Towards Reducing Common Ergonomic Hazards and Alleviating Techno-stress Associated with the Adoption of Information and Communication Technology

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Abstract

The paper examined how to reduce ergonomic hazard and alleviate techno-stress associated with the adoption of Information and Communication Technology (ICT). Two ergonomic issues are of central concern: the first is the stress caused by inability to cope with the dynamic innovations of ICT and the second is how to address the resultant hazards associated with its adoption. The paper focused on attaining a work environment that recognizes and accommodates a variety of human capabilities and limitations in a manner that reduces the potential disorders and motivates workers for optimal performance.

The University of Botswana was used as a case study. Survey research design was adopted to collect information from the staff of the University. Specifically, questionnaire, personal observation and interview methods were used to collect data from computer users in the University. The respondents were selected from the academic and administrative staff and the students of the University.

Findings revealed that the University of Botswana has been transformed from conventional to modern University with the introduction of online catalogue in the Library, computer laboratory, Webct and e-learning and network connection to a central server through mopipi.ub.bw. However, there appeared to be a serious gap in ergonomic practices in the University. There was a low level of awareness of the major causes of techno-stress and hazards and the adverse effects of pervasive computing have not been fully addressed because the occupational health and safety policy has not been fully adopted.

The paper concluded that organizations should maintain a good balance between the utilization of the attractive features of ICT and ensuring human needs for safe and efficient working conditions to motivate them for optimal performance and increased productivity.

Introduction

Technology has become the integral part of work place and affects human resources from the operational up to the strategic levels of modern organizations. Its dramatic and liberating benefits especially as relate to the quest for fast response time, accuracy, and ability to resolve

complex problems have made it attractive for gaining commanding share of market and mustering global competitive strength. Technology comes with the pressure and high performance expectations from the employees who are equipped with relevant materials. Employees are able to get connected anywhere and anytime. Offices are infested with telecommunication gadgets such as fax machines, computers and mobile phones. It is obvious that technology will continue to co-exist with human resources in the organizations.

As organizations adopt technological innovations for competitiveness in the knowledge based economy, the need to maintain an optimal balance between the utilization of the attractive features of ICT and ensuring human needs for safe and efficient working conditions have become a phenomenon in modern public and business organizations. Making the work easier and more interesting by introducing tools that are user-friendly and capable of increasing productivity are not without attendant risks and problems. Having access to these devices enables work to be done regardless of time and location but unfortunately intrude into the privacy and rest of employees and may eventually lead to stress, health challenge and low level of performance. The adoption of ICT to make work more interesting and increase productivity has thus been marked with attendant risks and problems.

Noyes (2001) discovers an increase in sick people caused by ergonomic hazards resulting from ICT equipments. People who use computers extensively could have musculoskeletal disorder and are also prone to carpal-tunnel syndrome, eyestrain and headaches. He raises concern that all these might reduce motivation and performance. Pribbenow (1990) points out that those who are glued to computers in offices could experience high level of tension, both in blood vessels and muscles. All these are the challenges that good ergonomic practices attempt to address.

Ergonomics

The focus of ergonomics is on the design of workstation that recognizes and accommodates a variety of human capabilities and limitations in a manner that reduces the potential disorders in order to motivate workers to put in their best performance. O'Brien and Marakas (2007) refer to Ergonomics as human factors engineering with the goal of designing healthy work environments that are safe, comfortable, and pleasant for people to work in. Its designs are to increase employees' morale and productivity. It seeks to improve the match between the job and the man's physical abilities, information handling and workload capacities. The general understanding of physical ergonomics is that people come in all shapes and sizes and the average workstation configuration will not fit everyone (Soopu, 2009). Kroemer (2006) defines ergonomics as the applications of scientific principles, methods and data drawn to design the workstation so as to make computer users' life and performance of task safer, efficient and easy to use. Helander (2006) quoting Karwowski (1999) pointed out that ergonomic was derived from two Greek words ergo (work) and nomos (law). He advises that ergonomics, a scientific discipline that tries to describe the interactions between human beings and computers, should follow the laws and principles governing the design of the machine and workstation in order to optimize human well-being and overall system performance. Similarly, Santon (2005) agrees that as a scientific discipline, ergonomics holds high moral ground with the aim of improving human performance, safety and satisfaction of job by providing compatibility of the computer users, workstations and the correct knowledge of how to use in the safe side for better performance. Brauer (2006) states that it addresses the ability of people to perform task to make pretences and choices which are important in marketing. From these definitions, one could infer that the focus of ergonomics is on how to design work environment to optimize human well-being and overall system performance.

