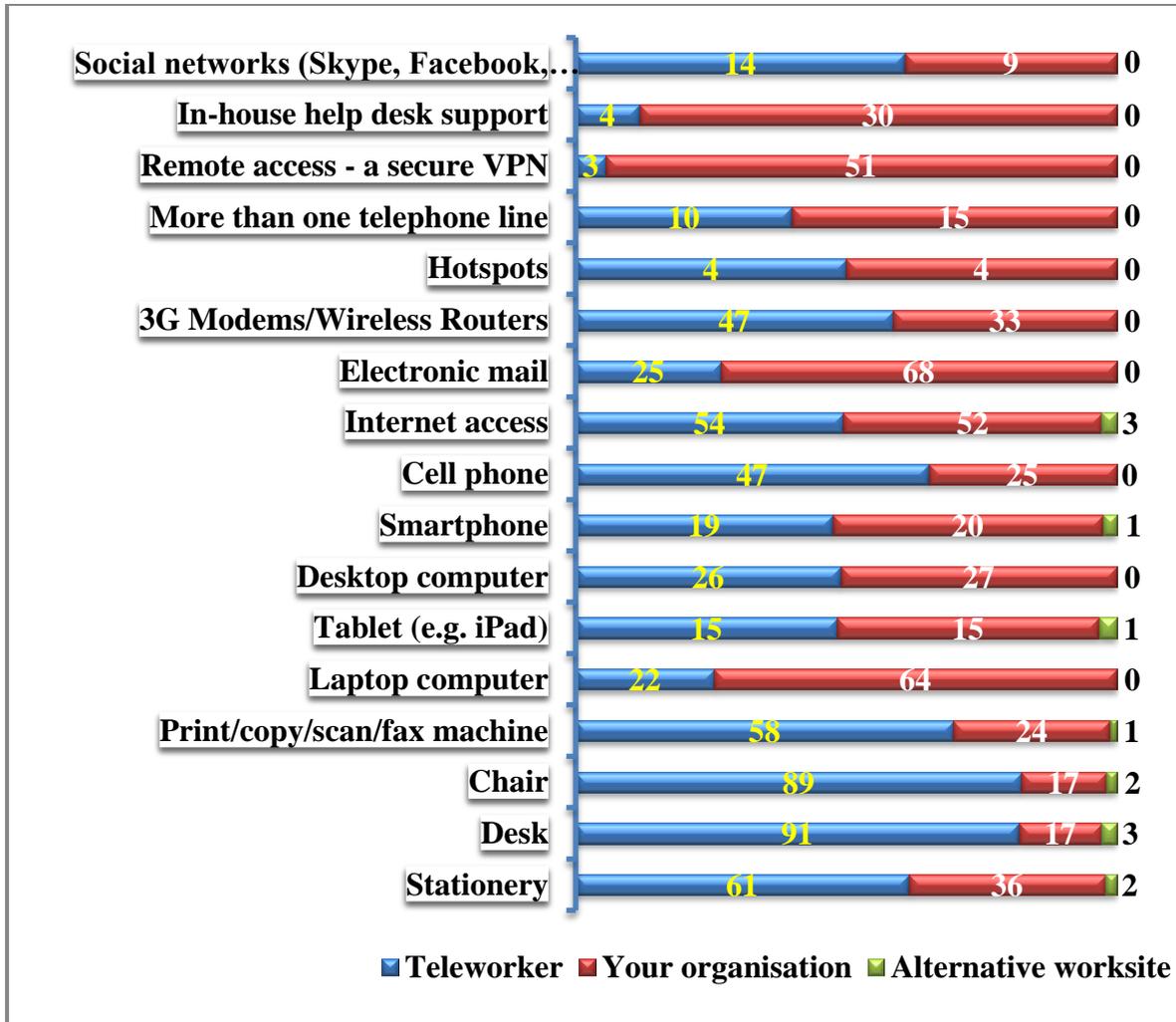


FIGURE 4.26: FREQUENCY OF OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES USED FOR TELEWORKING

Figure 4.26 indicates that the *furniture* (desk, $n = 91$ and chair, $n = 89$) used for teleworking belonged mostly to the teleworker. Stationery used also belonged mostly to the teleworker ($n = 61$) in comparison to the stationery supplied by the organisation ($n = 36$). As far as *equipment* was concerned, the organisation supplied the laptop computer ($n = 64$) while the desktop computers belonged almost equally to the teleworker ($n = 26$) and the organisation ($n = 27$). Cell phones ($n = 47$) belonged mostly to the teleworkers, while cell phones supplied to the teleworkers by the organisation was indicated as $n = 25$. The print/copy/fax machines used belonged to the teleworker ($n = 58$).

As for *services*, the 3G modem and wireless router ($n = 47$) belonged to the teleworker while $n = 33$ were supplied by the organisation. Internet access used for teleworking seemed to be almost equally supplied by the teleworker ($n = 54$) and organisation ($n = 52$). The use of electronic mail indicated that the organisation's e-mail represents $n = 68$, while the teleworker's e-mail used was $n = 25$. The alternative work site did not seem to be a very popular telework option since a very small percentage of teleworkers indicated that the furniture, equipment and services belonged to the alternative work site.

Table 4.39 indicates the ownership of the furniture, equipment and services. The highest frequency indicating ownership is indicated in bold.

TABLE 4.39: OWNERSHIP OF FURNITURE/EQUIPMENT/SERVICES USED FOR TELEWORKING REPRESENTED IN FREQUENCIES

Furniture/Equipment/Services	Teleworker	Organisation	Alternative work site
Stationery	61	36	2
Desk	91	17	3
Chair	89	17	2
Print/copy/scan/fax machine	58	24	1
Laptop computer	22	64	0
Tablet (e.g. iPad)	15	15	1
Desktop computer	26	27	0
Smartphone	19	20	1
Cell phone	47	25	0
Internet access	54	52	3
Electronic mail	25	68	0
3G Modems/Wireless Routers	47	33	0
Hotspots	4	4	0
More than one telephone line	10	15	0
Remote access - secure VPN	3	51	0
In-house help desk support	4	30	0
Social networks	14	9	0

Table 4.39 indicates the ownership distribution frequencies of the furniture, equipment and services belonging to the teleworker, the organisation and the alternative work site. Furniture that was provided mostly by the teleworkers is desk, chair and print/copy/scan/fax machine. Equipment that was mostly supplied by the organisation is tablet, Smartphone, Laptop computer, desktop computer. Tablets seemed to have equal ownership between the organisation and teleworker. However, cell phones belonged mostly to the

teleworker. Services that were mostly supplied by the organisation are Electronic mail, In-house help desk support, More than one telephone line and remote access provided by a secure virtual private network. The services belonging to the teleworker were Internet access, wireless routers/3G modems, social networks (Skype/Facebook). Hotspots were also equally distributed between the organisation and the teleworker. The Stationery used was mostly supplied by the teleworker.

The data obtained from teleworkers on the ownership of furniture/equipment/services used corresponds with what the managers indicated in paragraph 4.2.3.5. The teleworkers also indicated that the organisations expected the teleworkers to supply and pay for the fixed assets (furniture) used while teleworking. Organisations were willing to supply equipment however; the running costs were the responsibility of the teleworkers. The fact that teleworkers were required to pay for stationery might be due to the fact that the teleworkers dependants might also use stationery (typing paper, staplers and cellotape) simply because it is available in the homes of the teleworker.

The distribution of responses according to how participants responded to item V9 was examined. The results are presented by Tables 4.40, 4.41 and 4.42.

**TABLE 4.40: TEST FOR EQUALITY OF PROPORTIONS:
FURNITURE/EQUIPMENT/SERVICES USED FOR TELEWORKING**

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	113
Cochran's $\chi^2_{(7)}$	290.1735
P-value	0.0000

The differences in proportions of the various responses regarding furniture/equipment/services used for teleworking are highly significant ($Q = 290.1735; P < 0.001$). Therefore, teleworkers differed significantly on how they responded to the item regarding the furniture/equipment/services used for teleworking in their respective organisations.

Table 4.41 makes this explanation more explicit.

TABLE 4.41: COMPARISON OF TELEWORKERS ACCORDING TO FURNITURE/EQUIPMENT/SERVICES USED FOR TELEWORKING: CRUDE ESTIMATES

Outcome variable: _q9, n = 904

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	2.050	0.350	<0.001	(1.364 to 2.735)
3	1.922	0.328	<0.001	(1.279 to 2.566)
4	-0.038	0.182	0.836	(-0.394 to 0.318)
5	0.493	0.252	0.051	(-0.002 to 0.987)
6	-2.062	0.305	<0.001	(-2.659 to -1.465)
7	-0.828	0.289	0.004	(-1.395 to -0.262)
8	-1.836	0.275	<0.001	(-2.375 to -1.296)
Constant	0.525	0.196	0.007	(0.142 to 0.908)

* Baseline category

The crude estimates, as presented by Table 4.41, are such that various responses are significantly different that is teleworkers differed highly significantly with respect to the furniture/equipment/services used for teleworking in their organisations. However the teleworkers did not differ significantly with regard to the use of a print/copy/scan/fax machine, and laptop computer as compared to the use of stationery.

**TABLE 4.42: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR
RESPONSES TO FURNITURE/EQUIPMENT/SERVICES USED FOR
TELEWORKING: HIERARCHICAL REGRESSION MODEL**

Outcome variable: _q9, n = 904

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	2.131	0.355	<0.001	(1.436 to 2.826)
3	2.001	0.330	<0.001	(1.355 to 2.648)
4	-0.040	0.193	0.836	(-0.418 to 0.338)
5	0.521	0.268	0.052	(-0.005 to 1.046)
6	-2.172	0.320	<0.001	(-2.800 to -1.545)
7	-0.879	0.306	0.004	(-1.480 to -0.279)
8	-1.938	0.288	<0.001	(-2.502 to -1.374)
V4				
OPSA*	0			
Unisa	1.525	0.362	<0.001	(0.816 to 2.234)
ABSA	0.615	0.349	0.078	(-0.070 to 1.299)
Telkom	(dropped)			
Constant	0.915	0.309	0.003	(0.310 to 1.519)

* Baseline category

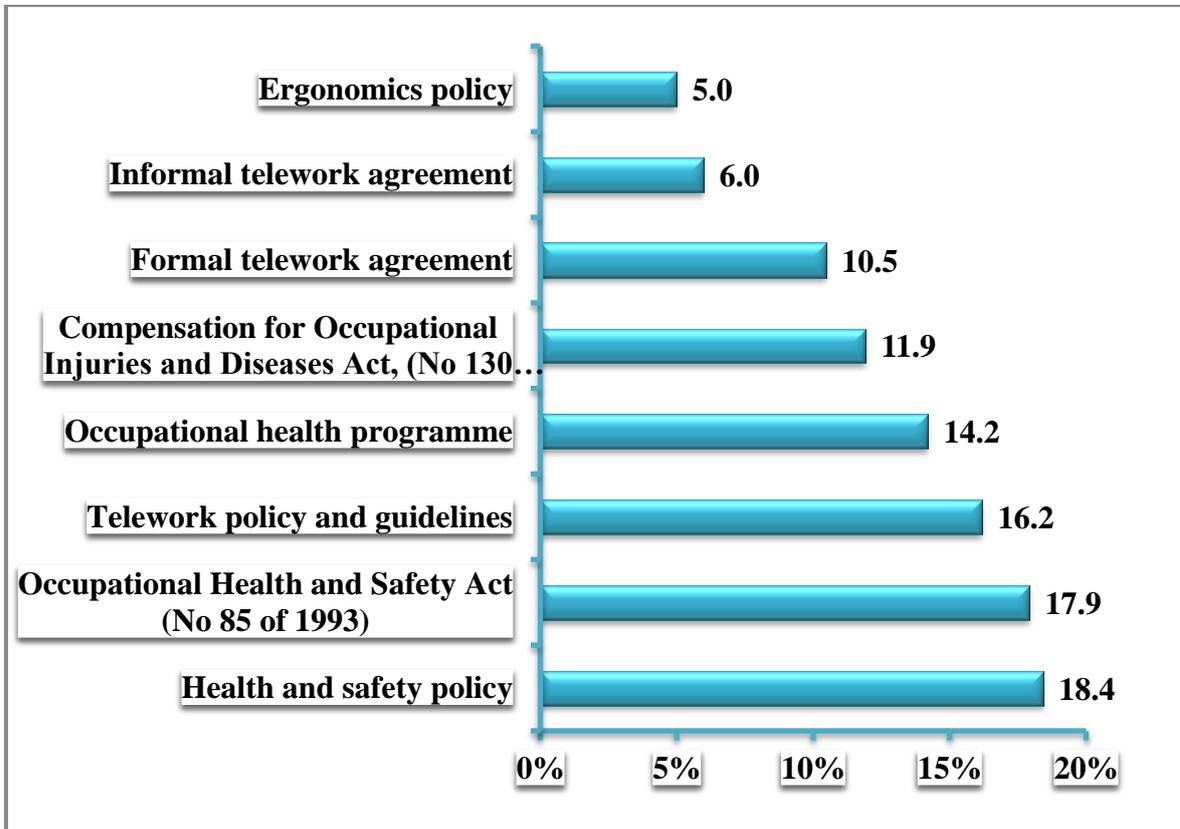
The statistical findings, as given by Table 4.42, are that ABSA is not significantly different from OPSA ($p = 0.078$). Therefore, teleworkers in ABSA and OPSA responded relatively the same to items regarding the furniture/equipment/services used for teleworking when controlling for all possible response choices. Thus, the furniture/equipment/services used for teleworking were not significantly different between OPSA and ABSA. However, the opposite is true for OPSA and Unisa ($p < 0.001$).

4.3.4 Regulatory compliance

This section of the questionnaire aimed to determine if, and which organisational policies, procedure and government acts were applicable and, how compliance with these were ensured. The training of teleworkers to create awareness and knowledge of organisation policies and regulations to work productively and effectively in these e-environments were also determined.

4.3.4.1 Application of organisational policies/procedures/government acts

The participants were required to indicate which policies, procedure and acts were applied in their organisations. The aim of this question was to assess awareness and knowledge of health and safety legislation promulgated in South Africa. Participants could choose any number of options. Figure 4.27 indicates the responses.



**FIGURE 4.27: ORGANISATIONAL POLICIES/PROCEDURES/
GOVERNMENT ACTS APPLIED IN THE ORGANISATION**

The teleworkers indicated an awareness of the organisation's Health and Safety policy (18.4%) that could be linked to awareness of the Occupational Health and Safety Act (No 85 of 1993) (17.91%) and also to the organisation's occupational health programme (14.2%). The awareness of the organisation's telework policy (16.2%) corresponded with the application of formal telework agreements (10.4%) and informal telework agreements (6%) in the organisations. The awareness of the Compensation for Occupational Injuries and Diseases Act (No 130 of 1993) was reported as 11.9% and the ergonomics policy was reported as a very low 5%.

The data indicated the ergonomics policy to be the least favourite policy applied in the organisations. This is an alarming indication of negligence on the part of organisations. Ergonomics are key to the well-being of employees, especially in the distributed e-environment where employees are not under the direct and visible supervision of the employer. Knowledge of ergonomics should form an integral part of every teleworker's training in order to practise safe telework.

Teleworkers were requested to indicate how their organisations ensured that telework policies were adhered to and how regulatory compliance was applied. Figure 4.28 represents the responses to this question.

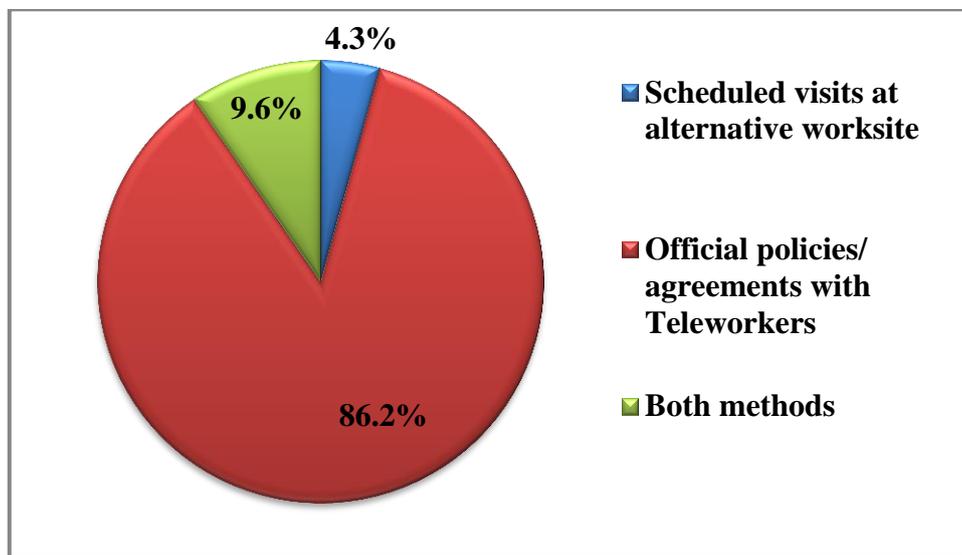


FIGURE 4.28: MONITORING OF TELEWORK POLICY AND REGULATORY COMPLIANCE

The majority of participants (86.2%) indicated that official policies/agreements with teleworkers were the method used to ensure telework policy adherence and to enforce regulatory compliance. Scheduled visits to the alternative work site were not a popular method to ensure compliance as indicated by 4.3% of the participants. In 9.6% of the cases both methods were applied to ensure policy compliance.

This data correlates with what has been reported by managers in the first questionnaire. Telework policies and agreements were applied by the organisations but the formal and informal telework agreements were not indicated by the managers and teleworkers to be consistently applied by the organisations. It seems as if there is a reluctance or lack of

knowledge on what such telework agreements should cover. The fact that scheduled visits to the alternative work sites was not a popular method to ensure policy adherence and to enforce regulatory compliance, is an alarming situation. This implies that the employers/managers did not establish that the alternative work sites complied with ergonomic principles. This may have a negative effect on the health and wellness of teleworkers.

Table 4.43 indicates the results of the test for association between ensuring telework policy and regulatory compliance (V12) and participating industry sectors (V4).

TABLE 4.43: ASSOCIATION BETWEEN ENSURING TELEWORK POLICY AND REGULATORY COMPLIANCE AND INDUSTRY SECTORS

	V4		V12		Both	Total	Pearson's Chi-square*
	Ensuring telework policy/regulatory compliance	Scheduled visits at alternative work site	Official policies/ agreements with teleworkers				
ABSA	8	88	24	120	20.891		
	(25.00)	(13.58)	(33.33)	(15.96)	0.000		
OPSA	8	112	16	136	2.145		
	(25.00)	(17.28)	(22.22)	(18.09)	1.000		
Unisa	0	144	24	168	14.226		
	(0.00)	(22.22)	(33.33)	(22.34)	0.000		
Telkom	16	304	8	328	34.329		
	(50.00)	(46.91)	(11.11)	(43.62)	0.000		
Total	32	648	72	752			
	(100.00)	(100.00)	(100.00)	(100.00)			
Cases	32	648	72	752			

* Pearson's Chi-square / Bonferroni-adjusted p-values

Table 4.43 shows that the association among the four participating organisations and ensuring telework policy and regulatory compliance are significantly different since their respective p-values are not greater than 0.05. However, the proportions of participants within the levels of V12 in OPSA are not significantly different ($P = 1.000$). Thus, different entities within OPSA are statistically not associated.

Tables 4.44, 4.45 and 4.46 present the results on the distribution of responses regarding item V11.

TABLE 4.44: TEST FOR EQUALITY OF PROPORTIONS: APPLICATION OF ORGANISATIONAL POLICIES/PROCEDURES/GOVERNMENT ACTS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	105
Cochran's $\chi^2_{(7)}$	130.2656
P-value	0.0000

Table 4.44 indicates that the differences in proportions of the various responses regarding application of organisational policies/procedures/government acts are highly significant ($Q = 130.2656; P < 0.001$). Therefore, teleworkers differed significantly on how they responded to multiple response items regarding the application of organisational policies/procedures/ government acts in their respective organisations.

Table 4.45 presents how teleworkers responded to item V11, which had eight possible options (multiple response item).

TABLE 4.45: COMPARISON OF TELEWORKERS ACCORDING TO APPLICATION OF ORGANISATIONAL POLICIES/PROCEDURES/ GOVERNMENT ACTS: CRUDE ESTIMATES

Outcome variable: _q11, n = 840

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-0.698	0.239	0.004	(-1.167 to -0.230)
3	-2.317	0.284	<0.001	(-2.873 to -1.761)
4	-0.385	0.312	0.218	(-0.996 to 0.227)
5	-1.276	0.297	<0.001	(-1.859 to -0.693)
6	-2.086	0.317	<0.001	(-2.707 to -1.466)
7	-0.090	0.221	0.684	(-0.523 to 0.344)
8	-1.042	0.221	<0.001	(-1.475 to -0.609)
Constant	0.870	0.215	<0.001	(0.449 to 1.291)

* Baseline category

Table 4.45 shows the crude estimates together with their respective 95% confidence intervals. The comparison of the Health and safety policy, and Telework policy and guidelines, and Occupational Health and Safety Act indicates that the responses are not significantly different. Therefore teleworkers did not differ significantly with respect to the

choices application of this organisational policy and Act. However the choice of ‘health and safety policy’ as compared with the choices of the rest organisational policies/procedures/government acts was significantly different.

TABLE 4.46: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO APPLICATION OF ORGANISATIONAL POLICIES/PROCEDURES/GOVERNMENT ACTS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q11, n = 840

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	-0.718	0.246	0.004	(-1.201 to -0.235)
3	-2.382	0.294	<0.001	(-2.958 to -1.805)
4	-0.395	0.320	0.218	(-1.023 to 0.233)
5	-1.313	0.310	<0.001	(-1.919 to -0.706)
6	-2.146	0.329	<0.001	(-2.792 to -1.500)
7	-0.092	0.227	0.685	(-0.537 to 0.353)
8	-1.072	0.230	<0.001	(-1.522 to -0.622)
V4				
OPSA*	0			
Unisa	0.344	0.360	0.340	(-0.362 to 1.049)
ABSA	1.153	0.401	0.004	(0.367 to 1.938)
Telkom	(dropped)			
Constant	0.584	0.334	0.081	(-0.071 to 1.239)

* Baseline category

The adjusted model, as presented by Table 4.46, indicates that OPSA and Unisa are not significantly different regarding the application of organisational policies/procedures/government acts. However, OPSA and ABSA are significantly different. Therefore, teleworkers in the OPSA and ABSA responded relatively the same to items regarding the application of organisational policies/procedures/government acts when controlling for possible response choices.

The next section required participants to indicate whether they received training on a number of policies and acts from their organisations. Figure 4.29 reflects the responses of the participants.

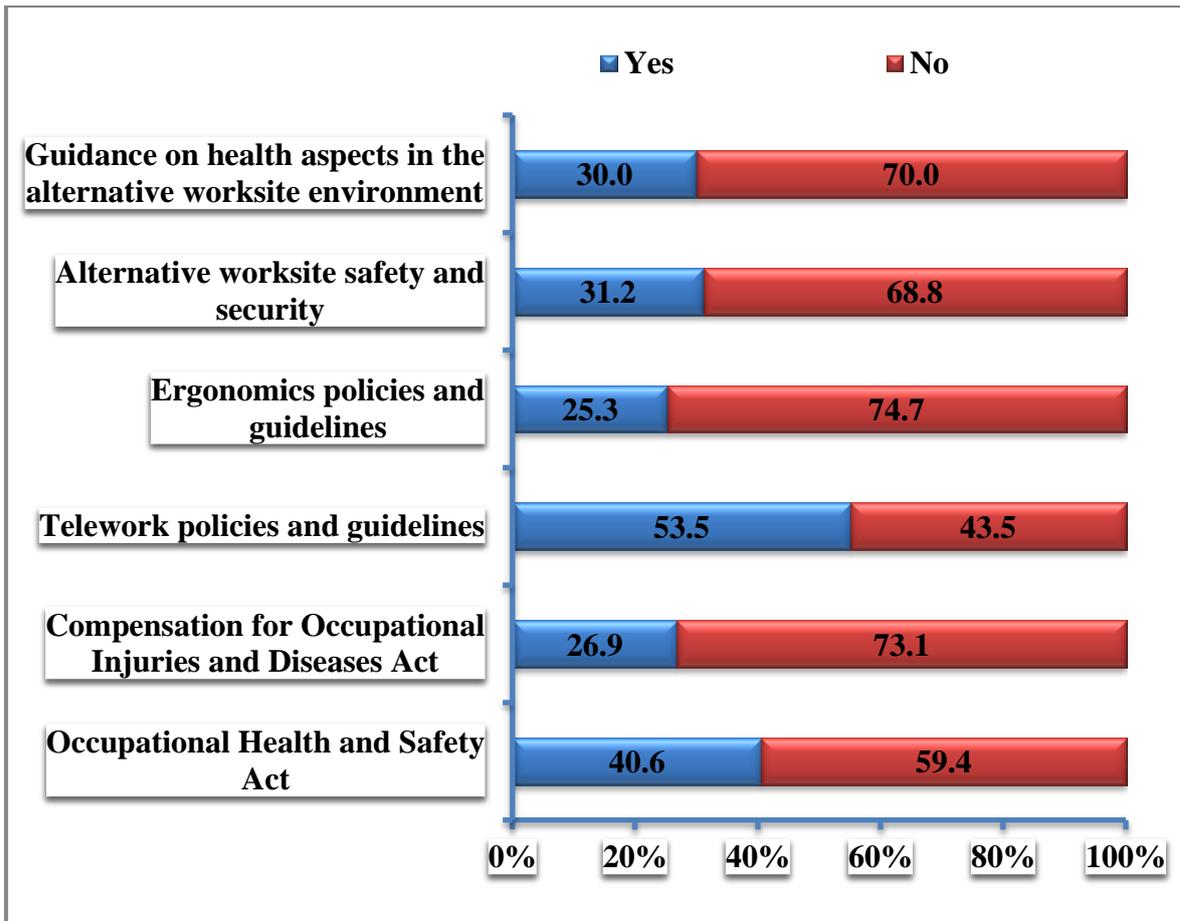


FIGURE 4.29: TRAINING RECEIVED ON POLICIES AND ACTS

The majority of teleworkers did not receive proper training on the given options. Training on telework policies and guidelines was the only option that reflected a positive response (53.5%) while 43.5% of the teleworkers did not receive any training. Training received on the Occupational Health and Safety Act (No 85 of 1993) was indicated as 40.6% while no training received was indicated as 59.4%. Ergonomics policies and guidelines received the lowest indication of training with 25.3% reported while 74.7% indicated no training.

This data corresponds with the previous question's responses on the application of policies. This is an indication that ergonomics were not regarded as important. This corresponds positively with the low training done on alternative work site safety and security with, 31.2% of teleworkers indicating that training has been received against 68.8% who did not receive any training on this important aspect. This tendency continues with the data reported on guidance on health aspects in the alternative work site environment indicating that no training has been received by 70% while only 30% indicated training has been received.

4.3.5 Work-related musculoskeletal disorders and ergonomics

This section of the questionnaire determined the occupational risk factors, the symptoms experienced and the ergonomic and other factors that caused or contributed to the development of work-related disorders due to incorrect e-environment ergonomics. It focused on the actions that could be taken to correct the health, safety and wellness hazards encountered due to incorrect virtual office ergonomics. This section also identified the most common work-related musculoskeletal disorders affecting the nerves, tendons, bursae, muscles, blood vessels and spinal discs. It further investigated the cost and workdays lost due to required medical intervention. This section concluded with questions on whether compensation claims have been lodged and finally, reasons why compensation claims have not been lodged although some teleworkers were suffering from work-related musculoskeletal disorders.

4.3.5.1 Occupational risk factors

Participants were requested to indicate their exposure to a number of occupational risk factors while teleworking. The participants had to indicate the occurrence of their exposure by choosing from a Likert scale of never, sometimes, often and always as reflected in Figure 4.30.