Some scholars contend that ergonomics is concerned with fitting the job to the worker rather than forcing the worker to contort to fit the Job (O'Leary and O'Leary, 2006). According to MacLeod (2000) ergonomics is an interdisciplinary field of study that seeks to design tool, equipment and tasks to optimize human capabilities. Brauer (2006) agrees and adds that it focuses on the relationship between people and variety of things, equipment, facilities, printed materials and other informational media. O'Leary and O'Leary, (2006) describe it as the study of human factors related to the things people use. These definitions show that ergonomics is concerned with finding a perfect match in the interaction between the worker, the job and the tools. Ergonomics is all about how we fit as human being in the work environment. It therefore attempts to "fit the job to man" rather than "fit the man to the job" ' or 'fit the task to the person and not the person to the task'. (ILO, 1987) describes this as harmonizing man's work and his environment. The focus here is on how equipments can be designed and used to increase productivity, and avoid health risks. Ergonomics is therefore concerned with the design that will lead to the least amount of stress by reducing such things as tiredness and discomfort. It notes that the human body has needs, limitations and abilities and designs systems and environments to take cognizance of these factors. It studies human beings and human behavior anatomy, psychology and physiology and utilizes the advantage of unique human capabilities when designing tools and equipments.

A number of scholars have argued that good ergonomic practices could be motivational and effective in modeling behaviors to improve performance. According to ILO (1987), it is a systematic application of relevant information about human abilities, characteristics, behavior and motivation in the execution of their activities. This implies that it aims at attaining optimal adaptation of man to his or her work with its benefits measured in terms of work efficiency and well being of workers. Soopu (2009) claims that most business organizations that adapt ergonomic principles as a bottom line tradeoff between safety and efficiency have learned that designing a safe work environment could motivate workers to increase productivity. Ergonomics is applied to human biological sciences in conjunction with the engineering science to the worker and his working environment to obtain maximum satisfaction for the worker and at the same time enhance productivity. This emphasizes the important traits of ergonomics elements as comfort, health and productivity and suggests that ergonomics seeks to adapt work to human physical and psychological capabilities and limitations. Ergonomics prescribes the principles and techniques for creating a work environment that reduces stress, provides relevant equipments and motivate workers for optimal performance. It provides a set of conceptual guide posts for adapting work places, products and services to fit human needs. It offers a strategy for engineering design and philosophy for good management with the underlying goal of improving the fit between human and work place activities. Two issues that are of central concern to ergonomics are techno-stress and hazards.

Techno-stress

Techno-stress refers to human reaction to the influence of technology of computers and how human change according to its effects (Michelle 2007) It is a combination of performance anxiety, information overload, role conflicts and organizational factors (kupersmith 1992). Techno-stress is caused by inability of many users to cope with new technologies due to knowledge or skill deficiencies and psychological pressures. The rate at which technology changes and need for workers to continually familiarize with applications of the dynamic and complex features of new innovations cause a lot of trepidation in modern organizations. These effects are more visible in computer based departments where workers deal directly with electronic devices.

This is why the most studied aspect of techno-stress is machine based stress (computer anxiety and obsession) caused by poor ergonomics and badly designed software. In her research, (kupersmith 1992). discovered that 85% of the population feels uncomfortable with computer technology and described reaction to the omnipresence of computer technology as techno-stress.

Helander (206) attributes the prevalence of techno-stress to lack of information concerning the proper use of electronic machines and asserts that we have lots of information technology nowadays but we don't have any information on how to use them. New innovations in hardware and software are not accompanied with proper training on how to operate them. Lack of proper Knowledge on the use of computers at workplace often results in worries and ergonomic health related problems such as visual fatigues, repetitive motion injuries, exposure to radiation and poor job satisfaction.

Human Reaction Time has also been identified as a cause of techno-stress in organizations. Helander, (2006) claims that reaction time is used to reformulate or redesign decisions on the use of computers so that they can become easier, quicker and more reliable. Human reaction time refers to the degree to which human and computer users react to the effect resulting of using ICT devices. This always differ from time to time depending on what people are reacting to. Hick's law stipulates that the reaction time is always the function of the number of choices in decisions undertaken. The quicker the decision taken in reacting to the ergonomics health related problems, the safer the users of computers. In human factor ergonomics, complex decisions take a Long time and they normally result in problems (Helander, 2006). It is imperative to develop means of discovering these effects in time and address them appropriately.

Ergonomic Hazards

Hazard is a condition or changing set of circumstances that presents a potential for injury, illness or property damage to cause harm which could seriously affect the health of the workers and in other circumstances being life threatening (Brauer, 2006). It is a result of repeated use of any part of the body which can eventually lead to such disorders as white finger injuries (Noyes 2001). Helander (2006) identified technology health related problems as visual fatigues, repetitive motion injuries, exposure to radiation. People who use computers extensively are prone to developing carpal-tunnel syndrome which is disorder that affects nerves and wrist and capable of degenerating into permanent disability. Another serious health hazard is musculoskeletal disorders, According to the United State of America National Research council (2001), musculoskeletal disorders accounted for-the visit of 70 million people to physician for treatment while more than I million people take time off from work to heal and recover from ergonomic health related problems both in the lower and upper back extremity. This has led to an increase in compensation costs, loss of wages and productivity estimated between $45 and $54 billion annually in the United kingdom(National Research Council, 2001), an estimated 12.3 million workdays were lost due to time taken off by employees that experienced injuries such as neck, feet and eyes (Health and Safety Executive, 2003). The use of computer may lead to headache, eye strain, and vision problems if the monitor is not properly positioned. Computers also emit gasses which can result in dizziness and respiratory problems. Scholars have attributed factors such as poor office chair design, viewing distance, defective lighting, radiation from computers, thermal discomfort and noise level among others as capable of causing ergonomic hazards in the work place.

Poor office chair design often arises from engineering activities such as planning, design, production, operations and maintenance, though they might not be deliberately introduced but created inadvertently (Brauer, 2006). The sitting posture of persons and machines are crucial to

their health and safety. Kramer and Hill (1989) advise that the viewing angle of the screen should be lower than the height of the eye in order to obtain a viewing angle of about 25-30° below the horizontal. Helander (2006) refers to the standardized format put forward by Human Factors and Ergonomics Society in 2003 as well as International standard Organization (ISO) of 2004 and advises that sitting in an upright posture looking up with the head bent back is a true common cause of strain and muscles fatigue in the neck. He argues that manufactures should comply with the International standard organizations series 9241 of 2004 in the design of chairs**.** The chair represents the primary support which puts the user in contact with work situation. It is more important for those tasks which require precise coupling of hands tools and high degrees of visual attention for prolonged period of time as the case of computer operators (Karwowski et al, 1999). Inappropriate design of chair can cause musculoskeletal injury, back pain, discomfort, and neck pain. All these may affect workers' performance, productivity and eventually the corporate objective of the organization. Chairs should be designed to fit all the users and not for a specific individual. Office chairs should have adjustable design features to make workers comfortable. According to Human factor Ergonomics HFES (2004) adjustability of the chair requires a minimum height of 11.4 cm with the recommended level ranges between 38cm to 56cm for total comfortability of a person. Michel (1994) explores the importance of the chair which can be adjusted at the seatback angle that is greater than 110° and states that it will reduce the pressure on the spine because the person is able to move from a straight standing posture to a straight sitting posture since the hips joint angle goes from 180° to 90°. This movement reduces the length of the leverage arm from erector spinal muscles.