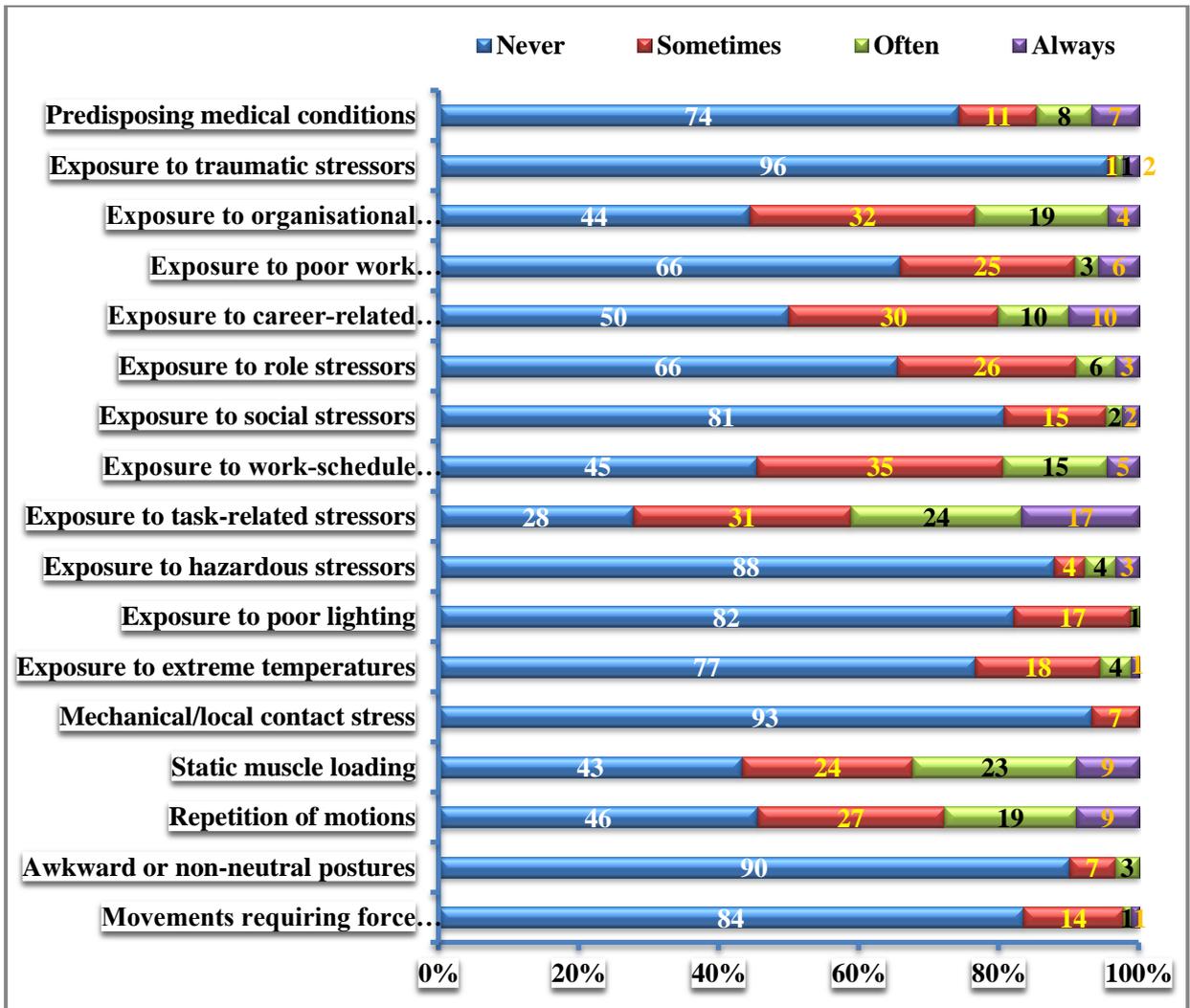


FIGURE 4.30: EXPOSURE TO OCCUPATIONAL RISK FACTORS

Figure 4.30 indicates the number of teleworkers for each of the four options. This data indicates that the largest group of the teleworkers were never exposed to the occupational risk factors. The minority of teleworkers were always exposed to the risk factors.

For interpretation purposes the above occupational risk factors could be categorised into three groups as follows:

- Ergonomic stressors refer to ergonomic stress factors that involve the interaction between the body and the physical environment. The largest group of the teleworkers indicated that they were never exposed to the following ergonomic stressors: movements requiring force exertion (83.5%); mechanical/local contact stress (93.3%); poor lighting (82.2%); exposure to extreme temperatures (76.7%) and exposure to hazardous stressors (87.8%).

- Psychosocial stressors refer to the effects of the organisational or social environment on the employee. Teleworkers indicated that they were sometimes exposed to task-related stressors (31.1%). Teleworkers indicated that they were never exposed to work-schedule stressors (45.5%), career-related stressors (50%), organisational stressors (44.4%), exposure to poor work organisation (65.9%), exposure to social stressors (80.9%), exposure to role stressor (65.6%), and exposure to traumatic stressors (95.5%).
- Physiological predisposition refers to some musculoskeletal disorder risk factors arising from the individual employee's physiology. Teleworkers indicated that they were never exposed to predisposing medical conditions (74.2%).

Table 4.47 indicates the details of the participants' responses (percentages). The highest percentages exposure to occupational risk factors is indicated in bold.

TABLE 4.47: PERCENTAGE EXPOSURE TO OCCUPATIONAL RISK FACTORS

Occupational risk factors	Never	Sometimes	Often	Always
Movements requiring force exertion	83.5	14.3	1.1	1.1
Awkward or non-neutral postures	90.1	6.59	3.3	0.0
Repetition of motions	45.6	26.7	18.9	8.9
Static muscle loading	43.3	24.4	23.3	8.9
Mechanical/local contact stress	93.3	6.74	0.0	0.0
Exposure to extreme temperatures	76.7	17.8	4.4	1.1
Exposure to poor lighting	82.2	16.7	1.1	0.0
Exposure to hazardous stressors	87.8	4.4	4.4	3.3
Exposure to task-related stressors	27.8	31.1	24.4	16.7
Exposure to work-schedule stressors	45.45	35.2	14.8	4.5
Exposure to social stressors	80.9	14.6	2.3	2.3
Exposure to role stressors	65.6	25.6	5.6	3.3
Exposure to career-related stressors	50.0	30.0	10.0	10.0
Exposure to poor work organisation	65.9	25.0	3.4	5.7
Exposure to organisational stressors	44.4	32.2	18.9	4.4
Exposure to traumatic stressors	95.5	1.1	1.1	2.2
Predisposing medical conditions	74.2	11.2	7.8	6.7

Table 4.47 indicates the percentage exposure rates to the occupational risk factors. There were a few psychosocial risk factors (when collapsing often and always) that indicate reasons for concern such as the following: task-related stressors 41.1%; organisational stressors 23.3%; career-related stressors 20%. When collapsing often and always, exposure

to ergonomic risk factors that caused concern were as follows: static muscle loading where the body was in a single position for a long period, was indicated to be 32.2% followed by repetition of motions where the same body parts were used repeatedly, with few breaks and rest chances indicated as 27.8%.

These occupational risk factors often lead to work-related musculoskeletal disorders. The statistics indicated that the teleworkers were not exposed to these risk factors in general. However, the data of previous sections indicated that very little training and specifically ergonomics training were provided to teleworkers. It might be a possibility that teleworkers' lack of knowledge of occupational risk factors caused them not to realise that they were indeed exposed to risk factors that could affect their health and wellness in the long run.

The Pearson's Chi-square test was used to test for association between the exposure to occupational risk factors and gender as indicated in Table 4.48.

**TABLE 4.48: ASSOCIATION BETWEEN EXPOSURE TO
OCCUPATIONAL RISK FACTORS AND GENDER**

Occupational risk factors	Female	Male	Total	Pearson's Chi-square
Movements requiring force exertion	50 (56.18)	39 (43.82)	89 (100)	2.7046 0.439
Awkward or non-neutral postures	50 (56.18)	39 (43.82)	89 (100)	0.2273 0.893
Repetition of motions	49 (55.68)	39 (44.32)	88 (100)	0.7694 0.857
Static muscle loading	49 (55.68)	39 (44.32)	88 (100)	2.6447 0.450
Mechanical/local contact stress	49 (55.68)	39 (44.32)	88 (100)	0.041 0.841
Exposure to extreme temperatures	49 (55.68)	39 (44.32)	88 (100)	4.2201 0.239
Exposure to poor lighting	49 (55.68)	39 (44.32)	88 (100)	1.7755 0.412
Exposure to hazardous stressors	49 (55.68)	39 (44.32)	88 (100)	4.5589 0.207
Exposure to task-related stressors	49 (55.68)	39 (44.32)	88 (100)	1.2012 0.753
Exposure to work-schedule stressors	48 (55.81)	38 (44.19)	86 (100)	2.0091 0.571
Exposure to social stressors	49 (55.68)	39 (44.32)	88 (100)	3.7309 0.292
Exposure to role stressors	49 (55.68)	39 (44.32)	88 (100)	1.9361 0.586
Exposure to career-related stressors	49 (55.68)	39 (44.32)	88 (100)	2.9003 0.407
Exposure to poor work organisation	47 (54.65)	39 (45.35)	86 (100)	5.1197 0.163
Exposure to organisational stressors	49 (55.68)	39 (44.32)	88 (100)	0.1792 0.981
Exposure to traumatic stressors	49 (55.68)	39 (44.32)	88 (100)	3.6730 0.299
Predisposing medical conditions	48 (55.17)	39 (44.83)	87 (100)	2.2629 0.520

* Pearson's Chi-square / Bonferroni-adjusted p-values

Pearson's Chi-square test was used to test for associations between exposure to occupational risk factors and gender. A significant association could not be observed for

exposure to occupational risk factors and gender since all the p-values were greater than 0.05.

4.3.5.2 Work-related musculoskeletal disorder symptoms experienced

Telework participants were requested to indicate which of the supplied disorder symptoms were experienced and how often they experienced these symptoms. Figure 4.31 indicates the responses to this question.

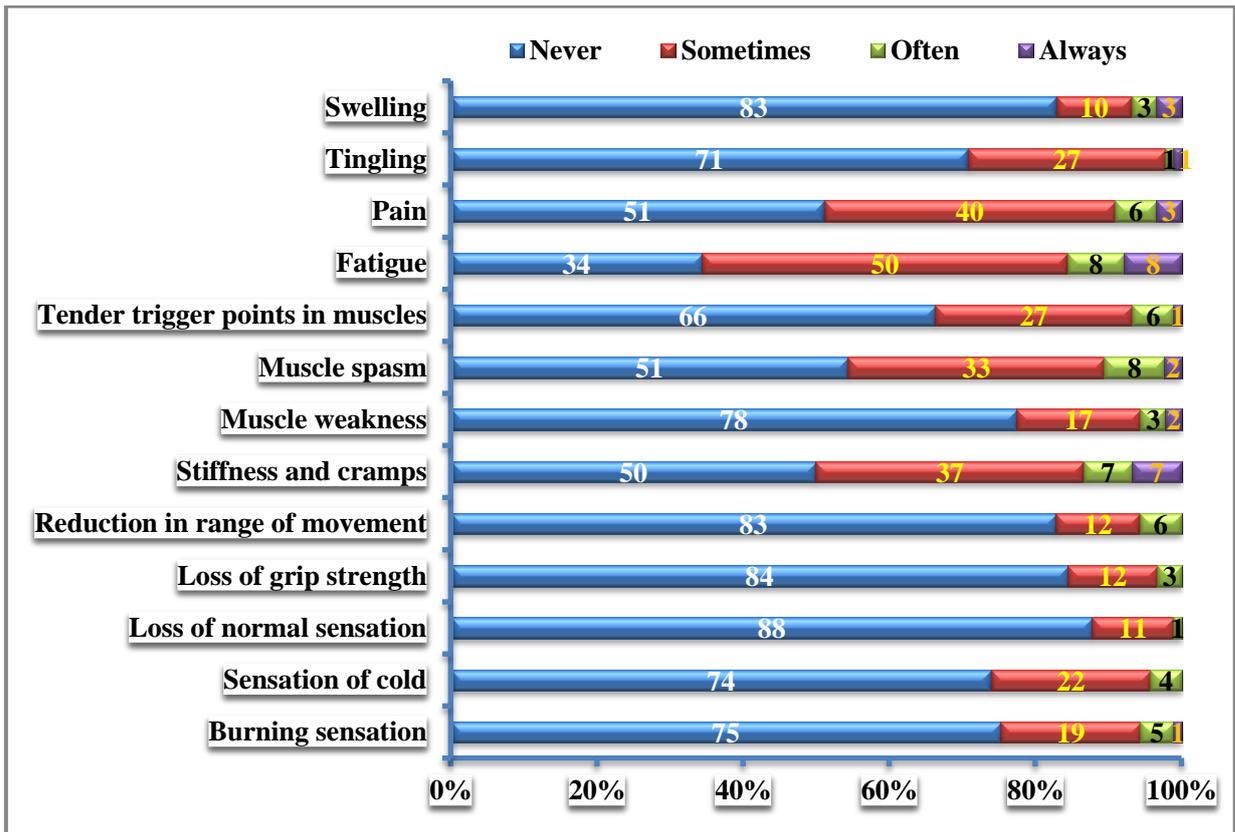


FIGURE 4.31: EXPERIENCE AND OCCURENCE OF WORK-RELATED MUSCULOSKELETAL DISORDER SYMPTOMS

The majority of the teleworkers never experienced any of the disorders symptoms listed. Fatigue, pain, stiffness and cramps and muscle spasm were sometimes experienced. A detailed analysis of the response percentages are presented in Table 4.49.

TABLE 4.49: EXPERIENCE AND OCCURENCE OF WORK-RELATED MUSCULOSKELETAL DISORDER SYMPTOMS PERCENTAGES

Work-related musculoskeletal disorder symptoms	Never	Sometimes	Often	Always
Burning sensation	75.3	19.1	4.5	1.1
Sensation of cold	73.9	21.7	4.3	0.0
Loss of normal sensation	87.8	11.1	1.1	0.0
Loss of grip strength	84.4	12.2	3.3	0.0
Reduction in range of movement	82.8	11.5	5.7	0.0
Stiffness and cramps	50.0	36.7	6.7	6.7
Muscle weakness	77.5	16.9	3.4	2.2
Muscle spasm	51.1	33.0	7.7	2.2
Tender trigger points in muscles	66.3	27.0	5.6	1.1
Fatigue	34.4	50.0	7.8	7.8
Pain	51.1	39.8	5.7	3.4
Tingling	70.8	27.0	1.1	1.1
Swelling	82.8	10.3	3.4	3.4

The responses indicate that some disorder symptoms were experienced sometimes, these may include the following: fatigue (50%); pain (39.8%); stiffness and cramps (36.7%); muscle spasm (33%); tender trigger points in muscles (27%) and tingling (27%). The rest of the disorder symptoms were never experienced. A minority of the disorder symptoms were experienced often and always.

The data indicated that tender trigger points, fatigue, pain, stiffness, muscle spasm and tingling were experienced sometimes. Risk increases as the frequency, duration, or intensity of these exposures to risk factors increase, or if multiple risk factors occur at the same time. Fewer injuries and less severe injuries could occur by reducing the number and frequency of exposures to risk factors. Therefore, even if symptoms were experienced only sometimes, it is enough reason to ensure that actions are taken to eliminate the causes of these disorder symptoms.

4.3.5.3 Ergonomic and other factors that caused or contributed to the development of work-related musculoskeletal disorders

The participants were requested to indicate on a four point Likert scale from strongly disagree to strongly agree, which ergonomic/other factors caused/contributed to the development of work-related musculoskeletal disorders. All the options provided were

important ergonomic factors that, if applied, could prevent disorders. Figure 4.32 indicates the responses of the participants.

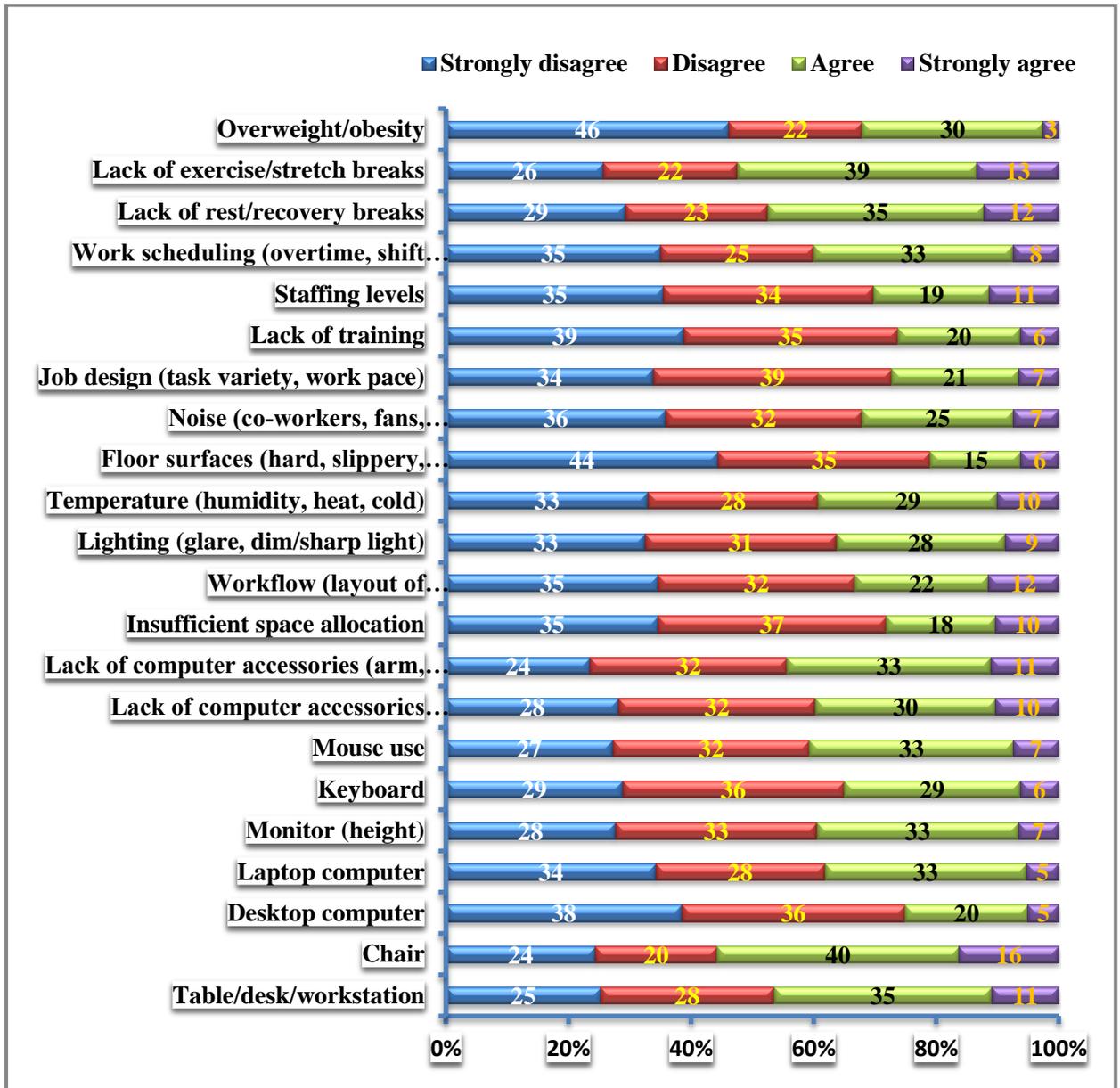


FIGURE 4.32: ERGONOMIC/OTHER FACTORS CAUSING/CONTRIBUTING TO THE DEVELOPMENT OF WORK-RELATED MUSCULOSKELETAL DISORDERS

The largest number of teleworkers, 55.8% (when collapsing agree and strongly agree) agrees that the chair contributed to the development of disorders. Almost all of the other ergonomic/other factors were not considered by the teleworkers to be contributing to the development of work-related musculoskeletal disorders. The highest score of disagreement

(when collapsing strongly disagree and disagree) was given to the desktop computer (75%) followed by the keyboard (65%). Table 4.50 indicates the detailed data on this question.

TABLE 4.50: ERGONOMIC/OTHER FACTORS CAUSING/CONTRIBUTING TO THE DEVELOPMENT OF WORK-RELATED DISORDERS (PERCENTAGES)

Ergonomic/other factors contributing to work-related disorders	Strongly disagree	Disagree	Agree	Strongly agree
Table/desk/workstation	25.1	28.1	35.4	10.9
Chair	24.4	19.8	39.5	16.3
Desktop computer	38.3	36.3	20.0	5.0
Laptop computer	34.2	27.6	32.9	5.3
Monitor (height)	27.6	32.9	32.9	6.6
Keyboard	28.8	36.2	28.8	6.3
Mouse use	27.2	32.1	33.3	7.4
Lack of computer accessories (risers, holder)	28.2	32.1	29.5	10.3
Lack of computer accessories (arm, foot rests)	23.5	32.1	33.3	11.1
Insufficient space allocation	34.6	37.2	17.9	10.3
Workflow (layout of furniture/workstation)	34.6	32.1	21.8	11.5
Lighting (glare, dim/sharp light)	32.5	31.3	27.5	8.8
Temperature (humidity, heat, cold)	32.9	27.9	29.1	10.1
Floor surfaces (hard, slippery, uneven, wet)	44.4	34.6	14.8	6.2
Noise (co-workers, fans, photocopiers, traffic)	35.8	32.1	24.7	7.4
Job design (task variety, work pace)	33.8	38.9	20.8	6.5
Lack of training	38.8	35.0	20.0	6.3
Staffing levels	35.4	34.2	18.9	11.3
Work scheduling (overtime, shift work)	35.0	25.0	32.5	7.5
Lack of rest/recovery breaks	29.3	23.2	35.4	12.2
Lack of exercise/stretch breaks	25.6	21.9	39.0	13.4
Overweight/obesity	46.2	21.8	29.5	2.6

The data supplied indicated the significant teleworkers' lack of ergonomic knowledge (linked to the lack of training on ergonomics and application of ergonomic policies as previously detected). All these ergonomic factors contribute significantly to the development of work-related musculoskeletal disorders.

4.3.5.4 Ergonomic intervention

In this section, participants were requested to indicate whether suffering from disorders led to any ergonomic interventions. The responses obtained from the participants are indicated in Figure 4.33.

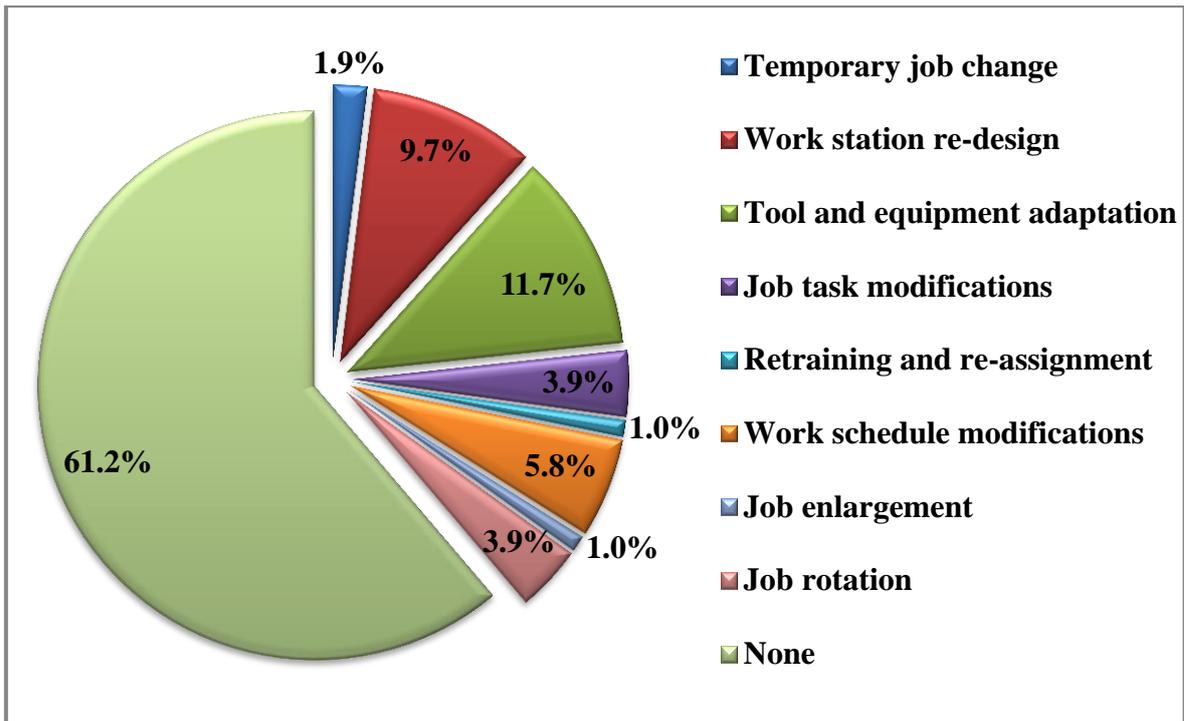


FIGURE 4.33: ERGONOMIC INTERVENTION

The largest number of the teleworkers, 61.2%, indicated that suffering from a work-related musculoskeletal disorder did not lead to any ergonomic intervention. The most popular intervention was tool and equipment adaptation (11.7%) followed by work station re-design (9.7%) and work schedule modifications (5.8%). These changes were made to the equipment and furniture.

There were no mentionable interventions made to the job itself. In general, organisations seem to be significantly negligent in terms of all aspects of ergonomics. All the ergonomic interventions could ensure that teleworkers remain healthy in the alternative work site. It creates a concern that the largest number of teleworkers (62.1%) indicated that suffering from a work-related musculoskeletal disorder did not lead to any ergonomic intervention.

Tables 4.51, 4.52 and 4.53 present the results from test of equality of proportions in the categories of item V17.

TABLE 4.51: TEST FOR EQUALITY OF PROPORTIONS: RESULTS OF SUFFERING FROM WORK-RELATED MUSCULOSKELETAL DISORDERS

Test for equality of proportions of non-zero outcomes in matched samples (Cochran's Q)	
Number of observations	86
Cochran's $\chi^2_{(7)}$	298.3893
P-value	0.0000

Table 4.51 shows that the differences in proportions of the various responses regarding results of suffering from work-related musculoskeletal disorders are highly significant ($Q = 298.3893; P < 0.001$). Therefore, teleworkers differed significantly on how they responded to the item regarding the results of suffering from work-related musculoskeletal disorders in their respective organisations.

TABLE 4.52: COMPARISON OF TELEWORKERS ACCORDING TO RESULTS OF SUFFERING FROM WORK-RELATED MUSCULOSKELETAL DISORDERS: CRUDE ESTIMATES

Outcome variable: _q17, n = 774

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	1.710	0.652	0.009	(0.431 to 2.988)
3	1.919	0.737	0.009	(0.473 to 3.364)
4	0.717	0.515	0.164	(-0.292 to 1.727)
5	-0.705	0.720	0.327	(-2.116 to 0.706)
6	1.147	0.595	0.054	(-0.019 to 2.313)
7	-0.705	1.251	0.573	(-3.158 to 1.748)
8	0.717	0.733	0.328	(-0.719 to 2.153)
9	4.745	0.817	<0.001	(3.143 to 6.347)
Constant	-3.738	0.720	<0.001	(-5.148 to -2.327)

* Baseline category

Various responses re item V17 are not significantly different (Table 4.52). Thus, teleworkers did not differ significantly with respect to the results of suffering from work-related musculoskeletal disorders in their organisations. However the significant differences were observed between the category 'temporary job change' versus 'work station re-design' ($p = 0.009$) 'temporary job change' and 'tool and equipment adaptation'

($p = 0.009$). Therefore teleworkers did differ with regard to these two results of suffering from work-related musculoskeletal disorders in their organisations.

The comparison of the results of suffering from work-related musculoskeletal disorders is shown in Table 4.53.

TABLE 4.53: COMPARISON OF INDUSTRY SECTORS ADJUSTING FOR RESPONSES TO THE RESULTS OF SUFFERING FROM WORK-RELATED MUSCULOSKELETAL DISORDERS: HIERARCHICAL REGRESSION MODEL

Outcome variable: _q17, $n = 774$

Covariate	Coef.	Std. Err.	P> z	95% Conf. Interval
R				
1*	0			
2	1.724	0.643	0.007	(0.465 to 2.983)
3	1.937	0.726	0.008	(0.513 to 3.360)
4	0.721	0.514	0.161	(-0.287 to 1.729)
5	-0.707	0.720	0.326	(-2.119 to 0.705)
6	1.155	0.591	0.051	(-0.004 to 2.313)
7	-0.707	1.256	0.573	(-3.168 to 1.754)
8	0.721	0.734	0.326	(-0.717 to 2.159)
...9	4.839	0.758	<0.001	(3.353 to 6.326)
V4				
OPSA*				
Unisa	-0.950	0.403	0.081	(-1.740 to -0.160)
ABSA	-0.950	0.403	0.081	(-1.740 to -0.160)
Telkom	(dropped)			
Constant	-0.626	0.455	0.169	(-1.518 to 0.267)

* Baseline category

The results from the adjusted model are given by Table 4.53 shows that organisations are not significantly different. In particular, ABSA ($p = 0.081$) and Unisa ($p = 0.081$) are not statistically different from OPSA. Therefore, teleworkers in the different industry sectors responded relatively the same to items regarding the results of suffering from work-related musculoskeletal disorders when controlling for possible response choices. Thus, the results of suffering from work-related musculoskeletal disorders were not significantly different between organisations.

4.3.5.5 Work-related musculoskeletal disorders

At the beginning of this section of the questionnaire, a figure was provided that illustrated the most common work-related musculoskeletal disorders affecting the nerves, tendons, bursae, muscles, blood vessels and spinal discs. A legend summarising these disorders according to colours was also provided. This section required participants to indicate if, and how many incidents of work-related musculoskeletal disorders were reported to the employer in the past year. Figure 4.34 indicates the percentage of the teleworkers that reported work-related musculoskeletal disorders to their organisations.

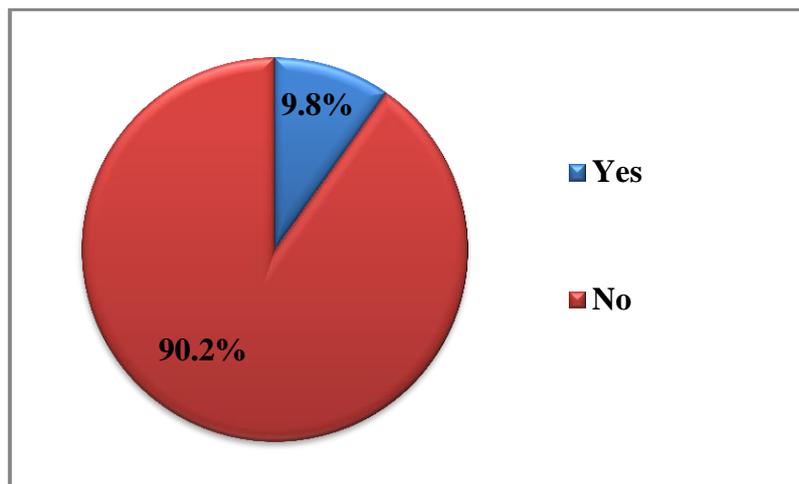


FIGURE 4.34: WORK-RELATED MUSCULOSKELETAL DISORDERS REPORTED

The majority of teleworkers, 90.2%, did not report any incidents of work-related musculoskeletal disorders to their employers/managers in the past year. Only 9.8% teleworkers indicated that they reported incidents to their employers. These teleworkers indicated the number of work-related incidents reported to their employers as one and two disorders (28.6%) each; while 14.3% reported four, 18 and 20 disorders each.

The assumption here again is that teleworkers probably did not realise that they were suffering from work-related musculoskeletal disorders. They did not know that they should or could report disorders and, they also did not know what the procedures were to report disorders and to claim compensation.

4.3.5.6 Costs and workdays lost due to work-related musculoskeletal disorders

This section requested participants to indicate the total costs per year for medical intervention due to work-related musculoskeletal disorders. The median costs per year per disorder are reflected in Table 4.54.

TABLE 4.54: MEDIAN COSTS PER YEAR PER DISORDER

Work-related musculoskeletal disorder	Minimum R	Median R	Maximum R
Stress	0	350	30 000
Migraine (headache)	0	120	10 000
Myofascial pain (trigger points)	0	0	1 500
Thoracic outlet syndrome	0	0	0
Shoulder tendinitis	0	400	3 500
Rotator cuff syndrome	0	0	10 000
Myalgia (muscle pain)	0	0	500
Cubital tunnel syndrome	0	0	0
Pronator teres syndrome	0	0	0
Anterior interosseous syndrome	0	0	0
Carpal tunnel syndrome	0	0	10 000
Guyon's canal syndrome	0	0	1
Ganglion cyst	0	0	0
Trigger finger	0	0	0
Osteoarthritis	0	0	5
Raynaud's disease (white finger)	0	0	0
Sciatica (lower back and leg pain)	0	17	15 000
Depression	0	2 000	12 000
Eye Strain	0	2 000	5 000
Tension neck syndrome	0	950	5 000
Cervical syndrome	0	0	0
Subacromial bursitis	0	0	0
Frozen shoulder (adhesive capsulitis)	0	0	4 000
Posterior interosseous syndrome	0	0	4
Tennis elbow	0	0	500
Olecranon bursitis	0	0	0
Radial tunnel syndrome	0	0	0
Golfer's elbow	0	0	2 500
Forearm myalgia	0	0	0
Hand-arm vibration syndrome	0	0	1
Extensor tenosynovitis	0	0	0
De Quervain's syndrome	0	0	5
Hypothenar hammer syndrome	0	0	4
Dupuytren's contracture	0	0	0
Dystonia writer's cramp	0	0	0
Deep vein thrombosis	0	0	1 200

Teleworkers reported the disorders with the highest median cost per year as depression and eye strain at R2 000 each followed by tension neck syndrome at a cost of R950, shoulder tendinitis costing R400, stress at R350 and migraine at R120.

A total number of 34 teleworkers responded to this question. From the data generated, it became evident that from these 34 teleworkers a total number of 225 response counts of work-related musculoskeletal disorders were given. This is confirmation that teleworkers did suffer from work-related musculoskeletal disorders. Eye strain attracted the highest response count ($n = 17$) of teleworkers, followed by migraine ($n = 13$), then stress, tension neck syndrome and shoulder tendinitis ($n = 12$). Depression ($n = 11$) and sciatica ($n = 9$) were also indicated as disorders that teleworkers suffered from.

Teleworkers suffering from work-related musculoskeletal disorders were requested to indicate the average workdays lost annually due to medical intervention. This section was answered by 29 teleworkers with a high total response count of 202. Table 4.55 provides the number of teleworkers who indicated that they suffered from the work-related musculoskeletal disorders (response counts). The table indicates only ten work-related musculoskeletal disorders that received the highest number of response counts and the average workdays lost annually as indicated by the 29 teleworkers. As this was a multiple response item, teleworkers could select more than one disorder.

**TABLE 4.55: AVERAGE RESPONSE COUNTS PER
WORK-RELATED MUSCULOSKELETAL DISORDER**

Work-related musculoskeletal disorder	Response count per disorder	Average workdays lost per year
Stress	16	18.69
Migraine (headache)	12	13.50
Eye strain	11	2.64
Shoulder tendinitis	9	45.22
Depression	9	4.56
Tension neck syndrome	9	3.22
Myofascial pain (trigger points)	7	2.57
Sciatica (lower back and leg pain)	7	0.43
Carpal tunnel syndrome	6	1.67
Frozen shoulder (adhesive capsulitis)	6	0.83

Stress was indicated by the largest number of the 29 teleworkers ($n = 16$) as the disorder that teleworkers suffered from, followed by migraine ($n = 12$) and eye strain ($n = 11$). Shoulder tendinitis, depression and tension neck syndrome has each been selected by nine of the teleworkers followed by myofascial pain and sciatica ($n = 7$) each. Carpal tunnel syndrome and frozen shoulder were selected by six teleworkers each. Figure 4.35 graphically indicates the average workdays lost per work-related musculoskeletal disorders per year as indicated by the 29 teleworkers.

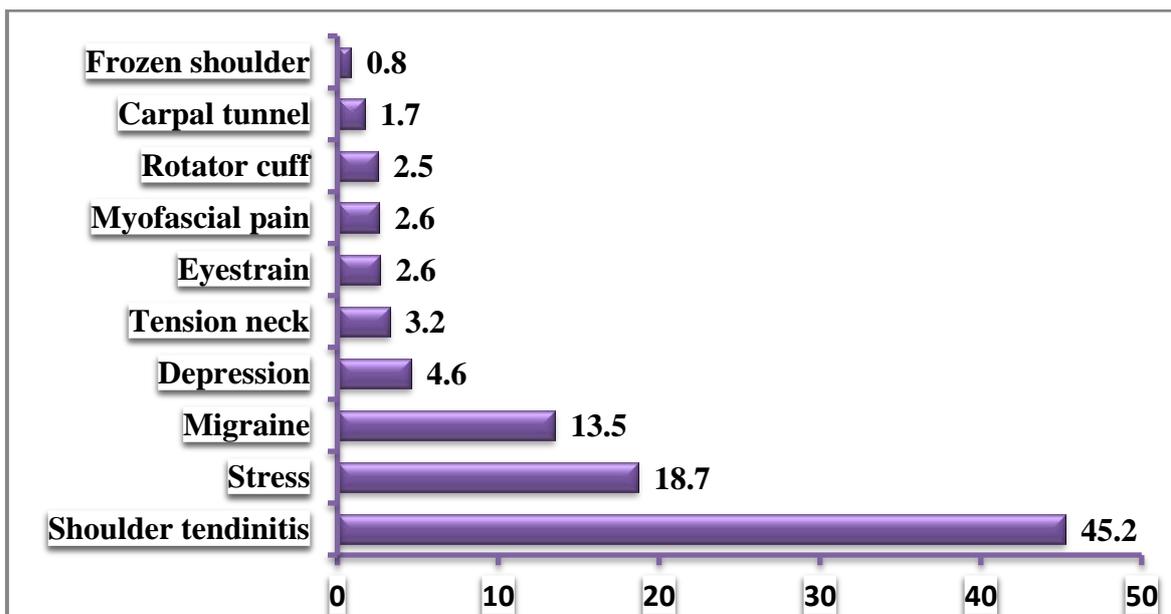


FIGURE 4.35: AVERAGE WORDAYS LOST PER YEAR DUE TO MEDICAL INTERVENTION

Shoulder tendinitis has been indicated by nine of the 29 teleworkers to be the disorder that resulted in the highest average workdays lost with a total of 45.2 workdays lost. Stress followed with 18.7 workdays lost ($n = 16$) and migraine with 13.5 workdays lost ($n = 12$). Depression caused 4.6 workdays lost ($n = 9$) followed by tension neck syndrome 3.2 workdays lost ($n = 9$); followed by eye strain ($n = 11$) and myofascial pain ($n = 7$) each with 2.6 workdays lost.

From the data on cost and workdays lost per work-related musculoskeletal disorders per year, it is evident that organisations cannot afford not to take notice of the negative consequences of work-related musculoskeletal disorders. If telework is going to be implemented on a larger scale in South Africa, it could be unfavourable for productivity if teleworkers are affected negatively by disorders. Organisations must be made aware of the

important role that ergonomics should play with regard to health and wellness in the e-environment.

4.3.5.7 Compensation claims lodged

The last section of the questionnaire requested participants to indicate if they lodged compensations claims and to provide reasons why they did not lodge compensation claims. Participants were requested to indicate the outcome if compensation claims have been lodged. Figure 4.36 indicates the response percentages of teleworkers to each option provide.

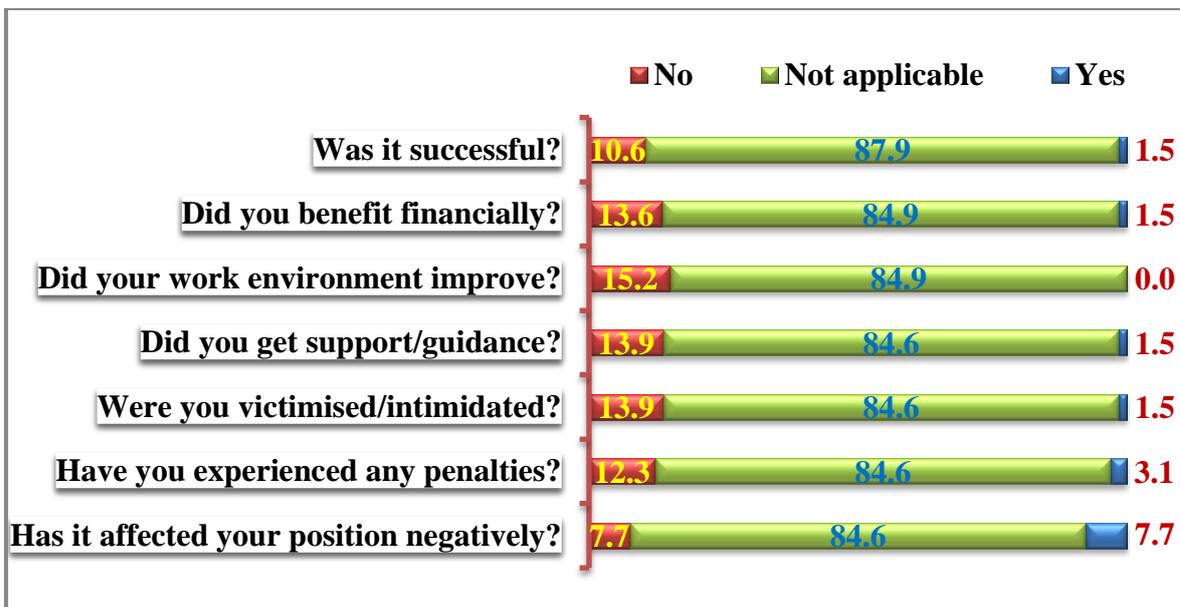


FIGURE 4.36: OUTCOME OF COMPENSATION CLAIMS LODGED

The majority of teleworkers (84.6% - 87.9%) indicated that no compensation claims were lodged. Those who did lodge a compensation claim indicated that:

- it was not successful (10.6%); it was successful (1.5%);
- there were no financial benefits (13.6%); there were financial benefits (1.5%);
- the work environment did not improve (15.2%);
- no support/guidance from their organisation were received (13.8%), received support from the organisation (1.5%).

However, those teleworkers who did lodge a compensation claim indicated that there was no victimisation (13.8%) while 1.5% indicated that victimisation was present. Some teleworkers did not receive any penalties from their organisations (12.3%) while 3.1% were penalised. Some teleworkers (7.7%) indicated that lodging a compensation claim has

affected their position at work negatively while another 7.7% indicated that it did not have a negative effect on their work.

The last section was an open-ended question that requested participants to indicate reasons for not lodging a compensation claim with the Compensation Commissioner according to the Compensation for Occupational Injuries and Diseases Act (No 130 of 1993). The reasons provided were grouped according to themes in order to interpret the data quantitatively. Annexure L contains the verbatim responses of the 24 teleworkers. Table 4.56 provides a summary of the reasons according to the identified themes.

TABLE 4.56: REASONS FOR NOT LODGING COMPENSATION CLAIMS FOR WORK-RELATED DISORDERS

THEMES	Ignorance	Reluctance	Discontentment	Insignificance	Ungrouped
	1	1	1	1	1
	1	1	1	1	1
NUMBER	1	1	1	1	1
OF	1	1		1	1
REASONS	1	1			1
	1				
	1				
TOTAL	7	5	3	4	5
PERCENTAGES	29.2	20.8	12.5	16.7	20.8

The theme ignorance refers to the reasons that indicated a lack of knowledge or facts about a situation or a particular subject. The lack of knowledge also implied that the teleworkers did not consider it to lodge a compensation claim for work-related musculoskeletal disorders. A total of 29.2% of the teleworkers indicated that they did not know that they could lodge compensation claims because they did not know that the Act was applicable or did not consider lodging a claim due to a lack of knowledge on the disorders. Reluctance refers to an unwillingness or lack of enthusiasm to do something. A number of teleworkers (20.8%) indicated that they were unwilling to lodge compensation claims because they did not think it will benefit them at all or, that it would be too much trouble to go through the process while some of the teleworkers simply accepted the disorders as part of the job and therefore were unwilling to lodge compensation claims. The theme discontentment refers to the belief that things will not be successful, or to the unhappy feeling that a person has when dissatisfied with something. Some teleworkers (12.5%) indicated that although they lodged compensation claims, nothing resulted from it and therefore they were mildly

unhappy, dissatisfied and disappointed with their employers. The insignificance theme refers to those teleworkers (16.7%) who thought that their disorders were minor, not that serious or already covered by their medical aid funds. The ungrouped theme represents 20.8% of the teleworkers that indicated that it was not applicable to them or that they did not want to provide a reason for not lodging a compensation claim.

4.4 SUMMARY

Chapter 4 dealt with the presentation of empirical results, analyses and interpretations of the data obtained from the two questionnaires distributed to managers/line-managers/supervisors of teleworkers and to teleworker employees. Statistical analyses were conducted in collaboration with and under the guidance of a statistician. The data collected provided insight into the key concepts of this study. The primary and secondary objectives/questions were concurrently investigated with the literature review. The role of ergonomics in the e-environment was investigated. The different types of virtual offices were identified and the implementation and management thereof were determined. The current situation with regard to equipment, furniture and services required for virtual offices and the ownership thereof was determined. The types of health and wellness risk factors that could cause work-related musculoskeletal disorders in the e-environment were investigated. This was followed by an investigation of the *status quo* with regard to organisational policies/procedures and government legislation implemented and, how regulatory compliance was ensured in e-environments.

Chapter 5 will commence with an introduction followed by the problem statement, conclusions and recommendations. The conceptual telework framework will be presented as a final recommendation. The limitations of this study will be discussed and proposals for future research will be made. The chapter concludes with a summary of the holistic project.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1	INTRODUCTION
5.2	RESEARCH PROBLEM
5.3	CONCLUSIONS
5.4	RECOMMENDATIONS
5.5	CONCEPTUAL TELEWORK FRAMEWORK
5.6	LIMITATIONS OF THIS STUDY
5.7	PROPOSALS FOR FUTURE RESEARCH

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This study was set out to explore the influence of information administration technologies on the conception and development of the e-environment. The study investigated the role that ergonomics could play in the prevention of work-related musculoskeletal disorders due to factors that employees working in the e-environment are exposed to. The study also investigated the existence of policies, regulations and acts and, the regulatory compliance of organisations to these policies and acts in a distributed e-environment.

The use of information and communication technologies has spread through all spheres of life over the last decade. It has led to a change in how organisations function and it has also led to a change in where and how employees fulfil their daily tasks. With all these electronic devices at the disposal of employees, there is no need to be at a specific geographic location to do the work. An employee can be at any alternative worksite and still be regarded as a full time employee. It can be deduced that the advancement of information and communication technologies led to the facilitation and development of the e-environment.

The e-environment and the use of information and communication technologies have created challenges for organisations and their employees. Employees are now able to work anywhere, anytime. The fact that managers cannot see their teleworking employees busy at their desks, changes the management styles and tasks. Managers have to trust their employees, rely on their employees' experience and manage according to the employee's output. Aspects such as health and safety and the application of ergonomics principles at the alternative worksites are adding a new dimension to the management of employees. Employees enjoy the flexibility to decide on when and where to work as long as they meet the deadlines and targets. However, employees working at alternative worksites, for example in their cars, at an airport or at their homes can easily disregard ergonomic principles. This could result in serious health and wellness complications that can lead to lost productivity, costly claims and high employee turnover for organisations. Therefore, to enable their employees to work at alternative worksites, organisations have to

compile and implement new policies and procedures and, have to comply with the applicable legislation.

Telework has been practised internationally for several decades. The overall implementation of telework has been successfully accomplished and, rapid escalation in telework has been reported in international telework reports (United States Office of Personnel Management, 2011b:4-5; 2012:8). However, the e-environment is fairly new in South Africa where limited research has been done on the implementation of telework.

Chapter 4 dealt with the presentation of empirical results, analyses and interpretations of the data obtained from the two questionnaires distributed to managers/line-managers/supervisors of teleworkers and to teleworker employees. Chapter 5 presents the solutions to the research problem and the conclusions and recommendations related to the primary and secondary research objectives. The conclusions and the literature review directed the development of a conceptual telework framework that will be presented in paragraph 5.5 as a separate recommendation. This conceptual telework framework addresses the fourth research objective/question (*cf.* Chapter 1, paragraph 1.5.2.4). The remainder of this chapter provides the limitations of the study and suggested future research proposals. The chapter concludes with a summary of the holistic project.

5.2 RESEARCH PROBLEM

This research was set out to investigate the problem pertaining to the incorrect usage (non-compliance with ergonomics) of technological advances that may often lead to work-related musculoskeletal disorders affecting the health and wellness of teleworkers. The costs resulting from employees being on sick leave, as well as possible compensation claims could cause organisations to be negatively affected by reduced productivity and unnecessary financial losses. These can be prevented if organisations comply with the required health, safety and ergonomics policies, procedures, regulations and promulgated legislation.

The diffusion of virtual offices in South Africa is unknown and the extent of health and wellness aspects that could lead to actions against employers need to be determined. Furthermore, the existence of policies and regulations and compliance with legislation that could serve as guidelines for teleworkers to perform optimally and effectively in the

e-environment, need to be established.

5.3 CONCLUSIONS

The empirical study was done to provide insight into the primary and secondary research objectives as stated (*cf.* Chapter 1, paragraph 1.5). The conclusions presented in this section were drawn from the literature review and analyses of the data collected from the questionnaires used for managers/line-managers/supervisors of teleworkers and telework employees.

5.3.1 Primary objective

The primary objective was to investigate the extent to which ergonomic policies, guidelines and regulations applicable to information and communication technologies were effective and adhered to in an e-environment. The occurrence of health and wellness aspects due to non-compliance with ergonomics and the regulatory Acts, need to be determined.

To be able to reflect and draw conclusions on the primary objective, it was deemed essential to elaborate on the concept of ergonomics by providing a definition, an indication of the domains and the factors to be included in a worksite analysis. This section also focuses on the health and wellness aspects and ergonomic legislation, organisational policies, guidelines and regulations applicable to an e-environment.

The most encompassing and appropriate ergonomics definition identified for the research was advocated by the Health and Safety Executive (2013:1) as: “Ergonomics is defined as a science concerned with the fit between people and their work. It puts people first, taking into account their capabilities and limitations. Ergonomics aims to make sure that tasks, equipment, information and the environment fit each individual employee”.

To understand the extent of the definition of ergonomics, it needs to be clarified that ergonomics have domains of specialisation within the discipline of ergonomics. Organisations have to realise this and take all three domains into consideration before any ergonomic policies and regulations can be compiled and implemented. The International Ergonomics Association (2014) indicates these domains as:

- physical ergonomics that are concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity;
- cognitive ergonomics that are concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system; and
- organisational ergonomics that are concerned with the optimisation of socio-technical systems, including their organisational structures, policies, and processes (*cf.* Chapter 2.3, paragraph 2.3.1 for a discussion of these domains).

It is concluded that applying ergonomics is far more than merely supplying the best technological equipment to teleworkers. Applying ergonomics implies a thorough analysis of the worksite environment incorporating the three domains of ergonomics. The data analysis indicated the home office as the most preferred alternative worksite. Therefore, an analysis of the home office should include:

- Task analysis - determine what each individual teleworker does in the job on a daily basis.
- Workstation analysis - investigate the physical components of the workstation such as equipment (desktop computer, tablet, telephone); furniture (desk and chair) and services (internet, e-mail and Skype) used at the home office. The physical components of the workstation should be measured relative to the individual teleworker's physique.
- Environmental analysis - examines the area surrounding the teleworker's workstation, taking into account factors that affect teleworkers' comfort and performance. Factors included here are lighting and glare, noise, temperature, humidity and office design.
- Organisational analysis - deals with issues at the departmental or organisation wide level, focusing on aspects that are typically considered as working conditions. Aspects included here are staffing levels, assignment of responsibilities, work schedules, overtime policies and job design.

Once the three domains have been considered and the worksite environment has been analysed, an organisation can then compile and implement the ergonomics policy, guidelines and regulations applicable to the organisation's teleworkers. Organisational policies and regulations are usually derived from the acts as imposed by the government on

commerce and industry. It is therefore necessary to clarify which government acts are in existence before the effectiveness and adherence to ergonomic policies, guidelines and regulations in an e-environment could be reflected on.

Ergonomics are cited in three sectors within South African legislation. It is legislation for the construction industry, the mining industry as well as compensation legislation. For the purposes of this study, the compensation legislation, Circular Instruction 180 regarding the compensation of work-related upper limb disorders in terms of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993), is most definitely applicable and has been covered in the literature review (*cf.* Chapter 2.4.3). In Circular Instruction 180, work-related upper limb disorders are referred to as an umbrella term that is used for a group of occupational diseases that consist of musculoskeletal disorders caused by the exposure to the workplace risk factors that affect the muscles, tendons, nerves, blood vessels, joints and bursae of the hand, wrist, arm and shoulder. The impact of this legislation on organisational ergonomic policies is that telework organisations have to take responsibility in identifying and quantifying the risk factors associated with work-related musculoskeletal disorders (Ergomax, 2013a; Interact Media Defined, 2011 and The Compensation Commissioners Guideline's for Health Practitioners and Employers to manage Work-Related Upper Limb Disorders, 2004).

With regard to the effectiveness and adherence to ergonomic legislation, it became clear from the data analysis that organisations are displaying gross negligence in this regard. From government's side, the literature indicates that all three the abovementioned acts encompassing ergonomics within South Africa have been in place for several years. However, it appears as if little is being done to comply or monitor conformance to the acts. This may be attributed to a two-fold scenario namely the lack of manpower within the Labour Law sector to enforce these acts, and the lack of knowledge and awareness in commerce and industry that these laws are actually in place. Furthermore, there continues to be a lack of understanding of ergonomics and how the application thereof may benefit an organisation (Interact Media Defined, 2011).

This lack of knowledge and application of ergonomic legislation were evident and confirmed in the data collected from managers and teleworkers. Managers and teleworkers were requested to indicate which organisational policies, procedures or acts were applied

in the organisations. The application of an ergonomics policy was indicated by only 5.2% of the managers and 5% of teleworkers. When requested to indicate training provided/received, the managers indicated that their organisations did not provide telework training for managers (72.7%) neither for teleworkers (72%). The teleworkers indicated that training on the majority of the policies was very limited or not provided at all. The teleworkers indicated the training on the ergonomics policies and guidelines as 25.3%. It was the lowest percentage indication of training received by the teleworkers. Therefore, the conclusion reached was that the extent to which ergonomic policies, guidelines and regulations applicable to information and communication technologies were effective and adhered to in an e-environment was indicated to be very low by both managers and teleworkers. The low profile of ergonomic policy application and ergonomic training in the e-environment was also evident in several of the secondary questions.

5.3.2 Secondary objectives

<p>The first secondary objective was to determine the preferred kind of telework for the South African context and to determine the profile of the teleworker.</p>
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This secondary objective aimed to address the following research questions:

What are the different types of virtual offices, how are they managed and what is the profile of the teleworkers? What are the technology applications (equipment), furniture and services required and, what are the ergonomic specifications applicable to these in the e-environment?

The development of information administration technology over the past few decades changed the traditional office environment and led to a new administrative phenomenon referred to as the virtual office. The virtual office or telework has been described as any alternative worksite outside the traditional office, where incumbents can still perform the work associated with a traditional office (As supported by: Hoffmann, 2011:32; United States Office of Personnel Management, 2011a:4; United States Office of Personnel Management, n.d.:2; and Fortier, 2005).

From the literature review the following types of virtual offices were identified:

- Home office/Working at Home/Small Office Home Office/Cocooning;

- Mobile office/Non-territorial office/Unassigned office/Alternative workspace/workplace/worksite;
- Telecentre/Telecottage/Televillage/Telecommuting centre/Telebusiness centre/Community technology centre/Interactive (service) delivery centres;
- Flexitime/Flexiwork/Flexiplace;
- Hot-desking/Free Address/Touchdown workstation;
- Hoteling;
- Desk sharing;
- Just in time; and
- Continuation of (Organisation) operations centres/Disaster recovery centres (United States General Service Administration, 2013; and Hoffmann, 2011) (*cf.* Chapter 2, paragraph 2.1.2 for a discussion of the above types of alternative worksite options).