Viewing Distance and Visual Problems also constitute ergonomic hazards. National Research Council (1983) advices that computer users should learn proper focusing mechanisms to minimize visual fatigue and temporary myopia disorders caused by too closeness to computers and radiation. The viewing distance to the screen, to the document and to the keyboard should all be the same, so as to allow the person to focus the eyes properly. NIOSH (1994) claims that 88% of the 66 million who work on computers for more than 3 hours a day complain of eyestrain. Symptoms of eyestrain are tired eyes, blurred vision, slow refocusing, double vision, color distortion, irritation, watery eyes, soreness and sensitivity to light all of which cause headaches.

Closely associated with the problem of eye strain is poor lighting. Although our eyes can adjust to a wide range of brightness, efficiency and safety will deteriorate unless workers clearly see what they are doing. Poor lighting has given rise to many health problems such as eyestrain, poor vision, headaches and has predisposed workers to accidents and reduced productivity and quality of work.

Radiation from Computer could also lead to hazard. Though Mollie (2009) claims that there might not be strong evidence that Cathode Rays Tubes (CRT) screens generate hazardous radiation which are harmful to human health in spite of the popular debate in different literatures and news media on their effects, he agrees that there is problem in measuring the effects of x-radiation and ultraviolet radiation. Noyes (2001) however reports the effects of exposure of radiation from computer to pregnant women. His research reveals that more than average number of female computer users among their workers in Toronto Star gave birth to children with abnormalities. Bergqvist (1986) notes a serious anxiety from the workers and managers on CTR effects and prevalent use of screen filters as precautionary measures. He observes that temporary myopia combined with dilated eye pupil might be caused by too much closeness to the computer. National Research council (1983) discovers that exposure to radiation emitted by CTR might lead to the formation of cataracts. It reported that the threshold dose of X radiation that induces

cataracts in human is always between200 and 500 rad for a single exposure and around100 rad for exposure speed over a period of several months. Computer users should be educated on how to exercise the focusing mechanisms of the eyes to minimize visual fatigue and temporary myopia disorder. Sauter et al (1985) reveals that the lower part of bifocal lens is supposed to typically ground for a viewing distance of about 30cm and the upper part for a far viewing distance of about 400m and that the distance between the eyes to the monitor should be around 60cm. Without a proper training, many people will need to maximize visibility hence bending their head back to read the screen using the lower part of the lens and at the same time moving the head closer.

Another probable hazardous area is thermal discomfort. Excessive temperature, either hot or cold could result in serious discomfort and poor morale of employees. They become restless, feel dizzy and loose the power to concentrate (Kogi et al, 1989). Workers can develop body aches and muscle cramps due to excessive loss of water and salt from the body through perspiration. The heat may be too severe to affect the brain and the employee may lose consciousness which may lead to death. Too much cold could lead to increased tension, stress levels and awkward working postures such as hunched shoulders.

Noise level is also a challenge to the well-being of workers. Noise levels whether too low or two high could cause ergonomic hazards**.** According to OHC (1998), excessive level of noise in an office setting may negatively affect communication, annoy or distract other workers, cause headaches and palpitations. Noise can cause hearing loss, affects performance and productivity and interfere with spoken communications (Karlsson, 1989). Noise is the most impertinent of all forms of interruption. It is not only an interruption but is also a disruption of thought of an individual using computers exposed to the noisy environment (Schopenhauer 1860, quoted in Halenders 2006). In a noisy environment, increased level of concentration might be required to perform assigned duties. This would in turn increase the levels of fatigue and stress. Noise level may be affected by ventilation Systems, fans, computers, photocopiers, fax machines and too much traffic in the work environment.

Findings and Discussion

Computer applications in the University of Botswana was like blood fluid in human body. The rate of adoption of ICT is very high in the University because most daily routines of academic and administrative staff and the students were done through the use of computers. All the respondents claimed that the use of computer was vital and critical to the attainment of their goals. Lecturers access information from the internet search, use computers to prepare their lecture notes and interact with students through a network arrangement (webct links) of the university. Administrative staff relate with themselves, academic staff and the students via the same network arrangement. Students receive notes and assignments through the webct and submit to the lecturers through the same channel.