The preferred type of virtual office implemented, is the home office, also referred to as working at home or the small office home office. The managers (48.9%) and teleworkers (68.9%) indicated that the home office is the preferred type of alternative workplace. Managers differed significantly with respect to the selection of the types of telework/alternative workplace arrangements applied in their respective organisations (*cf.* Table 4.2). However, the managers in the different industry sectors did not differ significantly with regard to the types of telework/alternative workplace arrangements applied in their organisations (*cf.* Table 4.4). When comparing the possible choices of types of telework/alternative workplace arrangements, teleworkers differed significantly in their respective organisations (*cf.* Table 4.33). However, the teleworkers from the different industry sectors responded more or less the same with respect to the types of telework/alternative workplace arrangements (*cf.* Table.4.34). The adjusted Pearson's Chi-square test indicated that the managers representing the four industry sectors did not differ significantly with respect to how many years their telework programmes have been in operation (*cf.* Table 4.5).

On the management of telework, the data indicated that managers of teleworkers were predominantly from the middle management level (63.6%). These managers were responsible for an average of 22 teleworkers per organisation and most of these managers monitored teleworkers by focusing on results and output (65.4%). The managers did not

differ significantly with respect to how they monitored the teleworkers (*cf.* Table 4.7). However, the choice of ‘track teleworkers through a time and attendance register’ as compared with ‘telework policies and guidelines’ were significantly different between the managers from the different industry sectors (*cf.* Table 4.9).

The data collected from the four organisations was used to compile a profile of the teleworker (*cf.* Chapter 4, paragraph 4.3.2 on demographic information and paragraph 4.3.3 on telework). The age distribution of teleworkers indicated that the more matured employees preferred to telework and were thus allowed to telework. The age group 40-49 years represented 33.1% and the age group 50-59 years represented 26.3% of the teleworkers. The data indicated that there were more females (59.3%) involved in telework. However, males and females were not different with regard to the frequency of telework arrangements (*cf.* Table 4.35). Almost half of the participants’ telework arrangement was up to five days per week (48.2%), followed by up to two days per week (24.6%). The statistical results indicated that the differences among the participating organisations concerning the frequency of telework arrangements were significant (*cf.* Table 4.36). Twenty eight percent of the teleworkers indicated that they were involved with the telework programme of their organisation for up to two years, while 25% were involved in telework for up to a year and for up to five years each. This again confirms the conclusion that telework is a relatively new concept in South Africa. The proportion of males to the proportion of females (gender) in the number of years involved in telework was not significantly different (*cf.* Table 4.37). However, the four organisations differed significantly with respect to the period that their telework programmes are implemented (*cf.* Table 4.38).

Modern technological advances have made it easier to work anytime, anywhere, and at anyplace. It is clear that without this enabling technology, the virtual office and telework would not be possible (United States General Service Administration, 2012; and Telework Exchange, 2009:1). Furniture and the necessary services at the home office support the use of electronic devices. However, without proper training on the correct ergonomic principles applicable to these electronic devices, furniture and equipment as used at the home office, the teleworker may develop work-related musculoskeletal disorders.

The most popular equipment indicated by teleworkers was laptop computers, followed by print/copy/scan/fax machine, cell phones and desktop computer. The most popular furniture was a desk and a chair. The services indicated by teleworkers were internet access, electronic mail and 3G modems/wireless routers. As to the ownership of the above, managers (57.1%) indicated that the organisations requested teleworkers to purchase, or to provide their own equipment, furniture and services. Teleworkers reported that laptop computers were supplied by the organisations while cell phones belonged to the teleworkers. Furniture and services used were predominantly the property of the teleworkers. Table 4.11 indicated that the managers of the different organisations did not differ significantly with respect to the ownership of furniture/equipment/services used by teleworkers (their respective p-values are greater than 0.05). The Cochran's tests indicate that managers differed significantly with respect to ownership of furniture/equipment/services in their respective organisations. However, the managers did not differ significantly with regard to 'request employees to purchase their own furniture/equipment/services' (*cf.* Table 4.13). Teleworkers differed significantly with respect to the furniture/equipment/services used for teleworking. However the teleworkers did not differ significantly with regard to the use of a print/copy/scan/fax machine and laptop computer as compared to the use of stationery in the four organisations (*cf.* Table 4.41). ABSA and OPSA did not differ significantly, but OPSA and Unisa differed significantly with regard to the use of furniture/equipment/services (*cf.* Table 4.42).

The application of ergonomic specifications on the use of equipment, furniture and services is mainly done to avoid ergonomic risk factors. These risk factors are predominant in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling; or carrying of heavy objects and prolonged awkward postures. On the ergonomic specifications applicable to technology applications, furniture and services required in the e-environment, the conclusion reached is that the telework organisations should take each individual teleworker's specific situation into consideration when evaluating the risk factors. These ergonomic specifications should be applied to the teleworker's workstation (which include the desk, chair, computer, monitor, keyboard, mouse, accessories, and laptop); the office design (space allocation and workflow); the office environment (lighting, temperature, noise, floor surfaces) and the organisational environment (job design, staffing and scheduling, rest and exercise breaks). For a discussion

on all the ergonomic specifications applicable to these technology applications, furniture and services in the e-environment, refer to Chapter 2.3.4 paragraphs 2.3.4.1 to 2.3.4.4 (Occupational Safety and Health Administration, 2013; Washington State Department of Labour and Industries, 2002; Office Ergonomic Solutions, 2011).

Teleworkers working at the home office should be thoroughly trained on the correct ergonomic principles applicable to their work stations, the home office environment and the organisation of their work. These ergonomic principles include the correct sitting position, the choice of office chairs and desks, the correct use of technology (laptops), sufficient lighting and a proper work schedule. The application of the ergonomics policy by teleworkers was indicated to be only 5% and telework training provided was 25%. These figures create a major reason for concern for the growth and sustainability of telework in the South African context. It is concluded that the application of ergonomics principles are imperative to prevent the development of work-related musculoskeletal disorders.

The second secondary objective was to investigate the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers.

This secondary objective aimed to address the following research questions:

What types of occupational risk factors exist that could cause work-related musculoskeletal disorders in the e-environment, what types of work-related musculoskeletal disorders exist and what are the consequences for organisations and employees?

The literature review indicated that exposure to occupational risk factors are the main reason for the development of work-related musculoskeletal disorders in an e-environment.

The risk factors can be divided into three categories:

- Ergonomic stressors that refer to ergonomic risk factors that involve the interaction between the body and the physical environment.
- Psychosocial stressors that refer to the effects of the organisational or social environment on the employee.
- Physiological predisposition that refers to some musculoskeletal disorder risk factors arising from the individual employee's physiology (refer to Chapter 2,

paragraph 2.2.4 for a discussion on the risk factors and the baseline study as discussed in Chapter 1, paragraph 1.9.2).

After a thorough investigation on the types of work-related musculoskeletal disorders, it was evident that there are more or less 36 disorders mentioned in the literature (*cf.* Chapter 2, Figure 2.2.2). These work-related musculoskeletal disorders are caused by exposure to the abovementioned risk factors. These risk factors affect the health and wellness of the teleworkers. The level of risk depends on the intensity, frequency, and period of the exposure to these risk factors/conditions and, the individual's capacity to meet the job demands.

The data obtained from managers on the occupational risk factors indicated that their teleworkers have been exposed to the ergonomic risk factor (static muscle loading); psychosocial risk factor (task-related stressors); and physiological predisposition. The Pearson's test indicated that organisations did not differ significantly with respect to exposure to occupational risk factors (*cf.* Table 4.23). Cochran's tests indicated that ABSA and OPSA were not significantly different from Unisa with regard to the exposure of teleworkers to occupational risk factors. However, Telkom was statistically different from the other organisations (*cf.* Table 4.25). A large percentage of managers (91.3%) indicated that although risk factors were experienced, no work-related musculoskeletal disorders were reported. The managers (8.7%) that indicated that disorders were reported by their teleworkers indicated the costs and consequences as medical expenses and workdays lost. With regard to the type of consequences/costs resulting from reported work-related musculoskeletal disorders, there were significant differences between the organisations (*cf.* Table 4.29). What was perceived as a concern was that a large group of these managers (70.4%) indicated that there were no consequences or costs due to the disorders reported. This result supports the conclusions stated with the primary objective that, organisations are negligent with regard to the effectiveness and adherence to ergonomic legislation and organisations do not comply with Circular Instruction 180. The lack of knowledge can be attributed to the almost non-existing training of managers and teleworkers.

The data obtained from teleworkers indicated that in general they were not exposed to risk factors. There was also no association between exposure to occupational risk factors and gender (*cf.* Table 4.48). Disorder symptoms sometimes experienced were fatigue, pain,

stiffness and cramps and muscle spasm. Only 9.8% of teleworkers indicated that they reported incidents to their employers. However, of those 9.8% who did report disorders, 61.2% of the teleworkers indicated that it did not lead to any ergonomic intervention from their organisations while tool and equipment adaptation, work station re-design and work schedule modifications, were reported as ergonomic interventions. Teleworkers did not differ significantly with respect to the results of suffering from work-related musculoskeletal disorders in their organisations. However, significant differences were observed between the categories ‘temporary job change’ versus ‘work station re-design’ and also ‘temporary job change’ and ‘tool and equipment adaptation’ (*cf.* Table 4.52) in their organisations. As to the types of work-related musculoskeletal disorders reported, the results indicated that teleworkers suffered from eye strain, migraine, stress, tension neck syndrome, shoulder tendinitis and depression. Teleworkers that suffered from work-related musculoskeletal disorders reported the disorders with the highest median medical cost per year as depression and eye strain at R2 000 each, followed by tension neck syndrome at a cost of R950, shoulder tendinitis at R400, stress at R350 and migraine at R120. Teleworkers indicated the average workdays lost annually due to medical intervention as follows: shoulder tendinitis, 45.2 workdays lost; stress, 18.7 workdays lost; migraine, 13.5 workdays lost; depression, 4.6 workdays lost; tension neck syndrome, 3.2 workdays lost; eye strain and myofascial pain each with 2.6 workdays lost.

The conclusion reached on the exposure to occupational risk factors is that the teleworkers lacked knowledge on what can be regarded as risk factors and what could be done to avoid these risk factors either by themselves or the organisation. Teleworkers who suffered from disorders did not report these, nor did they claim compensation. This lack of knowledge is attributed to the lack of training (indicated to be less than 28%), and specifically ergonomics training that were not sufficiently provided for teleworkers. The indication from teleworkers that the application of an ergonomic policy is only 5% is supporting the conclusion that there is a gap in knowledge on ergonomics in general. The lack of any ergonomic or other interventions by the organisations again confirms that the managers of teleworkers also lack knowledge and display negligence towards their teleworking employees in terms of providing training. Organisations that employ telework need to be much more conscious of the risk factors, the type of disorders that could result from exposure to these risk factors and the consequences for the teleworkers as well as for the organisation. The conclusion reached is that organisations do not fully understand the

importance of complying with legislation, development and implementation of telework policies and ergonomics training of managers and teleworkers. Telework in South Africa is still a new concept. Organisations and teleworkers are lacking knowledge and experience in the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers.

The third secondary objective was to determine the extent of implementation and compliance with organisational policies/procedures and government legislation.

This secondary objective aimed to address the following research question:

Are the necessary organisational policies/procedures and government legislation implemented and how are regulatory compliance ensured in an e-environment?

Circular Instruction 180 regarding the compensation of work-related upper limb disorders in terms of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993) encompasses ergonomics. There are two acts that are applicable to the health and wellness of employees in the e-environment. These two acts should be considered before reaching a final conclusion on the effectiveness and adherence to ergonomic policies, guidelines and regulations in an e-environment:

The Occupational Health and Safety Act of 1993 (Act 85 of 1993) requires of the employer to bring about and maintain, as far as reasonably practicable, a work environment that is safe and without risk to the health of the workers (The South African Labour Guide, n.d. & Boshoff, 2013) (refer to Chapter 2, paragraph 2.4.2 for a discussion of this Act).

Managers were requested to indicate the organisational policies/procedures/government acts applied in their organisations. The data analysis indicated that the Occupational Health and Safety Act (No 85 of 1993) was applied by 19.8% of the organisations. It should be noted that this was the highest percentage indicated for the application and adherence of organisational policies, procedures or government acts by the managers (*cf.* Chapter 4, paragraph 4.2.4.1). The managers in the four organisations did not differ significantly with respect to the organisational policies/procedures/government acts applied (*cf.* Table 4.15 and 4.18). The teleworkers also indicated that their organisations applied the Occupational

Health and Safety Act (No 85 of 1993) as indicated by 17.91% of the participants (*cf.* Chapter 4, paragraph 4.3.4.1). Table 4.46 indicated that the teleworkers of OPSA and Unisa did not differ significantly, but teleworkers of OPSA and ABSA differed significantly regarding the application of organisational policies/procedures/government acts.

The conclusion reached from these responses is that the application and adherence to the Occupational Health and Safety Act (No 85 of 1993) is low. This causes concern with regard to the health and wellness of teleworkers. This conclusion is also supported by the section in the questionnaire that focused on the creation of knowledge through training programmes. On indicating the topics that should be included in the training programmes, managers indicated the Occupational Health and Safety Act (No 85 of 1993) to be the second most desired topic to be included with 18% (*cf.* Chapter 4, paragraph 4.2.4.2, figure 4.13). The differences in proportions among the four participating organisations with respect to topics to be included in a telework training programme were not significantly different since their respective p-values were greater than 0.05 (*cf.* Table 4.19). Managers did not differ significantly with respect to topics to be included in a telework training programme in their respective organisations (*cf.* Table 4.21), or between the different industry sectors (*cf.* Table 4.22). Teleworkers indicated training received on the Occupational Health and Safety Act (No 85 of 1993) as 40.6%. This was the second highest percentage for training received by teleworkers (*cf.* Chapter 4, figure 4.29).

Taking into consideration that the Occupational Health and Safety Act of 1993 (Act 85 of 1993) is preventative in nature, the conclusion reached is that organisations do not pay enough attention to the application and adherence to this Act. Organisations that allow flexible work arrangements must endeavour to adhere to the Occupational Health and Safety Act. The organisations must ensure that teleworkers are working in a safe environment by applying ergonomics and thus protect teleworkers from risk factors leading to work-related musculoskeletal disorders.

The Compensation for Occupational Injuries and Diseases Act (No. 130 of 1993) aims to provide compensation for disablement caused by occupational injuries or diseases sustained or contracted by employees in the course of their employment (Republic of South Africa, 1993b). Refer to Chapter 2, paragraph 2.4.3 for the process to be followed to

diagnose work-related upper limb disorders, to determine the impairment benefits payable, to report disorders to the Compensation Commissioner and the processing of the compensation claim.

From the literature review, it is clear that work-related musculoskeletal disorders are reported to the Compensation Commissioner so that payment of medical costs, sick leave and compensation can be considered in terms of the Compensation for Occupational Injuries and Diseases Act. This can be regarded as the safeguard for organisations provided that the necessary measures were taken to protect their teleworkers as required by the Occupational Health and Safety Act of 1993 (Act 85 of 1993) and Circular Instruction 180 on ergonomics. Regrettably, statistics outlining the impact of work-related upper limb disorders on South Africa's economy are not readily available to support the research study and conclusions reached (The Compensation Commissioners Guideline's for Health Practitioners and Employers to manage Work-Related Upper Limb Disorders, 2004; and Interact Media Defined, 2011).

From the data analysis it was evident that the Compensation for Occupational and Disease Act (No 130 of 1993) was applied by 14.7% of the organisations as indicated by the managers. When managers were requested to indicate which topics should be included in a telework training programme, the Compensation for Occupational Injuries and Diseases Act (No 130 of 1993) obtained 15.3% (*cf.* Chapter 4, paragraph 4.2.4.2). Teleworkers indicated the application of the Compensation for Occupational and Disease Act (No 130 of 1993) in their organisations as 11.9% (*cf.* Chapter 4, Figure 4.27) and training received on this act as 26.9% (*cf.* Chapter 4, Figure 4.29).

On the regulatory compliance with the acts and policies applicable to teleworkers, 75% of the managers indicated that their organisations relied on official policies and agreements with teleworkers. Only 10% of the managers indicated that they relied on scheduled visits to the alternative worksites and, 15% of the managers applied both of these methods to ensure compliance. The data analysis clearly indicated that the applicable policies and legislation were not seriously implemented and enforced in the organisations that participated. The conclusion reached here is that there cannot be compliance if there was no implementation of the policies and legislation.

It is concluded that the participating organisations did not diligently apply the Occupational Health and Safety Act of 1993 (Act 85 of 1993), the Compensation for Occupational and Disease Act (No 130 of 1993) and Circular Instruction 180 regarding the compensation of work-related upper limb disorders in terms of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993). The Compensation Commissioner's "Guidelines for medical practitioners and employers on how to manage Work-Related Upper Limb Disorders" (2004), should also be used for reference. Although these guidelines are available on the Department of Labour's official website, managers and teleworkers do not seem to be aware of the value thereof. Organisations did not provide proper training on the purpose of the Acts, the procedure to follow where disorders were suffered, and the rights that teleworkers are entitled to in terms of these Acts.

The fact that only 8.7% of the teleworkers reported work-related musculoskeletal disorders is not a positive indication that organisations applied measures to act pro-actively in order to prevent disorders. It could also be an indication of negligence on the side of the government to enforce legislation and negligence from the organisations to apply and comply with ergonomic policies, regulations and legislation. It should be regarded as essential that managers implement predetermined regulations to ensure that the ergonomic policies and guidelines are complied with.

The fourth secondary objective was to determine the elements that could ensure the successful implementation of a telework programme to be presented as a conceptual telework framework (*cf.* Chapter 5, paragraph 5.5).

This secondary objective aimed to address the following research question:

What are the elements that need to be in place to implement a telework programme successfully?

From the conclusions reached on the primary objective and secondary objectives, it is clear that there is reason for concern regarding the current situation of telework in the four organisations that participated in the research. Organisations and teleworkers lack knowledge on the applicable legislation, telework policies and ergonomics principles that are related to the e-environment. An alarming conclusion was reached that organisations

and the government seem to be negligent in terms of providing training to managers and teleworkers on all these elements. The need for an instrument that will assist organisations to implement telework successfully has been identified. Therefore, a conceptual telework framework that provides a structure of the elements that need to be in place to implement a telework programme successfully, has been proposed and discussed in detail in Chapter 2, paragraph 2.4.4 and presented in paragraph 5.5 as a separate recommendation.

5.4 RECOMMENDATIONS

The following recommendations proposed here are based on the reviewed literature, the results from the data analysis and the conclusions:

- Organisations should conduct a worksite analysis by following a holistic approach as suggested by Martin (n.d.) and Health and Safety Executive (2013). Applying a holistic approach would imply that the telework organisations should consider:
 - the individual telework employee with his/her specific distinguishing physical characteristics, experience and training;
 - the design of this teleworker's workstation referring to the equipment, furniture and location of the workstation;
 - how the teleworker organises the work itself, what processes are used for completing work and the nature of supervision implemented (identified as management by results);
 - the design of the teleworker's job, with regards to repetition, time pressure, material handling;
 - the layout of the home office, with regards to the floor plan and the work space; and
 - the environment in which this teleworker works, referring to lighting, noise, air quality and temperatures (*cf.* Chapter 2, paragraph 2.3.3 and Figure 2.3.1).

Once a worksite analysis has been conducted, ergonomic guidelines and regulations applicable to the identified information and communication technologies used by the teleworkers could be designed, implemented and adherence monitored (Martin, n.d. and Health and Safety Executive, 2013).

- Official organisational policies should be based on the three acts applicable to the health and wellness of teleworking employees. A formal organisational telework policy should make provision for formal telework agreements with teleworkers. The telework policy should stipulate how the application of ergonomic policies and

guidelines will be monitored. Apart from the formal telework agreements, scheduled visits to the homes of teleworkers could be a method to ensure compliance with the ergonomic policy. Managers themselves could visit the home offices to ensure that the teleworker's work environment meets the ergonomic requirements. To ensure that the application of ergonomics to the worksite is effective and that policies are adhered to, a prerequisite would be that the organisation ensures that managers and teleworkers received proper training on ergonomics.

- Since the preferred type of virtual office was the home office, organisations should ensure that the telework policies and agreements with teleworkers specify all the requirements applicable to the home office. The organisation's telework policy and the formal telework agreements should indicate who will be eligible to work at home, (age and gender), the number of days allowed at the alternative worksite, who will be managing teleworkers, who will be responsible for the equipment, furniture and services needed, and how regulatory compliance will be monitored and ensured.
- Based on the conclusion that the home office is preferred, organisations should budget and ensure that teleworkers are provided with the technology applications needed to be able to work at the alternative workplaces. The formal telework agreements should clearly indicate who will be responsible to provide the equipment, furniture and who will be paying for services required. The alternative workplaces should also be visited and evaluated to ensure that the use of equipment, furniture and services meets the ergonomic standards as indicated by the ergonomic policy of the organisations.
- Taking into consideration that the Occupational Health and Safety Act of 1993 (Act 85 of 1993) is preventative in nature, the teleworking organisations should apply ergonomic policies and principles pro-actively and not as a measure to rectify what went wrong. The goals of a proactive programme should be to identify the risk factors that could cause work-related musculoskeletal disorders, to put measures in place to prevent exposure to these risk factors in order to limit work-related musculoskeletal disorders resulting in teleworkers' compensation claims and to reduce the claims that could occur. Important elements of a proactive approach include:
 - comprehensive programme with management support;

- employee involvement;
- worksite analysis to identify problems;
- employee awareness training; and
- early reporting of symptoms.

Effective proactive controls for work-related musculoskeletal disorders do not have to be elaborate or expensive. Often simple changes in a work process, workstation layout or tools are effective. Ideally, controls should be designed to eliminate the teleworkers' exposure to risk factors. The two main types of controls are engineering and administrative. Engineering controls will reduce or eliminate the teleworkers' exposure to a risk factor whereas administrative controls do not change the physical environment but these do reduce the risk.

Examples of engineering controls include:

- modifying a workstation;
- providing new equipment or tools;
- changing the existing equipment or tools; and
- modifying the work process.

Examples of administrative controls include:

- establishing written policies and work procedures;
- changing work schedules;
- adjusting staffing;
- training employees;
- rotating employees; and
- broadening the job content.

A key element of choosing and implementing effective ergonomic controls is to involve those teleworkers who do the job as part of the team (Washington State Department of Labour and Industries, 2002:6; & Ontario, Ministry of Labour, 2009a).

- Training programmes and information sessions on work-related disorders, the risk factors, the symptoms thereof and the ergonomic measures that should be implemented to prevent the disorders should be provided as part of a compulsory ergonomics training programme for all managers and teleworkers. Training will enhance employee awareness. There should be full management support and participation in the training programmes.
- The core elements of what should be in place to implement a telework programme

successfully are presented in the conceptual telework framework (*cf.* Chapter 5, paragraph 5.5). Organisations that have not already implemented a telework programme but intend to do so, should use the conceptual telework framework as a guide as it is perceived to be a comprehensively sufficient tool for the implementation of a telework programme. Those organisations that have already implemented a telework programme, can benefit by using the proposed conceptual telework framework to assess themselves against the criteria and criterion parts of the conceptual telework framework.

5.5 CONCEPTUAL TELEWORK FRAMEWORK

The proposed conceptual telework framework consists of 11 elements as discussed in Chapter 2, paragraph 2.4.4. The first six elements (enablers) refer to what the organisation should do when implementing telework. These six elements can be regarded as the input and represent the actions, work and culture of the organisation. It requires a committed leadership team that would develop and implement the necessary policies and strategies. These policies refer to telework, ergonomics and health and wellness policies that are in compliance with the applicable Acts. The leadership should act in a socially responsible way by determining the needs, requirements and expectations of the community. The leadership should enhance relationships and determine satisfaction of the community with regard to the implementation of telework. The organisation should release the full potential of its management team and the teleworking employees. There should be ample provision of training programmes on the health and wellness aspects, ergonomics, policies and Acts for managers and teleworkers. The organisation should effectively and efficiently manage and plan, supply and support the use of resources and information and communication technologies provided to the teleworking employees. The element dealing with processes refers to how the organisation plans, implements, manages, measures and improves its processes with regard to telework implementation.

The focus of the last five elements (results) is on the quality of the output. The results represent measurements of what have been achieved on the work done on the enabler's side. The results represent what an organisation targets, measures and achieves. The results elements indicate the impact of implementing telework on the organisation, the community and on employee satisfaction. It refers to how successful the organisation was with regard to the information and communication technology support rendered to the teleworking

employees. The last result element refers to what the organisation has achieved in relation to its planned business objectives and in satisfying the needs and expectations of everyone with a financial interest or other share in the organisation (SAEF, 2000, 2002 and Bond, 2014).

The elements as proposed in the conceptual telework framework as enablers and result criteria and criterion parts are adapted specifically for teleworking organisations. It is believed that the proposed conceptual telework framework could render a valuable contribution to the e-environment in general and specifically to these organisations. The intention is to provide feedback to the four organisations and it will be recommended that the conceptual telework framework should be implemented or used as an assessment of telework programs that have already been implemented. The 11 elements of the proposed telework framework will be presented below:

ENABLER CRITERIA AND CRITERION PARTS:

1. Leadership

This criterion refers to how the behaviour and actions of the management team and all other leaders inspire, support and promote flexible work arrangements.

Criterion parts:

- 1.1 Obtain support from top management for the implementation of a telework programme.
- 1.2 Address possible managerial resistance to telework.

2. Policy and strategy

This criterion refers to how the organisation formulates, deploys, reviews and turns telework policy and strategy into plans and actions. Management must ensure that policies comply with the Acts and legislation that govern the health and wellness of employees. These Acts are:

- Occupational Health and Safety Act, 1993 (Act 85 of 1993);
- Section 65 (1) (a) of the Compensation for Occupational Injuries and Diseases Act, (No. 130 of 1993); and
- Circular Instruction 180 regarding the compensation of work-related upper limb disorders in terms of the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993).

Criterion parts:

2.1 Establish a telework policy.

With regard to programme operations, the telework policy should:

- Describe procedures for establishing a telework arrangement (application, approval levels, timeline for approval/denial, training requirements and written agreements).
- Establish that the performance of teleworkers will be evaluated consistent with the organisation's regular performance management system (teleworkers should be treated the same way as non-teleworkers with regard to performance management).
- Emphasise that teleworkers will receive the same treatment and opportunities as non-teleworkers (work assignments, awards and recognition, development opportunities and promotions).
- Address expectations regarding communication between teleworkers and supervisors, teleworkers and co-workers and teleworkers and customers/clients (will it be via telephone, e-mail or a combination and how often should communication take place?).
- Identify specific organisational requirements for training of teleworkers prior to entering into a written telework agreement and commencement of telework.
- Identify organisational expectations regarding telework training for managers and supervisors of teleworkers, as well as teleworkers.
- Address unexpected contingencies that could impact the telework arrangement. Clearly define expectations of teleworking employees during situations that involve early dismissal or late arrival. Identify what explicit procedures should be followed when emergency events occur that may involve closure at the official worksite or alternative worksite. Also, describe procedures to be followed in case of illness, and recall to the official site to meet business-related needs during a telework day.
- Identify procedures for changing or modifying telework arrangements (schedules or locations).
- Require that the written telework agreement be reviewed at regular intervals as determined by the organisation.
- Describe procedures for termination or withdrawal from a telework agreement.
- Include clear and specific requirements for record keeping and reporting for individual teleworkers and, to keep track of telework in the organisation for reporting purposes each year. It is recommended that the organisation describes in

the policy, the system and workflow being used to capture participation of the various types of telework (bi-weekly work report, time and attendance system; payroll provider) and provide specific instructions to managers and teleworkers that this information must carefully and consistently be collected either manually or electronically for reporting purposes.

- Include clear and specific requirements for evaluation of the telework programme, both for the individual teleworker and for the organisation in general.

With regard to participant responsibilities, the telework policy should:

- Define the responsibilities of supervisors and managers of teleworkers;
- define the responsibilities of teleworking employees;
- define the responsibilities of telework coordinators;
- emphasise teleworker responsibilities to ensure that the arrangement does not have any negative impact on the work of other members of the organisation (co-workers and supervisors);
- clearly indicate the ownership of furniture, equipment and services needed at the alternative work place and who will be responsible for the cost and maintenance of these (this includes insurance issues and tax implications); and
- assign clearly-stated responsibilities for record keeping and reporting requirements on the daily operational aspects and also for reporting to the organisation on the activities of the year.