In spite of the high rate of adoption, design of workstations did not perfectly match the standard expected to facilitate functionality and usability in the University. More than fifty percent of those interviewed claimed that their chairs and tables did not make for comfort. About ninety percent of the computers observed did not have screen filter to protect users from the probable effects of cathode rays radiation from the computers

The University conducts training on the use of computers for both the staff and the students frequently. Most of the respondents could boot, type and use application programs. More than 80% of those interviewed could use Microsoft word, excel and power point successfully. However, more than 50% were not capable of using excel for calculation and only 20% could use SPSS for

analytical purposes. All the respondents claimed that they were not trained on how to position their computers on the table and proper sitting posture. This has exposed them to ergonomic hazards.

All the administrative and students interviewed had no knowledge of ergonomics let alone the hazards and stress associated with it. Most of them heard the concept for the first time during the interview. However, more than 60% of the academic staff interviewed were familiar with the concepts and some related health problems. The University needs to make concerted efforts to educate the community on techno-stress and ergonomic hazards and the necessary precautions to take.About 75% of the respondents have experienced ergonomic problems though they did not know that it was caused by too much exposure to computers in improperly designed workstations. The table below shows the problems experienced by the respondents. The probable causes for the identified problems were deduced from the answers of the respondents to the researchers probing questions.

Most of the respondents have taken sick leave because of the above problems while others agreed that whenever the symptoms were on, they could not perform optimally. One of the respondents was forced to pack his car on the road when he 'felt a sudden eyes pain and darkness filled his eyes' when he was driving back home after spending the whole day using computer. Another respondent said 'I am gradually developing the problem of hearing due to this noise you hear from this sever. It is not supposed to be placed here where we are seated since morning to evening. You can even feel the heat coming from the server and the room is too small'

Table 1: Causes of Ergonomic Problems

Ergonomic Related Complaints	**Probable Causes**
Lower and Central Back Pains	Chairs without back rest and lumber support
Knees, legs swelling	Sitting without proper foot rest
Shoulders, fingers and arms	Unsupported arms during typing
Neck pains	Head bent back without backrest support
Lower back eyes and central back pains	Trunk bent forward closer to the screen
Headache, eye and chest pain	Computer without screen filter
Hearing problems	Sitting too long in a room with too much noise
Fingers, thumb, wrist and elbow angles pains	Improper typing skills

Source: Research Survey, 2009

Discussion

From the responses of the staff and students, the University of Botswana has been transformed from conventional to modern University with the introduction of online catalogue in the Library, Webct and e-learning that has impacted on the university community. Computers are available in all the offices observed and they are all connected to a central server through a network arrangement, mopipi.ub.bw. Provisions are made for students' computer laboratory and various arrangement are made to train the staff and students on the use of ICT equipments.

In spite of all these, there still appears to be a serious gap in ergonomic practices in the University. Most of the chairs observed were not adjustable or comfortable. No footrest and lumbar support. Most of the computers were not properly positioned and the viewing angles did not meet the required standard. The adverse effects of pervasive computing have not been fully addressed because the occupational health and safety policy has not been fully adopted. The policy provides guidelines on how to set up office environment and how tools and equipments are to be

arranged. Most technology driven economies have taken this seriously and have made concerted efforts to implement occupational health and safety policies. Firms are encouraged to incorporate these standards into their business strategies to prevent hazards and techno-stress.

The University needs to hire ergonomics consultants to provide the knowledge on ergonomic design solution and proper use of computers at workplace. Awareness workshops, seminars and training on the proper use of ICT equipments should be organized. This calls for collaborative efforts on the part of the management and computer users. The staff and students should be educated on the best practices of using computers in a healthy and productive environment. This awareness program should be incorporated in the overall policy and mission statement of the university to reinforce commitment to the good practices.

The university should embark on a comprehensive process of redesigning a productive and safer computer workstation. Ergonomic chairs that are adjustable and flexible enough to meet the needs of all users should be introduced. They should have lumbar support, backrest and footrest. Computers should be properly positioned and the viewing angle should be between 25 and 30 degrees. Antiglare filter should be put in front of the screen to reduce the effects of radiation from the computers. Proper sitting and working posture should be taught to all computer users in the University.