2.2 Establish eligibility criteria to ensure that teleworkers are selected on an equitable basis using criteria such as suitability of tasks and employee performance.

2.3 Establish policies or requirements to facilitate communication among teleworkers, managers, and co-workers.

2.4 Develop guidelines on workplace health and safety issues to ensure that teleworkers have safe and adequate places to work off-site.

2.5 Develop a telework agreement for use between teleworkers and their managers.

Elements that should be incorporated into a written telework agreement include:

- The location of the telework office (typically the home residence of the employee);
- an equipment inventory, clarifying what the employee will supply, what the organisation will supply, and what will be shared;
- the telework schedule;
- telework contact information (the phone number to use on the telework day);

- data and information security procedures;
- an ergonomics safety checklist, which is a self-certifying list to guide the teleworker in checking the safety of the alternative work site;
- expectations for emergency telework; clarifying whether or not the teleworker is expected to work in the case of an emergency (natural disaster, strikes and any situation that may result in a disruption of normal office operations).

3. Community focus

The focus of this criterion is on how the organisation determines needs, requirements and expectations, enhances relationships and determines satisfaction of the community with regard to flexible work arrangements.

Criterion parts:

- 3.1 Commitment to community responsibility.
- 3.2 Enhanced work/life effectiveness and balance of citizens.
- 3.3 Social responsibility towards persons with disabilities.
- 3.4 Ensures continuity of operations and economic stability.
- 3.5 Commitment to protect the natural resources (energy consumption) and ensure a healthier environment for the citizens (pollution).
- 3.6 Protection of the infrastructure (wear and tear of the roads, fewer cars on the roads).

4. Employee management

This criterion refers to how the organisation releases the full potential of its management team and the teleworking employees.

Criterion parts:

- 4.1 Inform the workforce about the telework programme, eligibility, ergonomic policies and telework agreements/policies.
- 4.2 Designate a telework coordinator.
- 4.3 Establish a cross-functional project team, including information technology support staff, union representatives, and other stakeholders.
- 4.4 Train all involved, including managers, teleworkers, non-teleworkers and support employees. Training must be successfully completed prior to entering into a written telework agreement.

- 4.5 Ensure that the same performance standards derived from a modern, effective, credible, and validated performance system are used to evaluate both teleworkers and non-teleworkers. Performance is managed primarily by focusing on results.
- 4.6 Establish guidelines to minimise a possible adverse impact on non-teleworkers before employees begin to work at alternative work sites.

5. Resources and information and communication technology management

This criterion refers to how the organisation manages and plans, supplies and supports the use of resources and information and communication technologies effectively and efficiently.

Criterion parts:

- 5.1 Conduct an assessment of teleworker and organisation resources and technology needs. It may include:
- Furniture and supplies:
Table, chair, computer accessories and stationery.
 - Services:
Internet connectivity, secure network access (e.g. Virtual Private Networks), Voice Over Internet Protocol, Web-based collaboration solutions, visual collaboration solutions and video conferencing.
 - Information and communication technologies:
A desktop computer, laptop computer, tablet, associated peripheral equipment (e.g. printer, copier, scanner, facsimile), phone, cell phone, smartphone, technical and in-house support.
- 5.2 Establish ergonomic standards for furniture, equipment and services in the telework environment.
- 5.3 Develop guidelines about whether the organisation or teleworker will provide the necessary furniture, technology equipment, services and supplies for telework. Outline what support, materials, and equipment the organisation may provide for teleworkers, what the organisation will not provide, and what responsibilities for these may be shared between the organisation and the teleworker.
- 5.4 Provision for on-the-spot assistance - teleworkers may occasionally need someone who is physically present in the main office to assist them to fax a document or look up information.

- 5.5 Provision for technical support for when teleworkers have technology application questions and break downs.
- 5.6 Address access and security issues related to telework. Elements that should be included in security issues are:
- Be familiar with, understand, and comply with the organisation's information security policies;
 - participate in organisational information security training; and
 - maintain security of any relevant materials, including sensitive hard-copy files and documents, correspondence, equipment, and follow the security protocols for remote connectivity. Depending on the sensitivity of the information being handled, the home office may need to include security measures such as locked filing cabinets, similar to what may be used at the official worksite.
- 5.7 Ensure that the organisation's training programmes include the usage of technology equipment and the ergonomic principles applicable to the usage of such equipment at the alternative workplace.

6. Processes

These processes include how the organisation plans, implements, manages, measures and improves its processes with regard to telework implementation.

Criterion parts:

- 6.1 Planning for the implementation of the telework programme:
- Establish measurable telework programme goals.
 - Develop an implementation plan for the telework programme.
 - Develop a business case for implementing a telework programme.
 - Provide funding to meet the needs of the telework programme.
 - Establish a pilot programme.
 - Establish training programmes (ergonomics, telework, health aspects) for managers and teleworkers.
- 6.2 Implementation of a telework programme:
- Pilot implementation programme.
 - Survey design to evaluate success and possible problems experienced.
 - Cost benefits analysis.
 - Overcoming technology barriers and problems.

6.3 Management of telework programme:

- Ensure that the same performance standards (focus on results), derived from a modern, effective, credible, and validated performance system, are used to evaluate both teleworkers and non-teleworkers.
- Establish guidelines to minimise an adverse impact on non-teleworkers before employees begin to work at alternative work sites.

6.4 Evaluation of telework programme:

- Establish processes, procedures, and/or a tracking system to collect data to evaluate the telework programme.
- Identify problems and/or issues with the telework programme and make appropriate adjustments.

RESULTS CRITERIA AND CRITERION PARTS:

7. Impact on organisation

This refers to the results that the organisation is achieving with the implemented telework programme.

Criterion parts:

- 7.1 Improved emergency responsiveness and continuity of operations disaster preparedness and recovery.
- 7.2 Improved recruitment, retention, and staffing.
- 7.3 Increased employee morale.
- 7.4 Increased workforce diversity.
- 7.5 Increased productivity.
- 7.6 Maintain an up-to-date technologically-capable workforce.
- 7.7 Performance management by results.

8. Impact on the community

This refers to the results that the organisation is achieving in relation to the responsibility towards satisfaction of its community.

Criterion parts:

- 8.1 Less traffic congestion.
- 8.2 Reduction of energy consumption and the associated carbon footprint.
- 8.3 Less wear and tear of the roads.
- 8.4 Improved accommodation for persons with disabilities.

- 8.5 Ensures continuity of operations and maintains operations during emergency events such as natural disasters or strikes and other situations that may disrupt normal business activities (*cf.* Chapter 2, paragraph 2.1.3).

9. Employee satisfaction

This refers to what the organisation is achieving in relation to the satisfaction of its teleworking employees.

Criterion parts:

- 9.1 Greater flexibility (work anywhere, anytime and anyplace), morale and decreased stress.
- 9.2 More time available due to less travelling to work.
- 9.3 Improved performance and productivity (free from office distractions, which may be particularly important when working on a complex project).
- 9.4 Optimal use of technological advances.
- 9.5 Holistically improved life, better work-life balance.
- 9.6 Reduction in absenteeism.
- 9.7 Flexibility to scheduled work periods according to natural productivity peaks, thus optimising output.
- 9.8 Enhances work/life effectiveness and balance - telework allows employees to manage their work and family obligations better, thereby retaining a more resilient, results-oriented employee.
- 9.9 It encourages commitment to the organisation - employees feel they have greater control over their work environment.

10. Information and communication technology support and performance

This refers to what the organisation is achieving in relation to the management of resources, information and communication technology and, in-house support provided to teleworkers.

Criterion parts:

- 10.1 Less disruptions due to equipment failure - technical assistance successfully provided to solve information and communication technology break downs.
- 10.2 Technical and in-house support and assistance satisfactorily and promptly provided.
- 10.3 Security measures successfully applied.

- 10.4 Less disruptions in communication with co-workers and customers - co-workers handle telephone calls or other communications appropriately.

11. Business results

This refers to what the organisation is achieving in relation to its planned business objectives and in satisfying the needs and expectations of everyone with a financial interest or other share in the organisation.

Criterion parts:

- 11.1 Office space and operating cost savings.
- 11.2 Space utilisation efficiency, effectiveness, and flexibility.
- 11.3 Overhead savings.
- 11.4 Sustainable development.
- 11.5 Financial growth due to the increased productivity of employees.
- 11.6 Promotes management effectiveness by targeting reductions in management costs related to employee turnover and absenteeism, transit costs, and environmental impact (South African Excellence Foundation (SAEF), 2000, 2002; Telework Exchange, 2009; Telework.gov., (n.d.); United States General Accounting Office, 2004; United States General Service Administration, (n.d.); United States Office of Personnel Management, 2011a; United States Office of Personnel Management, 2011b & Pyöriä, 2011).

5.6 LIMITATIONS OF THIS STUDY

The following limitations were experienced:

- Teleworkers who suffered from work-related musculoskeletal disorders were requested to indicate the approximate total costs per year for medical interventions. The fact that the medical costs could be below R500 for a medical consultation or as high as R50 000 for an operation made the data analysis complicated. Monetary brackets could therefore not be provided because of the big difference. The median medical cost was used to analyse the data and this resulted in a number of the disorders to be R0 while in fact it was not a true reflection of the actual costs.
- The diffusion of telework in South Africa is unknown. It was a challenge to obtain and convince organisations to participate in this study. A number of the larger well known teleworking organisations indicated that they were not interested to participate in any research.

- The calculation of the sample size was difficult. It was possible to determine the number of managers and teleworkers in the four organisations. The OPSA sample size could not be determined as there were 18 000 to 20 000 readers/subscribers and it was not known whom of these readers were involved in telework or who were managers or teleworkers or both.
- There are no statistics available for South Africa regarding the impact of work-related upper limb disorders on health care and the economy. Work-related upper limb disorders are regarded as a problem as these can affect every aspect of an employee's life, and these are costly for organisations.

5.7 PROPOSALS FOR FUTURE RESEARCH

Suggestions for possible areas of further exploration in the field are outlined below:

- The diffusion of telework in South Africa is unknown. An action research project can be undertaken by honours students to establish the diffusion of telework.
- A research project can be undertaken to implement the conceptual telework framework in an organisation with the aim to validate and refine the criteria and criterion parts.
- There is currently no statistics available on compensation for occupational injuries and diseases claims in South Africa. Research can be undertaken to determine the extent of compensation for occupational injuries and diseases claims in South Africa and to link it to work-related musculoskeletal disorders and the application of ergonomics in the e-environment.
- Research can be done to determine the effects of work-related musculoskeletal disorders in the e-environment on productivity in South Africa.

Chapter 5 presented the conclusions and recommendations aligned to the research objectives and questions as formulated. The limitations of this study were indicated as well as suggestions for possible future research projects. The chapter concluded with a summary of the holistic project.

The purpose of this study was to determine the existence of policies, regulations and legislation applicable to employers and employees in the e-environment. The study also determined the compliance with the requirements for ergonomics of information

administration technologies to avoid compensation claims and other legal actions due to health and wellness aspects.

Information and communication technology applications have made it possible to work anywhere, anytime and anyplace but can present challenges for both management and employees operating in the e-environment. This study aimed to identify the risk factors contributing to the development of work-related musculoskeletal disorders. These disorders are directly linked to a lack of applying the correct ergonomics principles in the e-environment. The costs resulting from workdays lost, as well as possible compensation claims for occupational injuries and diseases could have a negative influence on productivity and organisational profits.

Countless research has shown the proven benefits of applying ergonomics principles within the workplace. The result of a decreased rate of injury due to an improved user-task interface, as well as financial growth due to the increased productivity of employees. However, as a growing economy South African organisations still fail to acknowledge these benefits and the value of their resources (Hendrik, 2003). The reasons to implement ergonomics are that costs can be reduced by pro-actively managing the ergonomic risk factors that cause work-related musculoskeletal disorders. These types of bloodless injuries are often very expensive, yet easily preventable with a good ergonomics programme. Research consistently shows that days away from work due to non-fatal injuries are always higher for repetitive motion and overexertion injuries. Ergonomic solutions will improve productivity by reducing unnecessary force, movement or postures. Ergonomics improves quality, poor ergonomics leads to frustrated and fatigued workers. Ergonomics improves employee engagement, particularly if an employee does not experience fatigue and discomfort during their workday. Ergonomics reduce turnover, decrease absenteeism, improve morale and increase employee involvement. Teleworkers should be involved in the ergonomics process and, by being involved; teleworkers would take ownership of their actions and thus create a buy-in towards increasing health and safety (Ergomax, 2013b).

Organisations seem to be significantly negligent in terms of all aspects of ergonomics. This signals an alarming situation for the successful implementation, sustainability and growth of telework. Training provided to managers and teleworkers should be regarded as extremely important because it ensures the health and wellness of teleworkers that could

enhance the productivity in the organisations. Training in ergonomics will not only protect the teleworker against work-related disorders but will also protect the organisations against compensation claims for work-related musculoskeletal disorders. The relation between ergonomics training and the prevention of work-related musculoskeletal disorders were not recognised by managers of teleworkers as emphasised in this study. Ergonomics are key to the well-being of employees, especially in the distributed e-environment where employees are not under the direct and visible supervision of the employer. Knowledge of ergonomics should form an integral part of every teleworker's training in order to practice safe telework.

The proposed conceptual telework framework should be recognised by telework organisations as a tool to assist with the successful implementation of a telework programme. The power of the conceptual telework framework is that it clarifies the strategy, develops effective plans, delivers tangible improvements in all areas and allows organisations to benchmark themselves against others. The key to the success of the implementation of the conceptual telework framework is management commitment and involvement in all the processes. Organisations that have already embarked on a telework programme could also benefit by implementing the conceptual telework framework as a self-assessment tool to evaluate their telework activities.

This investigation has been completed in accordance with the title, the problem statement and research objectives/questions formulated for this study.

LIST OF SOURCES

- Adams, C. 2010. *The many names for repetitive stress injuries*. [Online]. Available at: <http://ergonomics.about.com/od/repetitivestressinjuries/qt/manynamesofrsi.htm> [accessed: 22 February 2010].
- Adams, C. 2011. *Guide to setting up an ergonomic computer station: the monitor*. [Online]. Available at: http://ergonomics.about.com/od/office/ss/computer_setup_2.htm [accessed: 10 March 2011].
- Adèr, H.J., Mellenbergh, G.J., & Hand, D.J. 2008. *Advising on research methods: A consultant's companion*. Johannes van Kessel Publishing.
- Atwood, C., et al. 2004. *Ergonomics and the Management of Musculoskeletal Disorders*. 2nd Edition. [Online]. Available at: <http://www.ipmr.kmu.edu.pk/sites/ipmr.kmu.edu.pk/files/Ergonomics%20and%20the%20Management%20of%20Musculoskeletal%20Disorders.pdf> Elsevier (USA): Butterworth-Heinemann. [accessed: 4 June 2014].
- Babbie, E. 2008. *The Basics of Social Research*. 4th ed. Chapman University: Thomson Wadsworth.
- Bond, W.E. 2014. Managing Member, Centre for Excellence, Pretoria: *Telephone interview supported by e-mail*, 5 February 2014.
- Boshoff, T. 2013. *Health and Safety adds value to business*. [Online]. Available at: <http://www.labourguide.co.za/value.htm>, [accessed: 8 July 2013].
- Bouma, G.D, & Ling, R. 2006. *The Research Process*. 5th ed. Oxford University Press: Australia.
- Bouwer, G. 2011. *Regional economic growth*. [Online]. Available from <http://www.statssa.gov.za/articles/16%20Regional%20estimates.pdf> [accessed: 11 January 2013].
- BusinessDictionary.com. 2013. *Ergonomics*. [Dictionary]. Available at: <http://www.businessdictionary.com/definition/ergonomics.html> [accessed: 1 August 2013].
- Buzzle.com. 2014. *Circulatory system problems and diseases*. [Online]. Available at: <http://www.buzzle.com/articles/circulatory-system-problems-and-diseases.html> [accessed: 7 August 2014].
- Canadian Centre of Occupational Health and Safety. 2002. *Office Ergonomics*, 5th ed. Example pages. The VDT Workstation. [Online]. Available at: <http://www.ccohs.ca/products/publications/pdf/samples/ergonomics.pdf> [accessed: 15 September 2010].
- (View) Canadian Standard Association. Standards referenced in Occupational Health & Safety Regulations. 2000. [Online]. Available at: <http://ohsviewaccess.csa.ca/viewStandards.asp> [accessed: 26 April 2011].
- (View) Canadian Standard Association. Standards referenced in Occupational Health & Safety Regulations. 2003 (Reaffirmed 2005). *CSA-Z412, Guideline on Office Ergonomics*. [Image]. Available at: http://ohsviewaccess.csa.ca/show_swf.asp [accessed: 26 April 2011]. (TO ACCESS: First go to

<http://ohsviewaccess.csa.ca/viewStandards.asp> and register, then choose jurisdiction Ontario, then page 9 and then Guidelines on Office ergonomics).

- Castillo, J.J. 2009a. *Convenience Sampling*. [Online]. Available at: <http://explorable.com/convenience-sampling> [accessed: 4 October 2011].
- Castillo, J.J. 2009b. *Judgmental Sampling*. [Online]. Available at: <http://explorable.com/judgmental-sampling> [accessed: 4 October 2011].
- Castillo, J.J. 2009c. *Population Sampling Techniques*. [Online]. Available at: <http://explorable.com/population-sampling> [accessed: 4 October 2011].
- Chiropractic-Help. 2013. *Frozen shoulder*. [Online]. Available at: <http://www.chiropractic-help.com/frozen-shoulder.html> [accessed: 13 July 2013].
- Collis, J. & Hussey, R. 2008. *Business Research*. 3rd ed. [Online]. Available at: <http://www.palgrave.com/business/collis/br/docs/sample.pdf> [accessed: 8 October 2011].
- (The) Compensation Commissioner's Guidelines for Health Practitioners & Employers to manage Work-related Upper Limb Disorders. 2004. *Circular Instruction 180 regarding compensation for work-related upper limb disorders (WRULDS) (Compensation for Occupational Injuries and Diseases Act, 1993 (Act No 130 of 1993), as amended)*. [Online]. Available at: [http://www.givengain.com/cause_data/images/947/WRULDS - Guidelines of Compensation Commissioner 07 2004.pdf](http://www.givengain.com/cause_data/images/947/WRULDS_-_Guidelines_of_Compensation_Commissioner_07_2004.pdf) [accessed: 10 March 2010].
- Creswell, J.W. 1994. *Research Design, Qualitative and Quantitative Approaches*. Sage Publications: United States of America.
- Creswell, J.W. 2014. *Research Design, Qualitative and Quantitative Approaches*. 4th ed. Sage Publications: United States of America.
- Davenport, T.H. 2013. *Thinking for a living: how to get better performances and results from your knowledge workers*. [Online]. Harvard Business School Press, Boston, Massachusetts. Available at: <http://books.google.co.za/books?hl=en&lr=&id=rpCEnGAGmRsC&oi=fnd&pg=PP3&dq=Knowledge+workers+&ots=jmZG5uMg61&sig=DNI8S6FS6926eRfzammzTk nAHVM#v=onepage&q=Knowledge%20workers&f=false> [accessed: 8 July 2014].
- Discher, M. 2007. *Avoiding eye strain when using a video display terminal*. [Online]. Available at: <https://fpm-www3.fpm.wisc.edu/safety/occupationalHealth/Ergonomics/EyestrainErgonomicTips/tabid/145/Default.aspx> [accessed: 2 March 2011].
- Dul, J., et al. 2012. A strategy for human factors/ergonomics: developing the discipline and profession. [Online]. *Ergonomics*, Volume 55:4, 2012:377-395. Available at: <http://dx.doi.org/10.1080/00140139.2012.661087> [accessed: 4 June 2014].
- easyDSE Computer Workstation Assessment. 2010a. *Stress. What is Repetitive Strain Injury (RSI)?* [Online]. Available at: http://www.easydse.com/rsi/what_is_rsi.htm#stress [accessed: 5 September 2009]. 2012 Website not available. Refer to http://inforumer.com/Top/Health/Conditions_and_Diseases/Musculoskeletal_Disorders/Repetitive_Strain_Injuries/044349/#

- easyDSE Computer Workstation Assessment. 2006b. *What is Repetitive Strain Injury (RSI)?* [Online]. Available at: http://www.easydse.com/rsi/what_is_rsi.htm [accessed: 5 September 2009]. 2012 Website not available. Refer to [http://inforumer.com/Top/Health/Conditions_and_Diseases/Musculoskeletal Disorders/Repetitive Strain Injuries/044349/#](http://inforumer.com/Top/Health/Conditions_and_Diseases/Musculoskeletal_Disorders/Repetitive_Strain_Injuries/044349/#)
- Ellison, J.K. 2012. *Ergonomics for Telecommuters and Other Remote Workers*. [Online]. Environmental and Occupational Risk Management Consulting. Available at: <http://www.asse.org/professionalsafety/docs/Jessica-Ellison-Article.pdf> [accessed: 7 August 2014].
- eOrthopod. 2011. *Guyon's canal syndrome*. [Online]. Available at: <http://www.eorthopod.com/content/guyons-canal-syndrome> [accessed: 12 October 2011].
- Ergo in Demand. 2013a. *Computer Posture - Laptop Workstations, How to Make Your Laptop Workstation Ergonomic*. [Online]. Available at: <http://www.ergoindemand.com/laptop-workstation-ergonomics.htm> [accessed: 2 March 2013].
- Ergo in Demand. 2013b. *Ergonomic laptop computer caddy*. [Online]. Available at: <http://www.ergoindemand.com/ergonomic-laptop-computer-caddy.html> [accessed: 19 April 2013].
- Ergoguys.com. 2013a. *Fellowes Office Suites Adjustable Height Monitor Riser*. [Online]. Available at: <http://store.ergoguys.com/fellowes-office-suites-standard-monitor-riser-plus.html> [accessed: 10 April 2013].
- Ergoguys.com. 2013b. *The Mobo keyboard and mouse tray system*. [Online]. Available at: <http://store.ergoguys.com/mobo--ergonomic-keyboard-tray-amp-mouse-tray.html> [accessed: 1 April 2013].
- Ergoguys.com. 2013c. *True Arm*. [Online]. Available at: <http://store.ergoguys.com/truearm.html> [accessed: 1 April 2013].
- Ergomax. 2013a. *Ergonomic legislation*. [Online] Available at: <http://ergomax.co.za/ergonomics-in-south-africa/> [accessed: 14 November 2013].
- Ergomax. 2013b. *Why implement ergonomics*. [Online] Available at: <http://ergomax.co.za/why-implement-ergonomics> [accessed: 14 November 2013].
- Ergomax. 2014. *What is ergonomics?* [Online]. Available at: <http://www.ergomax.co.za/index.php?option=content&task=view&id=3&Itemid=26> [accessed: 12 July 2014].
- Ergonomic Evolution. 2013. *The value of ergonomics*. [Online]. Available at: <http://informe.com/go/?domain=ergonomicsevolution.com&url=http://ergonomicsevolution.com&keyword> [accessed: 15 April 2013].
- Ergotherapy Solutions. 2011. *Ergo-Tilt* [Online]. Available at: http://www.ergotherapy.co.za/products_ergotilt.php [accessed: 11 March 2011].
- Facility Innovations. 2009a. *10 Keys to Office Hoteling Success*. [Online]. Available at: <http://www.facilityinnovations.com/10keys.htm> [accessed: 30 August 2011].
- Facility Innovations. 2009b. *Time and Place Extended*. [Online]. Available at: <http://www.facilityinnovations.com/prod02.htm> [accessed: 30 August 2011].

- Fortier, B. 2005. Ergonomics for teleworkers often overlooked. *Canadian HR Reporter*. [Online]. Available at: <http://www.ivc.ca/health2.html> [accessed: 2 September 2009].
- Good News Bible. 1977. *The Bible*. Bible Society of South Africa. Cape Town.
- Gordon, G.E. 1998. *Work/Life - Office/Home - Day/Night: Compensating the Workplace "Slashes" of the Future*. [Online]. Available at: <http://www.gilgordon.com/downloads/compensating.txt> [accessed: 30 August 2011].
- Gordon, G.E. 2007. *What's the difference between "telecommuting" and "telework"?* [Online]. Available at: <http://www.gilgordon.com/telecommuting/adminfaq/admin01.htm> [accessed: 28 June 2011].
- Government of Newfoundland and Labrador. 2009. Department of Government Services Occupational Health and Safety Division. *Part VI Occupational Health Requirements*. [Online]. Available at: http://www.gs.gov.nl.ca/ohs/guide/part_vi.pdf [accessed: 11 March 2011].
- Hamburg, M. 1985. *Basic Statistics: A Modern Approach*. Harcourt Brace.
- Hand and Wrist Centre of Houston. 2013. *Pronator Syndrome*. [Online]. Available at: <http://www.houstonhandandwrist.com/conditions/pronatorsyndrome.php> [accessed: 12 October 2013].
- Health and Safety Executive. 2003. *Aching arms (or RSI) in small businesses. Is ill health due to upper limb disorders a problem in your workplace?* [Online]. Available at: <http://www.hse.gov.uk/pubns/indg171.pdf> [accessed: 15 November 2009].
- Health and Safety Executive. 2013. *Ergonomics and human factors at work*. [Online] Available at: <http://www.hse.gov.uk/pubns/indg90.pdf> [accessed: 10 October 2013].
- Hendrik, H.W. 2003. Determining the cost-benefits of ergonomics projects and factors that lead to their success. *Applied Ergonomics*, 34, 419-427.
- Hendricks, A. 2012. *Optimal workstation set-up*. [Online]. Available at: <http://www.ergotherapy.co.za/article.php?id=5> [accessed: 15 November 2012].
- Hoffmann, E.C. 2000. Contextual implications of information technology on the administrative function. *DTech. Dissertation*. Vanderbijlpark, Vaal Triangle Technikon.
- Hoffmann, E.C. 2008. *Holistic research framework*. [Flowchart diagram]. Tshwane University of Technology. Unpublished guidelines for Post Graduate studies.
- Hoffmann, E.C. 2011. *Management of a Distributed e-Workforce*. Pretoria: privately published.
- Hofstee, E. 2009. *Constructing a Good Dissertation: A Practical Guide to Finishing a Master's, MBA or PhD on Schedule*. Johannesburg, South Africa: EPE.
- Institute of Ergonomics and Human Factors. 2014. *What is Ergonomics?* [Online]. Available at: <http://www.ergonomics.org.uk/learning/what-ergonomics/> [accessed: 7 July 2014].
- Interact Media Defined. 2011. *Understanding Ergonomics*. [Online] Available at: <http://www.interactmedia.co.za/> [accessed: 2 March 2011].
- International Ergonomics Association. 2014. *Definition and Domains of ergonomics*. [Online]. Available at: <http://www.iea.cc/whats/> [accessed: 6 August 2014].

- Investopedia. 2013. *Virtual Office*. [Online]. Available at: <http://www.investopedia.com/terms/v/virtual-office.asp> [accessed: 1 August 2013].
- Jala International. 2013. *What's Telework?* [Online]. Available at: <http://www.jala.com/definitions.php> [accessed: 23 June 2013].
- Jann, B. 2005. Tabulation of Multiple Responses. *The Stata Journal*, 5, pp. 92-122.
- Kennedy, C.A., *et al.* 2010. Systematic review of the role of occupational health and safety interventions in the prevention of upper extremity musculoskeletal symptoms, signs, disorders, injuries, claims and lost time. *Journal of Occupational Rehabilitation*. Volume 20:127-162.
- Leedy, P.D. & Ormrod, J.E. 2010. *Practical Research, Planning and Design*. 9th ed. Pearson Education International.
- Lefler, R.K. 2004. *Office Chair: Choosing the Right Ergonomic Office Chair*. [Online]. Available at: <http://www.spine-health.com/wellness/ergonomics/office-chair-choosing-right-ergonomic-office-chair> [accessed: 11 March 2011].
- Leigh, J.P. 2011. Economic Burden of Occupational Injury and Illness in the United States. *Milbank Quarterly*. [Online]. Volume 89, Issue.4:728-772. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0009.2011.00648.x/abstract> [accessed: 8 February 2012].
- Letsoalo, M.E. & Lesaoana, M. 2012. Determination of Causal Effect in Observational Studies: Analysis of Correlated Data with Binary End-Points. *Journal of Mathematics and System Science*, 2:119-125.
- Mahmud, N., Kenny, D.T., Zein, R.M. & Hassan, S.N. 2011. Ergonomic training reduces musculoskeletal disorders among office workers: Results from the 6-Month Follow-Up. *Malaysian Journal Medical Science*. April-June 2011; 18(2):16-26.
- Martin, L.M. (N.d.). *Ergonomics in the office environment*. [PowerPoint Presentation]. Available at: http://www.business.mcmaster.ca/hrlr/profs/zeytino/OHScoursematerial/Laura_Munro_Martin_Presentation.pdf [accessed: 8 February 2011].
- Mayo Clinic. 2010a. *Rotator Cuff: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/rotator-cuff-injury/DS00192> [accessed 6 October 2010].
- Mayo Clinic. 2010b. *Rotator Cuff: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/rotator-cuff-injury/DS00192/DSECTION=causes> [accessed: 11 October 2010].
- Mayo Clinic. 2011a. *Bursitis: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/bursitis/DS00032> [accessed: 22 February 2011].
- Mayo Clinic. 2011b. *Carpal tunnel syndrome: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/carpal-tunnel-syndrome/DS00326/DSECTION=causes> [accessed: 12 August 2012].
- Mayo Clinic. 2011c. *Carpal tunnel syndrome: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/carpal-tunnel-syndrome/DS00326> [accessed: 12 August 2012].

- Mayo Clinic. 2011d. *Fibromyalgia: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/fibromyalgia/DS00079> [accessed: 12 October 2011].
- Mayo Clinic. 2011e. *Raynaud's disease: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/raynauds-disease/DS00433> [accessed: 29 September 2012].
- Mayo Clinic. 2011f. *Raynaud's disease: symptoms*. [Online]. Available at: <http://www.mayoclinic.com/health/raynauds-disease/DS00433/DSECTION=symptoms> [accessed: 29 September 2012].
- Mayo Clinic. 2011g. *Sprains and strains: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/sprains-and-strains/DS00343> [accessed: 25 September 2012].
- Mayo Clinic. 2011h. *Subacromial bursitis*. [Online]. Available at: <http://www.mayoclinic.com/health/medical/IM01596> [accessed: 20 July 2012].
- Mayo Clinic. 2011i. *Trigger finger: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/trigger-finger/DS00155/DSECTION=causes> [accessed: 4 September 2012].
- Mayo Clinic. 2012a. *Back pain: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/back-pain/DS00171/DSECTION=causes> [accessed: 15 April 2013].
- Mayo Clinic. 2012b. *De Quervain's syndrome: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/de-quervains-tenosynovitis/DS00692/DSECTION=causes> [accessed: 20 July 2010].
- Mayo Clinic. 2012c. *Dupuytren's contracture*. [Online]. Available at: <http://www.mayoclinic.com/health/medical/IM01142> [accessed: 25 September 2013].
- Mayo Clinic. 2012d. *Eyestrain: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/eyestrain/DS01084/DSECTION=causes> [accessed: 24 February 2013].
- Mayo Clinic. 2012e. *Eyestrain: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/eyestrain/DS01084> [accessed: 11 May 2013].
- Mayo Clinic. 2012f. *Golfer's elbow: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/golfers-elbow/DS00713/DSECTION=causes> [accessed: 25 September 2013].
- Mayo Clinic. 2012g. *Golfer's elbow: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/golfers-elbow/DS00713> [accessed: 25 September 2013].
- Mayo Clinic. 2012h. *Myofascial pain syndrome: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/myofascial-pain-syndrome/DS01042> [accessed: 15 September 2012].
- Mayo Clinic. 2012i. *Sciatica: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/sciatica/DS00516> [accessed: 24 February 2013].

- Mayo Clinic. 2012j. *Sciatica: symptoms*. [Online]. Available at: <http://www.mayoclinic.com/health/sciatica/DS00516/DSECTION=symptoms> [accessed: 24 February 2013].
- Mayo Clinic. 2013a. *Deep vein thrombosis: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/deep-vein-thrombosis/DS01005> [accessed: 20 September 2013].
- Mayo Clinic. 2013b. *Migraine: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/migraine-headache/DS00120> [accessed: 2 July 2013].
- Mayo Clinic. 2013c. *Muscle pain: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/muscle-pain/MY00113/DSECTION=causes> [accessed: 17 September 2013].
- Mayo Clinic. 2013d. *Muscle pain: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/muscle-pain/MY00113> [accessed: 17 September 2013].
- Mayo Clinic. 2013e. *Osteoarthritis: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/osteoarthritis/DS00019> [accessed: 28 September 2013].
- Mayo Clinic. 2013f. *Tennis elbow: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/tennis-elbow/DS00469/DSECTION=causes> [accessed: 14 August 2013].
- Mayo Clinic. 2013g. *Tension headache: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/tension-headache/DS00304/DSECTION=causes> [accessed: 11 August 2013].
- Mayo Clinic. 2013h. *Tension headache: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/tension-headache/DS00304> [accessed: 11 August 2013].
- Mayo Clinic. 2013i. *Thoracic outlet syndrome: causes*. [Online]. Available at: <http://www.mayoclinic.com/health/thoracic-outlet-syndrome/DS00800/DSECTION=causes> [accessed: 25 September 2013].
- Mayo Clinic. 2013j. *Thoracic outlet syndrome: definition*. [Online]. Available at: <http://www.mayoclinic.com/health/thoracic-outlet-syndrome/DS00800> [accessed: 25 September 2013].
- Mayo Clinic. 2014. *Depression and anxiety*. [Online]. Available at: <http://www.mayoclinic.com/health/depression-and-anxiety/AN01615> [accessed: 24 July 2014].
- McMillan, J.H. & Schumacher, S. 2001. *Research in education – a conceptual introduction*. 5th ed. New York: Addison-Wesley Longman.
- McMillan, J.H. & Schumacher, S. 2014. *Research in education – Evidence-Based Inquiry*. 7th ed. Pearson Education Limited: London
- MedicineNet.com. 2014. *Hand-arm vibration syndrome*. [Dictionary]. Available at: <http://www.medterms.com/script/main/art.asp?articlekey=19713> [accessed: 10 July 2014].

- Miller, H. 2001. *Musculoskeletal disorders in the U.S. office workforce*. [Online]. Available at: http://www.jamarshall.com/images/wp_Musculoskeletal.pdf [accessed: 18 February 2010].
- New York University Medical Center. 2013. *Posterior interosseous nerve palsy*. [Online]. Available at: <http://neurosurgery.med.nyu.edu/conditions-we-treat/z-conditions-guide/supinator-syndrome> [accessed: 23 September 2013].
- Occupational Health Clinics for Ontario Workers Inc. 2008. *Office Ergonomics Handbook, 5th ed.* [Online]. Available at: <http://www.ohcow.on.ca/uploads/Resource/24234%20OHCOW%20Office%20Ergonomics%20Handbook%20Website.pdf> [accessed: 1 March 2011].
- Occupational Safety and Health Administration. 2013. *Safety and Health Topics: Ergonomics*. [Online]. Available at: www.osha.gov/SLTC/ergonomics/ [accessed: 9 September 2013].
- Office ergonomic solutions. 2011. *Office Ergonomics, Help Is Here!* [Online]. Available at: <http://www.office-ergonomic-solutions.com/> [accessed: 11 April 2011].
- Ontario Ministry of Labour. 2008. Workplace ergonomics-related injuries. *Background Document d'information*. [Online]. Available at: <http://www.labour.gov.on.ca/english/news/pdf/2008/08-15b2.pdf> [accessed: 23 April 2009].
- Ontario Ministry of Labour. 2009a. *Choosing and Implementing Controls*. [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/controls.php> [accessed: 23 April 2009].
- Ontario Ministry of Labour. 2009b. *Prevent Workplace Pains & Strains!* [Online]. Available at: http://www.labour.gov.on.ca/english/hs/pubs/ergonomics/is_ergonomics.php [accessed: 23 April 2009].
- Ontario Ministry of Labour. 2009c. *Understanding fixed and awkward postures*. [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/posture.php> [accessed: 16 March 2011].
- Ontario Ministry of Labour. 2009d. *Understanding force*. [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/force.php> [accessed: 16 March 2011].
- Ontario Ministry of Labour. 2009e. *Understanding repetition*. [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/repetition.php> [accessed: 16 March 2011].
- Ontario Ministry of Labour. 2009f. *Why are Pains and Strains/Musculoskeletal Disorders (MSDs) a Problem?* [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/problem.php> [accessed: 16 March 2011].
- Ontario Ministry of Labour. 2010. *Computer ergonomics: Workstation*. [Online]. Available at: http://www.labour.gov.on.ca/english/hs/pubs/comp_erg/gl_comp_erg_2.php [accessed: 17 March 2011].

- Ontario Ministry of Labour. 2011. *Why do Pains and Strains/ Musculoskeletal Disorders (MSDs) Occur in the Workplace?* [Online]. Available at: <http://www.labour.gov.on.ca/english/hs/pubs/pains/occur.php> [accessed: 1 March 2011].
- Patient.co.uk. 2013a. *Tendonitis and Tenosynovitis*. [Online]. Available at: <http://www.patient.co.uk/health/Tenosynovitis.htm> [accessed: 1 June 2013].
- Patient.co.uk. 2013b. *Olecranon bursitis*. [Online]. Available at: <http://www.patient.co.uk/health/Olecranon-Bursitis.htm> [accessed: 1 November 2013].
- Pyöriä, P. 2011. Managing telework: risks, fears and rules. *Management Research Review*. Volume 34:4. 2011:386-399. Emerald Group Publishing Limited.
- Ranney, D. 2011. *Pain in the Workplace*. [Online/Image]. Available at: <http://jubilation.uwaterloo.ca/~ranney/workpain.html> [accessed: 20 July 2011].
- Repetitive Strain Injuries Awareness. 2007a. *Bursitis*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/bursitis.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007b. *Carpal tunnel syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/carpal_tunnel.asp [accessed: 12 August 2009].
- Repetitive Strain Injuries Awareness. 2007c. *Cervical syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/cervical_syndrome.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007d. *Cubital tunnel syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/cubital_tunnel.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007e. *Damaged muscles/connective tissue*. [Online]. Available at: http://www.rsi.org.uk/text_only/whatis/damaged_muscles.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007f. *Double crush syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/double_crush.asp [accessed: 29 July 2010].
- Repetitive Strain Injuries Awareness. 2007g. *Dupuytren's contracture*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/dupuytren_contracture.asp [accessed: 4 August 2010].
- Repetitive Strain Injuries Awareness. 2007h. *Epicondylitis*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/epicondylitis.asp [accessed: 22 February 2010].
- Repetitive Strain Injuries Awareness. 2007i. *Ganglion cyst*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/ganglion_cyst.asp [accessed: 4 August 2010].
- Repetitive Strain Injuries Awareness. 2007j. *Hypothenar hammer syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/hypothenar_hammer.asp [accessed: 19 July 2010].

- Repetitive Strain Injuries Awareness. 2007k. *Inflamed tendons*. [Online]. Available at: http://www.rsi.org.uk/text_only/whatis/inflamed_tendons.asp [accessed: 22 February 2010].
- Repetitive Strain Injuries Awareness. 2007l. *Muscle sprain and strain*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/muscle_sprain.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007m. *Neck, shoulders, back, lower limbs*. [Online]. Available at: http://www.rsi.org.uk/text_only/whatis/neck_back.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007n. *Non-specific pain*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/non_specific_pain.asp [accessed: 29 July 2010].
- Repetitive Strain Injuries Awareness. 2007o. *Prevalence*. [Online]. Available at: http://www.rsi.org.uk/pdf/ULDs_Overview.pdf [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007p. *Pronator teres syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/pronator_teres.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007q. *Restricted blood flow*. [Online]. Available at: http://www.rsi.org.uk/text_only/whatis/restricted_blood_flow.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007r. *Tenosynovitis*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/tenosynovitis.asp [accessed: 22 February 2010].
- Repetitive Strain Injuries Awareness. 2007s. *Tension neck syndrome*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/tension_neck_syndrome.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007t. *Thoracic outlet*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/thoracic_outlet.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007u. *Trapped nerves*. [Online]. Available at: http://www.rsi.org.uk/text_only/whatis/trapped_nerves.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007v. *Upper limb disorders: An overview*. [Online]. Available at: http://www.rsi.org.uk/pdf/ULDs_Overview.pdf [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007w. *Vibration white finger*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/vibration_white_finger.asp [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007x. *What is RSI?* [Online]. Available at: <http://www.rsi.org.uk/headerpage1.asp> [accessed: 19 July 2010].
- Repetitive Strain Injuries Awareness. 2007y. *Writer's cramp*. [Online]. Available at: http://www.rsi.org.uk/text_only/conditions/writer_cramp_additional.asp [accessed: 19 July 2010].

- Republic of South Africa. 1993. *Section (1) (a) of the Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993*. [Online]. Available at: <http://www.labour.gov.za/downloads/legislation/acts/compensation-for-occupational-injuries-and-diseases/amendments/Amended%20Act%20-%20Compensation%20for%20Occupational%20Injuries%20and%20Diseases.pdf> [accessed: 5 July 2013].
- Republic of South Africa. 2004a. *Circular Instruction No. 180 Regarding the Compensation of Work-related Upper Limb Disorders*. The Government Gazette, Vol. 466, 23 April 2004, No. 26270. Pretoria. [Online]. Available at: <http://www.info.gov.za/view/DownloadFileAction?id=59564> [accessed: 5 July 2013].
- Republic of South Africa. 2004b. *Occupational Health and Safety Act, No. 85 of 1993 as amended by Occupational Health and Safety Amendment Act, No. 181 of 1993*. [Online]. Available at: http://www1.chr.up.ac.za/undp/domestic/docs/legislation_31.pdf [accessed: 5 July 2013].
- Right Health. 2010a. *Anterior interosseous nerve syndrome*. [Online]. Available at: http://www.righthealth.com/topic/Anterior_interosseous_nerve_syndrome? [accessed: 23 September 2010].
- Right Health. 2010b. *Posterior interosseous nerve syndrome*. [Online]. Available at: http://www.righthealth.com/topic/Posterior_Interosseous_Nerve_Syndrome [accessed: 23 September 2010].
- Right Health. 2010c. *Tendinosis*. [Online]. Available at: <http://www.righthealth.com/topic/tendinosis> [accessed: 19 July 2010].
- Robertson, M. & Vink, P. 2012. *Examining New Ways of Office Work between the Netherlands and the USA*. Work 41. 2012:5086-5090. IOS Press.
- Safety and Health Assessment and Research for Prevention (SHARP). 2007. Injured at work: what workers' compensation data reveal about work-related musculoskeletal disorders. *Summary of Technical Report number 40-10a-2006*. [Online]. Available at: <http://www.lni.wa.gov/Safety/Research/Files/InjuredAtWork.pdf> [accessed: 23 November 2009].
- Safety and Health Assessment and Research for Prevention (SHARP). 2013. Prioritising Industries for Occupational Injury and Illness Prevention and Research, Washington State Workers' Compensation Claims Data, 2002-2010. *Technical Report Number 64-1-2013*. [Online]. Available at: http://lni.wa.gov/Safety/Research/Files/bd_3F.pdf [accessed: 10 June 2014].
- Shaver, E. 2010. *Stress and stressors*. [Online]. Available at: <http://www.thehumanfactorblog.com/tag/workplace-stress/> [accessed: 20 April 2011].
- Shuttleworth, M. 2008. *Validity and Reliability*. [Online]. Available at: <http://www.experiment-resources.com/validity-and-reliability.htm> [accessed: 5 October 2011]. Retrieved from Experiment Resources.
- Skill Builders. 2009. *Radial tunnel syndrome*. [Online]. Available at: <http://skillbuilders.patientsites.com/Injuries-Conditions/Elbow/Elbow-Issues/Radial-Tunnel-Syndrome/a~1495/article.html> [accessed: 13 October 2010].

- Smit, B.R. (N.d.). *Using the South African Excellence Model to focus improvement strategies in South Africa*. Witwatersrand Technikon, Johannesburg, Gauteng, South Africa. (Online). Available from: <http://sajie.journals.ac.za>. Or http://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=4&ved=0CD0QFjAD&url=http%3A%2F%2Fsajie.journals.ac.za%2Fpub%2Farticle%2Fdownload%2F373%2F318&ei=CnKIUoq4BJOThQeju4HgDg&usg=AFQjCNFAT3hqptFPtmUbrGQPtJ90gw_n_g&bvm=bv.56643336,d.ZG4 [accessed: 16 November 2013].
- South African Excellence Foundation (SAEF). 2000. *The South African Business Excellence Model- Criteria and General Guidelines*. 3rd ed. S A Quality Institute, Pretoria South Africa.
- South African Excellence Foundation (SAEF). 2002. *History and Development of the South African Excellence Award*. Appendix E, Assessor Training Guide.
- (The) South African Labour Guide. (N.d.). *What every worker and employer should know about health and safety in the workplace*. [Online]. Available at: <http://www.labour.gov.za/DOL/downloads/documents/useful-documents/occupational-health-and-safety/Useful%20Document%20-%20OHS%20-%20What%20every%20worker%20should%20know.pdf> [accessed: 1 August 2013].
- Strydom, E.A. & Hoffmann, E.C. 2010. Business and information administration technologies and ergonomics: regulatory compliance in an e-environment. In School of Public Management. *12th International Winelands Conference, Public leadership for added citizen value*. University of Stellenbosch, 15-19 March 2010, Stellenbosch: unpublished.
- Strydom, E.A. 2013. *Work-related musculoskeletal disorders figure*. Adapted from 3D Male Human Anatomy, Zygote media group, Inc, 2006. [Image]. Available at: <http://www.flickr.com/photos/gerwaz/4473612841/> [accessed: 12 September 2010].
- SurveyMonkeyTM. 2013. *Free Online Survey and Questionnaire Design and Management Software Package*. [Online]. Available at: <http://www.surveymonkey.net/MySurveys.aspx> [accessed: 1 February 2013].
- Sutton, M. 2006. Why we need knowledge workers to become knowledge citizens. *South African Journal of Information Management*. Vol. 8(1) March 2006. Published by InterWord Communications for Department of Information and Knowledge Management, University of Johannesburg.
- Telework Exchange. 2009. *Straight Talk on Telework Technology*. [Online]. Available at: http://www.verizonbusiness.com/resources/whitepapers/wp_straight-talk-on-telework-technology_en_xg.pdf [accessed: 12 May 2011].
- Telework.gov. (N.d.). Telework 101 for Managers, *Benefits of telework*. [Online]. Available at: http://www.telework.gov/Tools_and_Resources/Training/Managers/Final_Lesson01/Lesson01/TM-01-01-0070.aspx [accessed: 12 May 2012].
- Telework.gov. 2014. *Official website of the Federal Government's telework program*. [Online]. Available at: http://www.telework.gov/About_Telework/index.aspx [accessed: 24 January 2013].
- The free dictionary by Farlex. 2013a. *Bursae*. [Encyclopaedia]. Available at: <http://medical-dictionary.thefreedictionary.com/Bursitis> [accessed: 9 March 2013].

- The free dictionary by Farlex. 2013b. *Depression*. [Encyclopaedia]. Available at: <http://encyclopedia2.thefreedictionary.com/depression> [accessed: 9 March 2013].
- The free dictionary by Farlex. 2013c. *Myalgia*. [Encyclopaedia]. Available at: <http://encyclopedia.thefreedictionary.com/myalgia> [accessed: 9 March 2013].
- The free dictionary by Farlex. 2013d. *Stress*. [Encyclopaedia]. Available at: <http://medical-dictionary.thefreedictionary.com/Stress> [accessed: 9 March 2013].
- The Picky. 2010. *What is cell phone elbow syndrome?* [Online]. Available at: <http://www.thepicky.com/gadgets/what-is-cell-phone-elbow-syndrome/> [accessed: 12 October 2010].
- Thomas, J. 2009. 'Cell Phone Elbow' - A New Ill for the Wired Age. *HealthDay News*. [Online]. 2 June 2009. Available at: <http://news.health.com/2009/06/02/cell-phone-elbow-new-ill-wired-age/> [accessed: 12 October 2010].
- Triano, J.J. 2010. *Office Chair: How to Reduce Back Pain*. [Online]. Available at: <http://www.spine-health.com/wellness/ergonomics/office-chair-how-reduce-back-pain> [accessed: 9 March 2011].
- Triano, J.J. and Selby, N.C. 2006. *Work Ergonomics: Minimize Back Injuries*. [Online]. Available at: <http://www.spine-health.com/wellness/ergonomics/work-ergonomics-minimize-back-injuries> [accessed: 10 March 2011].
- Tutor2u. 2013. *What is ICT?* [Online]. Available at: http://tutor2u.net/business/ict/intro_what_is_ict.htm [accessed: 16 October 2013].
- United States General Accounting Office. 2004. *Key Practices to Increasing Federal Telework*. GAO-04-950T (Washington, D.C.: July 2004). (Online). Available at: <http://www.gao.gov/new.items/d04950t.pdf> [accessed: 10 November 2013].
- United States General Service Administration. (N.d.). *The Benefits of Telework*. [Online]. Available at: <http://archive.teleworkexchange.com/pdfs/The-Benefits-of-Telework.pdf> [accessed: 16 June 2011].
- United States General Service Administration. 2012. *About Telework*. [Online]. Available at: <http://www.gsa.gov/portal/content/104528> [accessed: 16 June 2012].
- United States General Service Administration. 2013. *Alternative Workplace Solutions*. [Online]. Available at: <http://www.gsa.gov/portal/content/102702> [accessed: 28 June 2013].
- United States Office of Personnel Management. (N.d.). *A Guide to Telework in the Federal Government*. [Online]. Available at: <http://www.opm.gov/pandemic/agency2a-guide.pdf> [accessed: 15 November 2009].
- United States Office of Personnel Management. 2011a. *Guide to Telework in the Federal Government*. [Online]. Available at: http://www.telework.gov/guidance_and_legislation/telework_guide/telework_guide.pdf [accessed: 28 June 2011].
- United States Office of Personnel Management. 2011b. *Status of Telework in the Federal Government*. Report to the Congress. [Online]. Available at: http://www.telework.gov/Reports_and_Studies/Annual_Reports/2010teleworkreport.pdf [accessed: 24 July 2013].

- Unites states Office of Personnel Management. 2012. *Status of Telework in the Federal Government*. Report to the Congress. [Online]. Available at [http://www.telework.gov/Reports and Studies/Annual Reports/2012teleworkreport.pdf](http://www.telework.gov/Reports_and_Studies/Annual_Reports/2012teleworkreport.pdf) [accessed: 24 July 2013].
- University of Toronto. 2009. Environmental health and safety. *Office Ergonomics Standard: Ergonomic Requirements for Moderate and Intensive Computer Users*. [Online]. Available at: <http://www.ehs.utoronto.ca/services/Ergonomics/ergostd.htm> [accessed: 1 March 2013].
- Washington State Department of Labour and Industries. 2002. *Office Ergonomics: Practical solutions for a safer workplace*. [Online]. Available at: <http://www.lni.wa.gov/IPUB/417-133-000.pdf> [accessed: 8 February 2011].
- Watterson, B. (N.d.). *Bill Watterson Quotes*. [Online]. Available at: http://www.brainyquote.com/quotes/authors/b/bill_watterson.html [accessed: 18 January 2014].
- Welman, C., Kruger, F. & Mitchell, B. 2005. *Research Methodology*. 3rd ed. Cape Town: Oxford University Press SA.
- Werth, A.J. & Babski-Reeves, K. 2012. Assessing posture while typing on portable computing devices in traditional work environments and at home. [Online]. *Proceedings of the Human Factors and Ergonomics Society 56th Annual Meeting*. 2012:1258-1262. Available at: <http://pro.sagepub.com/content/56/1/1258>. [accessed: 6 June 2014].
- Williams, J.C. 2008. *A retrospective view of the South African excellence model*. (Online). Available at: <http://scholar.sun.ac.za/handle/10019.1/783> (accessed: 14 November 2013).
- Wisegeek. 2013c. *What is an anti-glare computer screen?* [Online]. Available at: <http://www.wisegeek.com/what-is-an-anti-glare-computer-screen.htm> [accessed: 14 April 2013].
- WorldatWork. 2011. *Survey on Workplace Flexibility*. [Online]. Available at: www.worldatwork.org/waw/adimLink?id=48160. [accessed: 9 June 2014].
- Workers' Compensation Board, Alberta. 2007. *Office Ergonomics: Think detection. Think prevention. Think Activity*. [Online]. Available at: http://www.wcb.ab.ca/pdfs/public/office_ergo.pdf [accessed: 8 February 2011].
- Zungu, L.I. & Ndaba, E.F. 2009. Self-reported musculoskeletal disorders among office workers in a private hospital in South Africa: prevalence and relation to physical demands of the work. *Occupational Health Southern Africa*. [Online]. September-October 2009:25-30. Volume 15 number 5. Available at: <http://www.occhealth.co.za/?/issue/185> [accessed: June 2014].
- Zygot media group, inc. 2006. *3D Male Human Anatomy*. [Image]. Available at: <http://www.flickr.com/photos/gerwaz/4473612841/> [accessed: 12 September 2010].

ANNEXURE A

Main study Questionnaire: Managers/Line-Managers/Supervisors of Teleworkers

<p>BUSINESS AND INFORMATION ADMINISTRATION

Consent

***1. Please note that the results of this survey is for purposes of a DAdmin Business Management. The results may be published. Your personal information will be kept anonymous and confidential.**

I have read all the conditions in the participant's information letter sent with this questionnaire.

- Yes, I consent to participate
 No, I do not wish to participate

***2. My organisation allows employees the flexibility to do telework.**

Telework refers to any arrangement in which an employee regularly performs officially assigned duties at home or other work sites geographically convenient to the residence of the employee.

- Yes
 No

Demographic information

3. Which of the following best describes your position in the organisation?

- Top management
 Middle management
 Line manager
 Supervisor

Other (please specify)

4. Which of the following best describes your industry sector?

- Agriculture, forestry and fishing
 Construction
 Education
 Electricity, gas and water
 Finance, real estate and business services
 General government services
 Manufacturing
 Mining and quarrying
 Personal services
 Transport, storage and communication
 Wholesale, retail and motor trade; Catering and accommodation

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

5. What is the total number of full-time knowledge workers in your organisation / department / unit / section managed by you?

(A knowledge worker is defined as somebody who works primarily with information or who develops and uses knowledge in the workplace.)

6. How many of each of the following electronic devices are used by knowledge workers in your organisation / department / unit / section managed by you?

Desktop computers

Laptops

Tablets (e.g. iPads)

Smartphones

Cell phones

Telework

Telework refers to any arrangement in which an employee regularly performs officially assigned duties at home or other work sites geographically convenient to the residence of the employee. Telework must occur at least one day per week on a regular and recurring basis and does not include full-time mobile work arrangements or situational telework (e.g. unscheduled, project-oriented, non-recurring, and/or irregular telework and/or any teleworking that occurs less frequently than once a week on a recurring basis).

7. Select the types of telework / alternative workplace arrangements applied in your organisation / department / unit / section from the list below:

- A home office / Working at Home / Small Office Home Office (SOHO) / Cocooning
- A mobile office / A non-territorial office / An unassigned office / Alternative workspace/-place/-site
- Telecentre / Telecottage / Televillage / Telecommuting centre / Telebusiness centre / Community technology centre / Interactive (service) delivery centres
- Flexitime / Flexiwork / Flexiplace
- Hot-desking / Free address / Touchdown workstations
- Hoteling
- Desk sharing
- Just in time

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

8. How many years have your organisation's / department's / unit's / section's telework programme been in operation?

- Up to a year
- Up to two years
- Up to three years
- Up to four years
- Up to five years

Over five years, please specify the number of years

9. How many full-time knowledge workers in your organisation / department / unit / section are engaged in telework on a regular, recurring basis (excluding day-extenders - referring to those employees who work at home after hours)?

10. With reference to the total number of teleworkers indicated in the previous question, specify the number of workers according to the following telework arrangements:

- One day per week
- Up to two days per week
- Up to three days per week
- Up to four days per week
- Up to five days per week
- Other

11. How do you monitor the teleworkers in your organisation / department / unit / section managed by you?

- Track teleworkers through a time and attendance register
- Use a dedicated software tracking system
- Focus on results/output
- No monitoring applied

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

12. With regard to furniture / equipment / services to the teleworker, did your organisation / department / unit / section

- provide needed furniture / equipment / services to the teleworker?
- purchase needed furniture / equipment / services for the teleworker?
- request employees to purchase their own furniture / equipment / services?
- require of employees to share furniture / equipment / services expenses with the organisation?
- agree to pay the fee for furniture / equipment / services used at an alternative worksite?

Other (please specify)

Regulatory compliance

13. Which of the following organisational policies / procedures / government acts are applied in your organisation?

- Health and safety policy
- Occupational health programme
- Ergonomics policy
- Telework policy and guidelines
- Formal telework agreement
- Informal telework agreement
- Occupational Health and Safety Act (No 85 of 1993)
- Compensation for Occupational Injuries and Diseases Act, (No 130 of 1993)

Other (please specify)

14. How does your organisation ensure telework policy and regulatory compliance?

- Scheduled visits to alternative worksite
- Official policies / agreements with teleworkers

Other (please specify)

15. Does your organisation provide telework training?

	No	Yes
For managers	<input type="checkbox"/>	<input type="checkbox"/>
For employees (teleworkers)	<input type="checkbox"/>	<input type="checkbox"/>

<p>BUSINESS AND INFORMATION ADMINISTRATION

16. In your opinion, which of the following topics should be included in a telework training programme?

- Occupational Health and Safety Act
- Compensation for Occupational Injuries and Diseases Act
- Telework policies and guidelines
- Ergonomics policies and guidelines
- Alternative worksite safety and security
- Guidance on health aspects in the alternative worksite environment
- None

Other (please specify)

Work-related musculoskeletal disorders and Ergonomics

Work-related musculoskeletal disorders is a collective term for a group of occupational diseases that comprise musculoskeletal disorders caused by exposure in the workplace affecting the muscles, tendons, nerves, blood vessels, joints and bursae of the hand, wrist, arm and shoulder. These are syndromes associated with characteristic symptoms and physical signs e.g. rotator cuff syndrome, epicondylitis at the elbow, tenosynovitis and nerve entrapments such as carpal tunnel syndrome.

Ergonomics uses information about human abilities, attributes, and limitations to ensure that their equipment, work and workplaces allow for these variations.

17. Which of the following occupational risk factors have teleworkers in your organisation / department / unit / section been exposed to?

- Movements requiring force exertion (lifting, carrying; pushing, pulling, gripping, manipulating objects)
- Awkward or non-neutral postures (movements at extremes of reach)
- Repetition of motions (same body parts are used repeatedly, with few breaks/chances to rest)
- Static muscle loading (holding the body in a single position for a long period)
- Mechanical/local contact stress (pressing hard with any body part on sharp edges)
- Exposure to extreme temperatures (humidity, heat and especially to cold)
- Exposure to poor lighting (glare, dim/sharp light)
- Exposure to hazardous stressors (noise, dirt, chemical and toxic substances)
- Exposure to task-related stressors (time pressure, work overload, work complexity, monotonous work, disruptions)
- Exposure to work-schedule stressors (night work, shift work, long hours, overtime)
- Exposure to social stressors (interpersonal conflicts, harassment, bullying)
- Exposure to role stressors (ambiguity, conflict)
- Exposure to career-related stressors (job insecurity, poor career opportunities)
- Exposure to poor work organisation (low level of control over work rate, no breaks)
- Exposure to organisational stressors (mergers, downsizing, re-organisation, technology implementation)
- Exposure to traumatic stressors (disasters, major accidents, dangerous activities)
- Predisposing medical conditions (previous joint injury, diabetes, high/low blood pressure)
- None

Other (please specify)

18. Has any work-related musculoskeletal disorders been reported by teleworkers in your organisation / department / unit / section in the last year?

- Yes
- No

If YES, how many?

<p>BUSINESS AND INFORMATION ADMINISTRATION

19. What type of consequences / costs resulted from the reported work-related musculoskeletal disorders in the last year?

- Disruptions in productivity
- Low quality work
- Lost workdays
- Worker replacement costs
- Training costs
- Paid leave
- Employee's compensation premiums
- Medical expenses
- Direct compensation costs
- Litigation costs
- None

Other (please specify)

20. If a teleworker lodged a compensation fund claim due to work-related musculoskeletal disorders, did your organisation / department / unit / section:

	Yes	No	Not applicable
provide support and guidance to the teleworker?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
improve the teleworker's work environment?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
put measures in place to prevent similar claims?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
discourage the teleworker to lodge the claim?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
penalise the teleworker in any way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

THANK YOU FOR YOUR CO-OPERATION AND SUPPORT!

ANNEXURE B

Main study Questionnaire: Teleworkers

<p>BUSINESS AND INFORMATION ADMINISTRATION

Consent

***1. Please note that the results of this survey is for purposes of a DAdmin Business Management. The results may be published. Your personal information will be kept anonymous and confidential.**

I have read all the conditions in the participant's information letter sent with this questionnaire.

- Yes, I consent to participate
- No, I do not wish to participate

***2. I have the flexibility to do telework in my environment.**

Telework refers to any arrangement in which an employee regularly performs officially assigned duties at home or other work sites geographically convenient to the residence of the employee.

- Yes
- No

Demographic information

3. Indicate your age in years.

4. Indicate your gender.

- Male
- Female

5. Which of the following best describes your industry sector?

- Agriculture, forestry and fishing
- Construction
- Education
- Electricity, gas and water
- Finance, real estate and business services
- General government services
- Manufacturing
- Mining and quarrying
- Personal services
- Transport, storage and communication
- Wholesale, retail and motor trade; Catering and accommodation

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

Telework

Telework refers to any arrangement in which an employee regularly performs officially assigned duties at home or other work sites geographically convenient to the residence of the employee. Telework must occur at least one day per week on a regular and recurring basis and does not include full-time mobile work arrangements or situational telework (e.g. unscheduled, project-oriented, non-recurring, and/or irregular telework and/or any teleworking that occurs less frequently than once a week on a recurring basis).

6. Select the types of telework / alternative workplace arrangements applicable to you from the list below:

- A home office / Working at Home / Small Office Home Office (SOHO) / Cocooning
- A mobile office / A non-territorial office / An unassigned office / Alternative workspace/-place/-site
- Telecentre / Telecottage / Televillage / Telecommuting centre / Telebusiness centre / Community technology centre / Interactive (service) delivery centres
- Flexitime / Flexiwork / Flexiplace
- Hot-desking / Free address / Touchdown workstations
- Hoteling
- Desk sharing
- Just in time

Other (please specify)

7. Select the frequency of the telework arrangement applicable to you.

- One day per week
- Up to two days per week
- Up to three days per week
- Up to four days per week
- Up to five days per week

Other (please specify)

8. How many years have you been on a regular, recurring basis involved in the telework programme of your organisation / department / unit / section?

- Up to a year
- Up to two year
- Up to three years
- Up to four years
- Up to five years

Over five years, please specify the number of years.

<p>BUSINESS AND INFORMATION ADMINISTRATION

9. Select the furniture / equipment / services used for teleworking.

- | | |
|--|---|
| <input type="checkbox"/> Stationery | <input type="checkbox"/> Internet access |
| <input type="checkbox"/> Desk | <input type="checkbox"/> Electronic mail |
| <input type="checkbox"/> Chair | <input type="checkbox"/> 3G Modems / Wireless Routers |
| <input type="checkbox"/> Print / copy / scan / fax machine | <input type="checkbox"/> Hotspots |
| <input type="checkbox"/> Laptop computer | <input type="checkbox"/> More than one telephone line |
| <input type="checkbox"/> Tablet (eg iPad) | <input type="checkbox"/> Remote access provided by a secure VPN |
| <input type="checkbox"/> Desktop computer | <input type="checkbox"/> In-house help desk support |
| <input type="checkbox"/> Smartphone | <input type="checkbox"/> Social networks (Skype, Facebook, Twitter) |
| <input type="checkbox"/> Cell phone | |

Other (please specify)

10. Specify whether the furniture / equipment / services used for teleworking belong to you as teleworker, your organisation or an alternative worksite.

	Teleworker	Your organisation	Alternative worksite
Stationery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Print / copy / scan / fax machine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laptop computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tablet (eg iPad)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desktop computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smartphone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cell phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic mail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3G Modems / Wireless Routers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hotspots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More than one telephone line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellphone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remote access provided by a secure VPN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In-house help desk support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social networks (Skype, Facebook, Twitter)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

Regulatory compliance

11. Which of the following organisational policies / procedures / government acts are applied in your organisation?

- Health and safety policy
- Occupational health programme
- Ergonomics policy
- Telework policy and guidelines
- Formal telework agreement
- Informal telework agreement
- Occupational Health and Safety Act (No 85 of 1993)
- Compensation for Occupational Injuries and Diseases Act, (No 130 of 1993)

Other (please specify)

12. How does your organisation ensure telework policy and regulatory compliance?

- Scheduled visits at alternative worksite
- Official policies / agreements with teleworkers

Other (please specify)

13. Did you receive telework training on any of the following topics from your organisation?

	Yes	No
Occupational Health and Safety Act	<input type="radio"/>	<input type="radio"/>
Compensation for Occupational Injuries and Diseases Act	<input type="radio"/>	<input type="radio"/>
Telework policies and guidelines	<input type="radio"/>	<input type="radio"/>
Ergonomics policies and guidelines	<input type="radio"/>	<input type="radio"/>
Alternative worksite safety and security	<input type="radio"/>	<input type="radio"/>
Guidance on health aspects in the alternative worksite environment	<input type="radio"/>	<input type="radio"/>

Work-related musculoskeletal disorders and Ergonomics

Work-related musculoskeletal disorders is a collective term for a group of occupational diseases that comprise musculoskeletal disorders caused by exposure in the workplace affecting the muscles, tendons, nerves, blood vessels, joints and bursae of the hand, wrist, arm and shoulder. These are syndromes associated with characteristic symptoms and physical signs e.g. rotator cuff syndrome, epicondylitis at the elbow, tenosynovitis and nerve entrapments such as carpal tunnel syndrome.

<p>BUSINESS AND INFORMATION ADMINISTRATION

Ergonomics uses information about human abilities, attributes, and limitations to ensure that their equipment, work and workplaces allow for these variations.

14. Are you exposed to any of the following occupational risk factors at the alternative worksite?

	Never	Sometimes	Often	Always
Movements requiring force exertion (lifting, carrying, pushing, pulling, gripping, manipulating objects)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awkward or non-neutral postures (movements at extremes of reach)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repetition of motions (same body parts are used repeatedly, with few breaks / chances to rest)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Static muscle loading (holding the body in a single position for a long period)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mechanical / local contact stress (pressing hard with any body part on sharp edges)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to extreme temperatures (humidity, heat and especially to cold)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to poor lighting (glare, dim / sharp light)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to hazardous stressors (noise, dirt, chemical and toxic substances)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to task-related stressors (time pressure, work overload, work complexity, monotonous work, disruptions)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to work-schedule stressors (night work, shift work, long hours, overtime)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to social stressors (interpersonal conflicts, harassment, bullying)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to role stressors (ambiguity, conflict)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to career-related stressors (job insecurity, poor career opportunities)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to poor work organisation (low level of control over work rate, no breaks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to organisational stressors (mergers, downsizing, re-organisation, technology implementation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to traumatic stressors (disasters, major accidents, dangerous activities)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predisposing medical conditions (previous joint injury, diabetes, high / low blood pressure)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

15. Which of the following work-related musculoskeletal disorder symptom(s) did you experience? Indicate the occurrence of the symptom(s).

	Never	Sometimes	Often	Always
Burning sensation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sensation of cold	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of normal sensation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of grip strength	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in range of movement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stiffness and cramps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle weakness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle spasm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tender trigger points in muscles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fatigue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tingling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swelling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

16. In your opinion, which ergonomic / other factor(s) caused / contributed to the development of work-related musculoskeletal disorders?

	Strongly Disagree	Disagree	Agree	Strongly Agree
Table / desk / workstation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chair	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Desktop computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laptop computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitor (height)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keyboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mouse use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of computer accessories (monitor risers, document holder)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of computer accessories (wrist / palm rest, armrest, footrest)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient space allocation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workflow (layout of furniture and organisation of individual workstation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lighting (glare, dim / sharp light)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Temperature (humidity, heat, cold)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Floor surfaces (hard, slippery, uneven, wet, sloping floor surfaces)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Noise (co-workers, ventilation systems, fans, computers, photocopiers, fax machines, telephones, outdoor noises such as traffic)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job design (task variety, work pace)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staffing levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work scheduling (overtime, shift work)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of rest / recovery breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of exercise / stretch breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overweight / obesity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

17. Did suffering from a work-related musculoskeletal disorder result in

- temporary job change?
- work station re-design?
- tool and equipment adaptation?
- job task modifications?
- retraining and re-assignment?
- work schedule modifications?
- job enlargement?
- job rotation?
- none

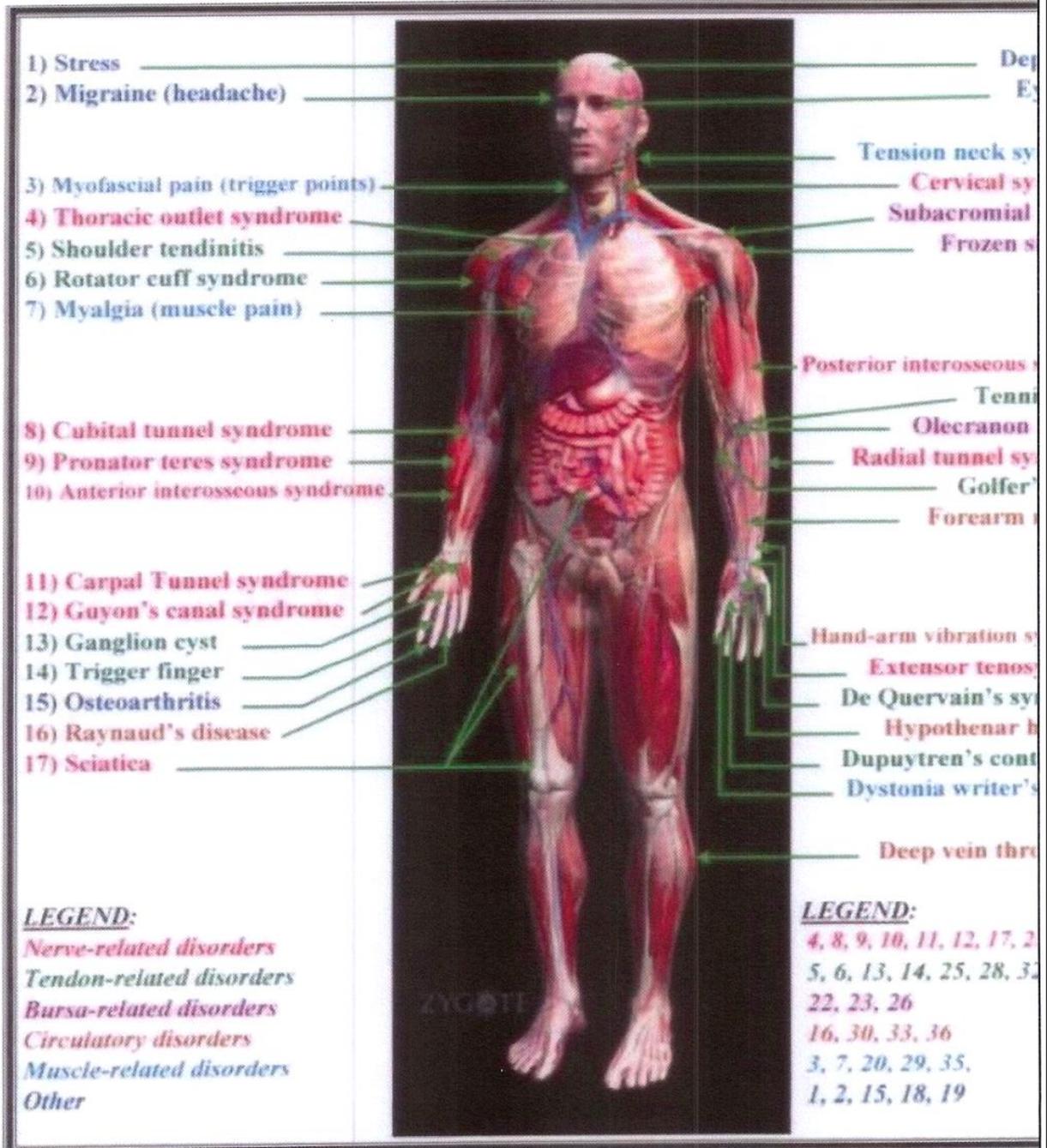
Other (please specify)

<p>BUSINESS AND INFORMATION ADMINISTRATION

The figure below provides an overview of the most common work-related musculoskeletal disorders affecting the nerves, tendons, bursae, muscles, blood vessels and spinal discs as summarised in the legend according to colours.

Use this figure as your guide to answer the next questions.

Keep in mind that your answers are **CONFIDENTIAL** and **ANONYMOUS**.



18. Have you reported any incidents of work-related musculoskeletal disorders to your employer in the last year?

- Yes
- No

If YES, how many?

19. If you suffered from any of the work-related musculoskeletal disorders indicated in the figure above, indicate the approximate total costs per year for medical intervention (e.g. medicine, visits to doctors / physiotherapists, hospital- and operation costs, rehabilitation).

Only enter the amount in whole figures without the "R" sign next to the identified disorders below.

- | | |
|--|----------------------|
| 1 Stress | <input type="text"/> |
| 2 Migraine (Headache) | <input type="text"/> |
| 3 Myofascial pain (trigger points) | <input type="text"/> |
| 4 Thoracic outlet syndrome | <input type="text"/> |
| 5 Shoulder tendinitis | <input type="text"/> |
| 6 Rotator cuff syndrome | <input type="text"/> |
| 7 Myalgia (muscle pain) | <input type="text"/> |
| 8 Cubital tunnel syndrome | <input type="text"/> |
| 9 Pronator teres syndrome | <input type="text"/> |
| 10 Anterior interosseous syndrome | <input type="text"/> |
| 11 Carpal tunnel syndrome | <input type="text"/> |
| 12 Guyon's canal syndrome | <input type="text"/> |
| 13 Ganglion cyst | <input type="text"/> |
| 14 Trigger finger | <input type="text"/> |
| 15 Osteoarthritis | <input type="text"/> |
| 16 Raynaud's disease (white finger) | <input type="text"/> |
| 17 Sciatica (lower back and leg pain) | <input type="text"/> |
| 18 Depression | <input type="text"/> |
| 19 Eyestrain | <input type="text"/> |
| 20 Tension neck syndrome | <input type="text"/> |
| 21 Cervical syndrome | <input type="text"/> |
| 22 Subacromial bursitis | <input type="text"/> |
| 23 Frozen shoulder (adhesive capsulitis) | <input type="text"/> |
| 24 Posterior interosseous syndrome | <input type="text"/> |
| 25 Tennis elbow | <input type="text"/> |

<p>BUSINESS AND INFORMATION ADMINISTRATION

26 Olecranon bursitis	<input type="text"/>
27 Radial tunnel syndrome	<input type="text"/>
28 Golfer's elbow	<input type="text"/>
29 Forearm myalgia	<input type="text"/>
30 Hand-arm vibration syndrome	<input type="text"/>
31 Extensor tenosynovitis	<input type="text"/>
32 De Quervain's syndrome	<input type="text"/>
33 Hypothenar hammer syndrome	<input type="text"/>
34 Dupuytren's contracture	<input type="text"/>
35 Dystonia writer's cramp	<input type="text"/>
36 Deep vein thrombosis	<input type="text"/>

<p>BUSINESS AND INFORMATION ADMINISTRATION

20. If you suffered from any of the work-related musculoskeletal disorders indicated in the figure, indicate the average workdays lost per year due to medical intervention.

Only mention the number of days in figures next to the identified disorders below.

- | | |
|--|----------------------|
| 1 Stress | <input type="text"/> |
| 2 Migraine (Headache) | <input type="text"/> |
| 3 Myofascial pain (trigger points) | <input type="text"/> |
| 4 Thoracic outlet syndrome | <input type="text"/> |
| 5 Shoulder tendinitis | <input type="text"/> |
| 6 Rotator cuff syndrome | <input type="text"/> |
| 7 Myalgia (muscle pain) | <input type="text"/> |
| 8 Cubital tunnel syndrome | <input type="text"/> |
| 9 Pronator teres syndrome | <input type="text"/> |
| 10 Anterior interosseous syndrome | <input type="text"/> |
| 11 Carpal tunnel syndrome | <input type="text"/> |
| 12 Guyon's canal syndrome | <input type="text"/> |
| 13 Ganglion cyst | <input type="text"/> |
| 14 Trigger finger | <input type="text"/> |
| 15 Osteoarthritis | <input type="text"/> |
| 16 Raynaud's disease (white finger) | <input type="text"/> |
| 17 Sciatica (lower back and leg pain) | <input type="text"/> |
| 18 Depression | <input type="text"/> |
| 19 Eyestrain | <input type="text"/> |
| 20 Tension neck syndrome | <input type="text"/> |
| 21 Cervical syndrome | <input type="text"/> |
| 22 Subacromial bursitis | <input type="text"/> |
| 23 Frozen shoulder (adhesive capsulitis) | <input type="text"/> |
| 24 Posterior interosseous syndrome | <input type="text"/> |
| 25 Tennis elbow | <input type="text"/> |
| 26 Olecranon bursitis | <input type="text"/> |
| 27 Radial tunnel syndrome | <input type="text"/> |
| 28 Golfer's elbow | <input type="text"/> |
| 29 Forearm myalgia | <input type="text"/> |
| 30 Hand-arm vibration syndrome | <input type="text"/> |
| 31 Extensor tenosynovitis | <input type="text"/> |
| 32 De Quervain's syndrome | <input type="text"/> |
| 33 Hypothenar hammer syndrome | <input type="text"/> |
| 34 Dupuytren's contracture | <input type="text"/> |

<p>BUSINESS AND INFORMATION ADMINISTRATION

35 Dystonia writer's cramp

36 Deep vein thrombosis

21. If you suffered from any of the work-related musculoskeletal disorders indicated in the figure and lodged a compensation claim,

	Yes	No	Not applicable
was it successful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you benefit financially?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did your work environment improve?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you get support / guidance from your organisation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
were you victimised / intimidated by your organisation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
have you experienced any penalties from your organisation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
has it affected your position at work negatively?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

22. If you suffered from any of the work-related musculoskeletal disorders indicated in the figure, list the reason(s) for NOT lodging a compensation claim with the Compensation Commissioner according to the Compensation for Occupational Injuries and Diseases Act.

THANK YOU FOR YOUR CO-OPERATION AND SUPPORT!

ANNEXURE C

Baseline study – Cover letter to Medical practitioners and Questionnaire

January 2010

TO: MEDICAL PRACTITIONERS

Dear Respondent

ACADEMIC RESEARCH: D.TECH: BUSINESS ADMINISTRATION

I am currently doing research to establish the extent to which companies in commerce and industry have the required policies and regulations in terms of ergonomics and technology in place.

Your input into this project will be of crucial value to identify the work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints that are not caused by acute trauma. The focus of this project is health and wellness aspects that could result in compensation claims and other legal actions against employers.

The results obtained from this research project could make a valuable contribution with regard to the labour situation in South Africa. The cost resulting from employees being on sick leave, as well as possible occupational health and safety claims have in recent years resulted in companies struggling with not only loss of productivity, but also consequent financial losses. Often this happens because companies do not comply with the required safety, health and wellness policies, procedures, regulations and legislation with regard to ergonomics and technologies.

I will appreciate it tremendously if you could take the time to complete the attached questionnaire in an anonymous capacity. I will personally collect it from your office within three days. The completion will not require more than ten minutes of your time.

Thank you very much for your time and support!

Best regards



EA Strydom
SENIOR LECTURER
DEPARTMENT OFFICE MANAGEMENT AND TECHNOLOGY

ENDORSED BY

(SGD) PROFESSOR ESTHER HOFFMANN
RESEARCH PROFESSOR (Promoter)
DEPARTMENT OFFICE MANAGEMENT AND TECHNOLOGY

QUESTIONNAIRE 1

MEDICAL PRACTITIONERS

Please ✓ in the appropriate .
Please supply other information on dotted lines.
Information supplied, will be treated as confidential.

1. What is the nature of your practice?
 - 1.1 General Practitioner
 - 1.2 Orthopedist
 - 1.3 Optometrist
 - 1.4 Physiotherapist
 - 1.5 Psychologist
 - 1.6 Chiropractor
 - 1.7 Biokineticist
 - 1.8 Other

2. Do you treat patients for any of the following work-related illnesses/injuries resorting under any of the following terms: Musculoskeletal Disorders, Repetitive Strain Injuries, Cumulative Trauma Disorders and Repetitive Motion Injuries?
 - 2.1 Carpal Tunnel Syndrome Yes
 - 2.2 Guyon's Tunnel Syndrome Yes
 - 2.3 Cubital Tunnel Syndrome Yes
 - 2.4 Trigger Finger/thumb Yes
 - 2.5 Tendonitis Hand/Wrist Yes
 - 2.6 Tenosynovitis/De Quervain's Syndrome Yes
 - 2.7 Bursitis Yes
 - 2.8 Thoracic Outlet Syndrome Yes
 - 2.9 Myofascial Pain Syndrome Yes
 - 2.10 Arthritis Yes
 - 2.11 Lateral Epicondylitis/Tennis Elbow Yes
 - 2.12 Rotator Cuff Syndrome/Shoulder Pain Yes
 - 2.13 Neck Pain Yes
 - 2.14 Sciatica/Back Pain Yes
 - 2.15 Myalgia/Muscle Pain Yes
 - 2.16 Headache/Migraine Yes
 - 2.17 Eye Strain Yes
 - 2.18 Stress Yes
 - 2.19 Depression Yes
 - 2.20 Other
 -
 -

3. Complete the table below for the work-related injuries/illnesses indicated in number 2 above.

Nr	Work-related injuries/illnesses	Approximate number of patients per month	Cause for patient's injury	Approximate medical costs involved in treatment	Average workdays lost due to medical procedures and treatment
3.1	Carpal Tunnel Syndrome				
3.2	Guyon's Tunnel Syndrome				
3.3	Cubital Tunnel Syndrome				
3.4	Trigger Finger/Thumb				
3.5	Tendonitis Hand/Wrist				
3.6	Tenosynovitus/ De Quervain's Syndrome				
3.7	Bursitis				
3.8	Thoracic Outlet Syndrome				
3.9	Myofascial Pain Syndrome				
3.10	Arthritis				
3.11	Lateral Epicondylitis				
3.12	Rotator Cuff Syndrome				
3.13	Neck Pain				
3.14	Sciatica/Back Pain				
3.15	Myalgia/Muscle pain				
3.16	Headache/Migraine				
3.17	Eye Strain				
3.18	Stress				
3.19	Depression				

3.20	Other not listed above:				

THANK YOU FOR YOUR CO-OPERATION AND SUPPORT!

ANNEXURE D

**College of Economic and Management Sciences Research Ethics Review Committee -
Ethics Clearance Certificate**

2 December 2013

Ref #: 2013_CEMS_008(3)

**COLLEGE OF ECONOMIC AND MANAGEMENT SCIENCES
RESEARCH ETHICS REVIEW COMMITTEE (CRERC)**

Mrs. EA Strydom (06570194) [strydomea@tut.ac.za; 012-382 5652]

Supervisor: Prof EJ Ferreira

Joint supervisor: Prof EC Hoffman

This is to certify that the application for ethics clearance submitted by
Mrs. EA Strydom (student # 06570194)

for the study

**INFORMATION ADMINISTRATION TECHNOLOGIES, ERGONOMICS AND HEALTH:
REGULATORY COMPLIANCE IN AN e-ENVIRONMENT**

has received ethics approval.

The ethics application for the above-mentioned research project was reviewed in compliance with the Unisa Policy on Research Ethics by the *Research Ethics Review Committee of the College of Economic and Management Sciences (CRERC)* on 15 July 2013. The CRERC accepted a final title change on 12 November 2013. You may proceed with the study provided that the research ethics principles outlined by the Unisa Policy on Research Ethics are adhered to throughout the entire project. Please be advised that the committee needs to be informed should any part of the research methodology as outlined in the Ethics application (Ref. Nr.2013_CEMS_008) change in any way.

The College of Economic and Management Sciences Research Ethics Review Committee wishes you all the best with this research undertaking.

Kind regards,

Dr. RG Visagie



Chair person of the College Research Ethics Review Committee

012-429 2478/Visagrg@unisa.ac.za



ANNEXURE E

**Unisa Senate Research and Innovation and Higher Degrees Committee - Permission
to do research involving Unisa staff**

PROF L LABUSCHAGNE
EXECUTIVE DIRECTOR: RESEARCH DEPARTMENT
Tel: +27 12 429 6368 / 2446 Fax: +27 12 429 6960
Email: llabus@unisa.ac.za
Address: Theo van Wijk Building, 10th Floor, Office no. 50 (TvW 10-50)

10 July 2013

Ms EA Strydom
Student in College of Economic and Management Sciences (CEMS)

Dear Ms Strydom

**PERMISSION TO DO RESEARCH INVOLVING UNISA STAFF, STUDENTS OR
DATA**

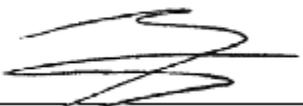
**A study into Business and information administration technologies and
ergonomics: regulatory compliance in an e-environment**

Your application regarding permission to conduct research involving Unisa staff, students or data in respect of the above study has been received and was considered by the Unisa Senate Research and Innovation and Higher Degrees Committee (SRIHC) on 27 June 2013.

It is my pleasure to inform you that permission has been granted for this study as set out in your application.

We would like to wish you well in your research undertaking.

Kind regards



PROF L LABUSCHAGNE
EXECUTIVE DIRECTOR: RESEARCH



ANNEXURE F

Letter requesting permission to conduct research involving Unisa staff

30 May 2013

REQUESTING PERMISSION TO CONDUCT RESEARCH INVOLVING UNISA STAFF

I am embarking on a research project for DAdmin - Business Management, entitled: Business and Information Administration Technologies and Ergonomics: Regulatory Compliance in an e-Environment.

The aim of this study is to establish the diffusion of a new administrative scenario, the virtual office. The virtual office is described as a work site that is situated outside of the traditional office where people still do the work associated with a traditional office, whilst maintaining their status as full-time employees. The virtual office (telework) emerged in enterprises because of the influence of technological developments, which drastically changed the traditional office scenario. Modern technological advances (Tablets, Smart phones, Internet, etc.) have made it easier to work anytime, anywhere, and any place. The incorrect usage of technological advances by the teleworker often lead to work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints. The costs resulting from employees being on sick leave, as well as possible compensation for occupational injuries and diseases claims may cause organisations to struggle with reduced productivity and unnecessary financial losses. This can be prevented if organisations apply/comply with the required health, safety and wellness policies, procedures, regulations and legislation.

The focus of the research will be on whether the necessary policies, procedures, regulations and legislation exist, are sufficient and whether employers and employees in the virtual environment are complying with the requirements which are applicable to the ergonomics of business and information administration technologies. Information on health and wellness aspects such as work-related musculoskeletal disorders that could result in compensation claims and other legal actions will be collected. The extent, to which safety and health legislation is promulgated, applied and complied with, will be investigated as well as the responsibilities of both the employer and the employee with regard to compliance to these.

I have obtained ethical approval from the College Research Ethics Review Committee of the College of Economic and Management Sciences and hereby request permission to distribute two questionnaires by e-mail amongst managers/line-managers/supervisors of teleworkers and telework employees via the Unisa intranet.

The results obtained from this research project could make a valuable contribution with regard to labour regulations in Unisa. The researcher intends to provide a framework to teleworking organisations of policies/regulations/training which should be in place to regulate telework. This framework could assist to prevent work-related musculoskeletal disorders and limit compensation claims. The results of this study will be made available to Unisa in the form of a PowerPoint presentation by the researcher. The envisaged research output will also include conference attendance and research articles.

I am familiar with the following:

- UNISA Research policy
- UNISA Research Ethics policy (2012)
- UNISA IP policy

The research plan of my project is as follow:

Activity	Date
Complete research instrument	March 2013
Request ethical approval	June 2013
Request permission (SENTRIC)	July 2013
Complete preliminary literature study	May 2013
Conduct pilot study	May 2013
Conduct survey	June 2013
Analyse data	August 2013
Compile findings	October 2013
Compile recommendation	December 2013
Design framework for implementing telework in SA	January 2013
Complete chapter 1 and Methodology chapter	February 2014
Submit for examination	May 2014
Write article	June 2014

My CV is attached below.

Regards



.....
EA Strydom



CV ESNA 2013 Word
doc.doc



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
www.unisa.ac.za

ANNEXURE G

Letter requesting permission to conduct research at organizations, ABSA, Grundfos and Telkom and Consent form.

BUSINESS AND INFORMATION ADMINISTRATION TECHNOLOGIES AND ERGONOMICS: REGULATORY COMPLIANCE IN AN E-ENVIRONMENT

22 May 2013

ABSA

Judy Mahadeo

Head: Leadership, Learning & Talent: Enterprise Services

Office +27 11 350 4176

Fax +27 86 753 0144

Mobile +27 82 455 8977

Email judyma@absa.co.za

Dear Ms Mahadeo

My name is Esna Strydom and I am doing research with Prof Ferreira (Supervisor), from the Department of Business Management, Unisa, and Prof Hoffmann (Co-supervisor), from the Department Office Management and Technology, Tshwane University of Technology, towards a Doctor of Administration in Business Management at the University of South Africa. We are inviting your organisation to participate in a study entitled **“Business and Information Administration Technologies and Ergonomics: Regulatory Compliance in an e-Environment”**.

The aim of this study is to establish the diffusion of a new administrative scenario, the virtual office. The virtual office is described as a work site that is situated outside of the traditional office where people still do the work associated with a traditional office, whilst maintaining their status as full-time employees. The virtual office (telework) emerged in enterprises because of the influence of technological developments, which drastically changed the traditional office scenario. Modern technological advances (iPads, iPhones, internet, etc.) have made it easier to work anytime, anywhere, and any place. The incorrect usage of technological advances by the teleworker often lead to work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints. The costs resulting from employees being on sick leave, as well as possible occupational health and safety claims may cause companies to struggle with reduced productivity and unnecessary financial losses. This can be prevented if companies apply/comply with the required health, safety and wellness policies, procedures, regulations and legislation.

The focus of the research will be on whether the necessary policies, procedures, regulations and legislation exist, are sufficient and whether employers and employees in the virtual environment are complying with the requirements which are applicable to the ergonomics of business and information administration technologies. Information on health and wellness aspects such as work-related musculoskeletal disorders that could result in compensation claims and other legal actions will be collected. The extent, to which safety and health legislation is promulgated, applied and complied with, will be investigated as well as the responsibilities of both the employer and the employee with regard to compliance to these.

Although telework has been practised internationally for several decades, it is a relatively new concept in South Africa that necessitates an investigation into the current context.

Your organisation has been selected to participate in this research project because you are one of only a few organisations in South Africa known to have a telework program in place.

The study involves two web-based non-identifiable questionnaires. You are requested to send one e-mail containing of a cover letter and the participant's information sheet to all the staff members who are involved in telework through your intranet. The cover letter would explain to your staff that ABSA has given consent to participate in this research and the participant's information sheet will be attached as supplied by the researcher.

The first questionnaire is addressed to **MANAGERS/LINE-MANAGERS/SUPERVISORS** in the organisation/department/branch/section **involved with telework**. These respondents should use the following link to complete the questionnaire <https://www.surveymonkey.com/s/5SJSK6B>

The second questionnaire should be completed by **TELEWORKERS** in the organisation/department/branch/section. Telework respondents should use the following link to complete the questionnaire <https://www.surveymonkey.com/s/KOYSLYP>

The questionnaires cover three aspects: firstly the preferred kind of telework for the South African context; secondly the extent to which companies in trade and industry are aware of and comply with the required policies and regulations in terms of ergonomics and technology in the administrative workplace and thirdly the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers. The researcher expects that the distribution and completion of the questionnaire should be accomplished within ten working days. Completion of the web-based questionnaire will not require more than twenty to twenty five minutes of the participant's time.

Should you be willing to assist the researcher with the research and data collection, the researcher will be extremely grateful.

The results obtained from this research project could make a valuable contribution with regard to labour regulations in participating organisations. The researcher intends to provide a framework to teleworking companies of policies/regulations/training which should be in place to regulate telework. This framework could assist to prevent work-related musculoskeletal disorders and limit compensation claims. The results of this study will be made available to participating organisations in the form of a power point presentation by the researcher.

Yours sincerely



EA Strydom
Senior Lecturer
Department of Office Management and Technology
Faculty of Management Sciences
Tshwane University of Technology

CONSENT TO PARTICIPATE IN THIS STUDY

I, (participant name)

acting on behalf of (company name),
confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I have received a signed copy of the informed consent agreement.

Participant name & surname.....(please print)

Participant signature.....Date.....

Researcher's name & surname: Esna Strydom

Researcher's signature  Date 22 May 2013

Witness name & surname.....(please print)

Witness's signature.....Date.....

ANNEXURE H

Letter requesting permission to publish link through OPSA

BUSINESS AND INFORMATION ADMINISTRATION TECHNOLOGIES AND ERGONOMICS: REGULATORY COMPLIANCE IN AN e-ENVIRONMENT

14 May 2013

Dear Mrs. Samantha Brown

I met you at our TUT graduation ceremony on Thursday, 9 May and requested you to be on the lookout for this e-mail. I appreciate the opportunity to contact you regarding my research.

I am a registered Doctoral candidate at UNISA and hereby wish to request permission from OPSA to publish two links to my questionnaires to enable your Terrific Tuesday readers to participate in research for my Doctoral Degree in Administrative Business Management. Please find attached explanatory documents consisting of three letters that will inform you on the gist of the research. Obviously you will know which parts you would make use of if you agree to publish the two links appearing in (letter 1).

- 1. Request for permission from OPSA to assist with research**
- 2. Information sheet to MANAGER/LINE-MANAGERS/SUPERVISORS AND TELEWORKERS**
- 3. Consent to assist/participate in this study**

I will really appreciate it if OPSA would be willing to grant their consent to assist in my Doctoral Study (requested in letter 1). Anonymity and confidentiality will be guaranteed in terms of your company name, should this be a requirement, as well as participants. There will be no other obligation on the part of OPSA except for publishing the link for as long as you are willing to do so.

I am in the process of obtaining ethical clearance from UNISA and will hopefully hear within the next week if I may start with the distribution of the online questionnaires. I therefore request that you should please not publish the attached documents consisting of the link at this point in time; it only serves to clarify the protocols of the research.

It is a Unisa requirement to submit the "Consent to assist/participate in this study" (letter 3) from OPSA before I will receive unconditional ethical clearance. If you agree to assist me, I humbly request that letter 3 be completed and mailed back to me as soon as possible.

Participation by your readers will involve the completion of two online questionnaires, one by managers and one by teleworkers. I will sincerely appreciate it if I could have an estimate of the number readers to whom your Terrific Tuesday Newsletter are sent. This information is required in order to establish the population sizes involved in the research.

I trust that you will be able to assist and if necessary, I can visit or phone you should any further explanations or clarifications be required.

I thank you for your attention in advance.

Regards
Esna Strydom
Senior Lecturer
Department of Office Management and Technology
Faculty of Management Sciences
Tshwane University of Technology
083 294 1779
012 382 5652
strydomea@tut.ac.za

ANNEXURE I

Letters of Consent – Organisations, ABSA, Grundfos, Telkom and OPSA

CONSENT TO PARTICIPATE IN THIS STUDY

I, Ezanne Oosthuizen.....(participant name)

acting on behalf of Absa Bank.....(company name).

confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I have received a signed copy of the informed consent agreement

Participant name & surname Ezanne Oosthuizen..... (please print)

Participant signature E. Oosthuizen..... Date 03/06/2013

Researcher's name & surname: Esna Strydom

Researcher's signature Esna Strydom Date 22 May 2013

Witness name & surname J. Mahadev.....(please print)

Witness's signature J. Mahadev Date 03/06/2013

CONSENT TO PARTICIPATE IN THIS STUDY

I, Lorraine Smaak (participant name)

acting on behalf of Sound for (P.L.) Ltd (company name)

confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I agree to the recording of the questionnaires.

I have received a signed copy of the informed consent agreement.

Participant name & surname L. Smaak (please print)

Participant signature [Signature] Date 8/5/13

Researcher's name & surname: Esna Strydom

Researcher's signature [Signature] Date 8 May 2013

Witness name & surname Anda Gravitze (please print)

Witness's signature [Signature] Date 8/5/2013

CONSENT TO PARTICIPATE IN THIS STUDY

I, Broom Minkler..... (participant name)

acting on behalf of Telkom SA XXX Ltd (company name),
confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

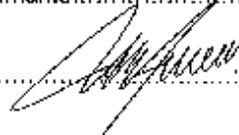
I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

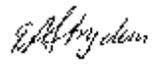
I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I have received a signed copy of the informed consent agreement.

Participant name & surname: Broom Minkler..... (please print)

Participant signature: ..... Date: 2013-06-05

Researcher's name & surname: Esna Strydom

Researcher's signature  Date 30 May 2013

Witness name & surname: Luxia Jordan.....(please print)

Witness's signature: ..... Date: 2013-06-05

4. CONSENT TO ASSIST/PARTICIPATE IN THIS STUDY

I, Samantha Brown..... (participant name)

acting on behalf of OPSA..... (company name),

confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

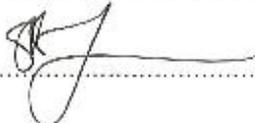
I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

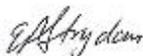
I agree to the recording of the questionnaires.

I have received a signed copy of the informed consent agreement.

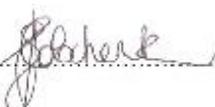
Participant name & surname Samantha Brown..... (please print)

Participant signature ..... Date 14/5/2013

Researcher's name & surname: Esna Strydom

Researcher's signature ..... Date 13 May 2013

Witness name & surname Elaine Volschenk..... (please print)

Witness's signature ..... Date 14/5/2013

ANNEXURE J

Participant's information letter

**ATTENTION: ALL MANAGERS/LINE-MANAGERS/SUPERVISORS
ALL TELEWORKERS**

22 July 2013

**BUSINESS AND INFORMATION ADMINISTRATION TECHNOLOGIES AND
ERGONOMICS: REGULATORY COMPLIANCE IN AN e-ENVIRONMENT**

Dear Prospective Participant

My name is Esna Strydom and I am doing research with Prof Ferreira (Supervisor), from the Department of Business Management, Unisa, and Prof Hoffmann (Co-supervisor), from the Department Office Management and Technology, Tshwane University of Technology, towards a Doctor of Administration in Business Management at the University of South Africa. We are inviting you to participate in a study entitled “Business and Information Administration Technologies and Ergonomics: Regulatory Compliance in an e-Environment”.

The aim of this study is to establish the diffusion of a new administrative scenario, the virtual office. The virtual office is described as a work site that is situated outside of the traditional office where people still do the work associated with a traditional office, whilst maintaining their status as full-time employees. The virtual office (telework) emerged in organisations because of the influence of technological developments, which drastically changed the traditional office scenario. Modern technological advances (tablets, Smartphones, Internet, etc.) have made it easier to work anytime, anywhere, and any place. The incorrect usage of technological advances by the teleworker often lead to work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints. The costs resulting from employees being on sick leave, as well as possible compensation for occupational injuries and diseases claims may cause organisations to struggle with reduced productivity and unnecessary financial losses. This can be prevented if organisations apply/comply with the required health, safety and wellness policies, procedures, regulations and legislation.

The focus of the research will be on whether the necessary policies, procedures, regulations and legislation exist, are sufficient and whether employers and employees in the virtual environment are complying with the requirements which are applicable to the ergonomics of business and information administration technologies. Information on health and wellness aspects such as work-related musculoskeletal disorders that could result in compensation claims and other legal actions will be collected. The extent, to which safety and health legislation is promulgated, applied and complied with, will be investigated as well as the responsibilities of both the employer and the employee with regard to compliance to these.

Although telework has been practised internationally for several decades, it is a relatively new concept in South Africa that necessitates an investigation into the current context. Your organisation has been selected to participate in this research project because you are one of only a few organisations in South Africa known to have a telework program in place. The researcher contacted your Human Research Manager and requested consent to distribute the questionnaire via your organisation’s intranet to the participants.

The study involves two web-based non-identifiable questionnaires. If you are managing workers with flexible work arrangements, you should complete the first questionnaire addressed to **MANAGERS/LINE-MANAGERS/SUPERVISORS** in the organisation/department/branch/section involved with **telework**. Participants should use the following link to complete the questionnaire <https://www.surveymonkey.com/s/5SJSK6B>

The second questionnaire should be completed by **TELEWORKERS** in the organisation/department/branch/section. Telework participants should use the following link to complete the questionnaire <https://www.surveymonkey.com/s/KQYSLYP>

The questionnaires cover three aspects: firstly the preferred kind of telework for the South African context; secondly the extent to which organisations in trade and industry are aware of and comply with the required policies and regulations in terms of ergonomics and technology in the administrative workplace, and thirdly the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers. The researcher expects that the distribution and completion of the questionnaire should be accomplished within ten working days. Completion of the web-based questionnaire will not require more than twenty minutes of participant's time.

Being in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, the questionnaire makes provision for you to indicate your consent. You are free to withdraw at any time and without giving a reason. However once you have submitted the questionnaire, your anonymous data will form part of a database from which it cannot be withdrawn.

The results obtained from this research project could make a valuable contribution with regard to labour regulations in participating organisations. The researcher intends to provide a framework to teleworking organisations of policies/regulations/training which should be in place to regulate telework. This framework could assist to prevent work-related musculoskeletal disorders and limit compensation claims.

There is a minimal discomfort to the participants involved in this study due to the nature of the questions on the work-related musculoskeletal disorders. The length of the questionnaire (approximately 15 - 20 minutes) may also cause inconvenience.

Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers may be reviewed by people responsible for making sure that research is done properly, including a statistician, the researcher, the two supervisors and members of the Research Ethics Committee. A report of the study may be submitted for publication e.g. journal articles, conference presentation but individual participants will not be identified in such a report.

Hard copies of the data will be stored for a period of 5 years in a locked filing cabinet in the researcher's office for future research or academic purposes; electronic information will be stored on a password protected computer. After five years all hard copies of the data will be shredded. Due to the possibility of a follow-up longitudinal study, electronic copies will be kept on an external memory device in the safe at the researcher's home. All electronic copies will be permanently deleted from the hard drive of the researcher's office computer after 5 years. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

This study has received written approval from the Research Ethics Committee of the College of Economic and Management Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

The results of this study will be made available to participating organisations in the form of a PowerPoint presentation by the researcher. The envisaged research output will also include conference attendance and research articles. The findings are accessible for 5 years. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Esna Strydom on 083 294 1779 or strydomea@tut.ac.za. Should you have concerns about the way in which the research has been conducted, you may contact Professor Eddie Ferreira, on (012) 429-3331 or Eferreir@unisa.ac.za.

Should you be willing to assist the researcher with the research and data collection, the researcher will be extremely grateful.

Thank you for taking time to read this information sheet and for participating in this study.

Yours sincerely



EA Strydom
Senior Lecturer
Department of Office Management and Technology
Faculty of Management Sciences
Tshwane University of Technology
012 542 3739
083 294 1779
strydomea@tut.ac.za
gerrie.s@mweb.co.za

ANNEXURE K

**e-Mail cover letter to participating organizations: ABSA, Grundfos, Telkom and
Unisa**

22 July 2013

Dear ABSA, Grundfos, Telkom, and Unisa Employee

PARTICIPATION IN RESEARCH: BUSINESS AND INFORMATION ADMINISTRATION TECHNOLOGIES AND ERGONOMICS: REGULATORY COMPLIANCE IN AN e-ENVIRONMENT

I hereby wish to inform you that your organisation has officially consented to participate in this research and you are therefore allowed to take part in my request to assist.

I am doing research towards a Doctor of Administration in Business Management at the University of South Africa. You are invited to participate in the completion of an online survey because you are one of a limited number of employees having the privilege of a flexible work arrangement (telework). Your organisation and its employees will benefit from the feedback that will be provided by the researcher after completion of the study.

I need to indicate to you that your participation is vital to the success and the completion of this research. This mail was sent to only 210 participants in four organisations and I need to receive 140 completed questionnaires back. I therefore humbly request you to be so kind as to read the attached participants' information letter that contains two hyperlinks. The first hyperlink is for managers of employees who are teleworking and the second hyperlink is for employees with a flexible work arrangement. By clicking on the appropriate hyperlink, you will have access to the questionnaire.

I will sincerely appreciate it if you could kindly complete this questionnaire within ten working days as from the date of this e-mail.

You can also access the questionnaires by using the following links:

MANAGERS/LINE-MANAGERS/SUPERVISORS of teleworkers

<https://www.surveymonkey.com/s/5SJSK6B>

TELEWORKERS

<https://www.surveymonkey.com/s/KQYSLYP>

I thank you in advance for participating in this research on behalf of your organisation.

Regards



Esna Strydom
Senior Lecturer
Department of Office Management and Technology
Faculty of Management Sciences
Tshwane University of Technology
012 542 3739
083 294 1779
strydomea@tut.ac.za
gerrie.s@mweb.co.za

ANNEXURE L

Invitation to participate in research as published in Terrific Tuesday, 23 July 2013



Association for
Office Professionals
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23 July 2013

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Annual Conference
Association for Office Professionals of South Africa



"It Works for Me"
Misty Hills, Muldersdrift, Gauteng
Wednesday 4 - Thursday 5 September 2013

[Register now!](#)



Association for
Office Professionals
of South Africa



Please complete this survey

OPSA actively supports research that helps us understand the work environment and role of office professionals in South Africa. Below is an invitation to participate in a research project being undertaken by Esna Strydom, a senior lecturer in office management and technology at the Tshwane University of Technology. Please take a few minutes to participate.



Are you involved in any form of flexible work arrangement? Are you working for an organisation which allows you to work from an alternative place like your home? Then you are considered a teleworker and you can make a valuable contribution! You can let your voice be heard by participating in research for a doctoral study titled: **Business and Information Administration Technologies and Ergonomics: Regulatory Compliance in an e-Environment.**

The aim of this study is to establish the diffusion of the virtual office. The virtual office is described as a work site that is situated outside of the traditional office where people still do the work associated with a traditional office, whilst maintaining their status as full-time employees. The virtual office (telework) emerged in organisations because of the influence of technological developments, which drastically changed the traditional office scenario. Modern technological advances (tablets, Smartphones, Internet, etc.) have made it easier to work anytime, anywhere, and any place. The incorrect usage of technological advances by the teleworker often lead to work-related musculoskeletal disorders affecting muscles, spinal disks, tendons, nerves, ligaments and joints. The costs resulting from employees being on sick leave, as well as possible compensation for occupational injuries and diseases claims may cause organisations to struggle with reduced productivity and unnecessary financial losses. This can be prevented if organisations apply/comply with the required health, safety and wellness policies, procedures, regulations and legislation.

The study involves two web-based non-identifiable questionnaires. If you are managing workers with flexible work arrangements, you should complete the first questionnaire addressed to **MANAGERS/LINE-MANAGERS/SUPERVISORS** in the organisation/department/branch/section involved with **telework**. Participants should use the following link to complete the questionnaire: www.surveymonkey.com/s/5SJSK6B The second questionnaire should be completed by **TELEWORKERS** in the organisation/department/branch/section. Telework participants should use the following link to complete the questionnaire: www.surveymonkey.com/s/KQYSLYP

The questionnaires cover three aspects: firstly the preferred kind of telework

for the South African context; secondly the extent to which organisations in trade and industry are aware of and comply with the required policies and regulations in terms of ergonomics and technology in the administrative workplace, and thirdly the prevalence and extent of health and wellness aspects that could result in compensation claims and other legal actions against employers. The researcher expects that the distribution and completion of the questionnaire should be accomplished within ten working days. Completion of the web-based questionnaire will not require more than twenty minutes of a participant's time.

Being in this study is voluntary and completely anonymous. Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. If you do decide to take part, the questionnaire makes provision for you to indicate your consent. You are free to withdraw at any time and without giving a reason. However once you have submitted the questionnaire, your anonymous data will form part of a database from which it cannot be withdrawn.

This study has received written approval from the Research Ethics Committee of the College of Economic and Management Sciences, Unisa. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Esna Strydom on 083 294 1779 or strydomea@tut.ac.za.

ANNEXURE M

**Verbatim responses of teleworkers:
Reasons for not lodging compensation fund claims for work-related disorders**

Page 6, Q1. If you suffered from any of the work-related musculoskeletal disorders indicated in the figure, list the reason(s) for NOT lodging a compensation claim with the Compensation Commissioner according to the Compensation for Occupational Injuries and Diseases Act.

1	It was regarded a constrain and time shifting change adjustments	Aug 15, 2013 2:47 AM
2	Reluctant they never do follow ups	Aug 12, 2013 3:22 AM
3	I did not consider it.	Aug 12, 2013 2:34 AM
4	BECAUSE ITS NOT THAT SERIOUS, NOTHING EYEGENE CAN'T FIX	Aug 7, 2013 2:00 AM
5	i did lodge a compliant whoever it was not consired.	Aug 6, 2013 11:17 PM
6	i didnt know i had to for my eyes and stress	Aug 6, 2013 8:36 AM
7	I never considered the possibility.	Aug 6, 2013 12:47 AM
8	Minor	Aug 5, 2013 11:46 PM
9	Did not think the Act was applicable	Aug 5, 2013 12:38 AM
10	not that serious	Aug 5, 2013 12:34 AM
11	I only realise now that I have a few tendon disorders. I have not been to see a doctor, because I thought it was arthritis-related.	Aug 2, 2013 4:40 AM
12	N/A	Jul 30, 2013 2:24 PM
13	Just part of the job - goes with the territory	Jul 30, 2013 9:34 AM
14	I did not know that i could and therefore haven't done so. Also no loss in working days only took some pain killers and massages to combat the pain.	Jul 30, 2013 8:03 AM
15	N/A	Jul 30, 2013 2:06 AM
16	i sent an email to the Vice-Chancellor pleading my case. I received a 'read' receipt but no communication. the same email was forwarded to the Executive Dean of the College, to my COD and to the academic union - all without response. I referred to the Safety Act with which the institution is obligated to comply, but was ignored. I am a senior academic at my institution with a proven track record of 24 years. However, clearly the well-being - physical and psychological - is of little consequence to management.	Jul 29, 2013 9:36 AM
17	Covered by medical scheme	Jul 29, 2013 6:31 AM
18	Not familiar with possibilities	Jul 29, 2013 6:25 AM
19	Not serious enough.	Jul 29, 2013 4:26 AM
20	Part of the job.	Jul 22, 2013 6:32 AM
21	none	Jul 22, 2013 1:34 AM
22	Too much trouble and hassle to lodge a claim, based on my experience to motivate for adaptive equipment.	Jul 22, 2013 1:02 AM
23	no	Jul 21, 2013 11:31 PM
24	Felt it would not result to much.	Jul 21, 2013 11:31 PM

ANNEXURE N

**Permission letter from Weldon Bond,
Managing Member of Centre for Excellence to use and adapt the SAEM**

Centre for Excellence

Prosperity
through ...

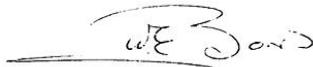
- 6 Ireland Heights, Ireland Road, Eldoraigne Ext 45, Centurion 0157
- Telephone: +27 (0)12 654 3672
- Facsimile: +27 (0)12 654 3672
- E-mail: weldon@ideaman.co.za
- Reg No: 1990 / 035338 / 23

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TO WHOM IT MAY CONCERN

I, Weldon Edgar Bond, Managing Member of Centre for Excellence, and sole owner of the Intellectual Property Rights to the South African Excellence Model hereby give permission to Mrs Esna Amanda Strydom (student number 0657-019-4) to utilise the South African Excellence Model in the thesis for the attainment of the degree
DOCTOR OF ADMINISTRATION IN BUSINESS MANAGEMENT
in the College of Economics and Management Sciences at the University of South Africa

Signed on this 6th day of February, 2014 in Pretoria.



WE Bond

MANAGING MEMBER: CENTRE FOR EXCELLENCE

Training and Consultancy Services



Members: Weldon Bond (Managing) - Prof Watson Ladzani