Though training of employees will add cost to the organization on the short run, it will be beneficial and profitable on the long run as it reduces future risks on ergonomic related health problems. Training should not be limited to booting the system and using application software. It should extend to psychological and physiological capabilities of computer users. Proper training will reduce psychological stress and physical hazards. Absenteeism will be kept to the barest minimum and health care cost will reduce reasonably. An improvement in employees' well being will reduce compensation costs (arising from ergonomic hazards), improve performance and increase productivity.

Health Hazards Assessment (HHA) technique should be used to evaluate the human health aspects of the system designs (Ericson, 2005). HHA concentrates on human health hazards during production, test, as well as operational phases. It involves the consideration for ergonomics, noises, vibration, temperature, chemicals and hazardous materials. The aim of the assessment is to identity problems in the early stage and tries to eliminate before an injury or providing for a protective measures such as screen filters to reduce the associated risk to an acceptable level at work place. Three stages involved in this model are Identification of Preliminary Hazard List (PHL); Preliminary Hazard Analysis (PHA) and provision of a design safety focus. The theory of Health Hazard Assessment incorporates inputs and identification of potential human health hazards resulting from system operators' exposure followed by Health Hazards Assessment process and later the outputs which inform the result of the safety requirement and the action taken. The University, after setting up computer station, should identify the human hazards sources accompanied with the installation and its logistics to have a critical determination of quantity exposure level and then establish the design mitigation ways to alleviate or reduce exposure to a tolerable level.

Conclusion

Organizations should maintain a good balance between the utilization of the attractive features of ICT and ensuring human needs for safe and efficient working conditions. Workstations should be designed to recognize and accommodate a variety of human capabilities and limitations

to reduce the potential disorders and adequately motivate workers for optimal performance and increased productivity.

References

Berqvist, U. (1986), "Workstations Design and Posture", Human Factors, 15, pp 265-268.

Brauer R. (2006), Safety and Health for Engineers, 2nd ed., John Wiley and Sons Inc, New Jersey

Cakir et al (1980). "History of Personal Workstations", Proceedings of the ACM Conference on the History of Personal Workstations; New York, ACM pp.183-198

Health and Safety Executive (2003), "Health and Safety Highlights", National Statistics, London, HSE Press

Helander, M. (2006), A Guide to Human Factors Ergonomics 2nd ed., USA, CRS Press

Human Factor and Ergonomics Society (2004), Human Factors Engineering of Computers Workstations: Draft Standard for Trial Use, USA, Santa Monica Publishers, 2003

International Standard Organization (2004), ISO Series 9241, Geneva, ISO Press

International Labor Office (1987), "Ergonomics in Developing Countries: An International Symposium" Occupational Safety and Health Series, Geneva

ILO (1998) Work Organization and Ergonomics, Geneva, International Labor Office

Karwowski W. and Marras W. (1999)," Principles and Applications in Engineering Series" Occupational Ergonomics, Engineering and Administrative Controls, USA, CRC Press LLC

Kogi, K. Phoon W. Thusman J. (1989), "Low-Cost Ways of Improving Working Condition: 100 Examples from Asia" International Labor Organization Publication, Geneva 22, Switzerland.

Kroemer, K. E and Hill S. G. (1989), "Preferred Delineation and the Line of Sight" Human Factors Ergonomic, UK, Prentice Hall Publishers

Kroemer, K. E. (2006), Extra-Ordinary Ergonomics: How to Fit All Peoples, USA, Taylor and Francis Group

Kupersmith, J. (1992) "Techostress and the Reference Librarian", Reference Services Review, 20, 7-14, 50, Prerian Press

Macleod D, (2000), The Rules of Work: A Practical Engineering Guide to Ergonomics Taylor and Francis, New York. Evans R. 2008

Michel, D. P. (1994), "Effects of Two Chairs Types on Stature Change and Comfort for Individuals with Health and Herniated Discs", Ergonomics, 41, pp.1618-1641

Michelle, W. (2007), A Conversation with Technostress Authors, University of Warwick, CRC Press

Mollel E. R. (2009) "Investigations on the Mechanisms Adopted to Reduce Ergonomic Hazards and Alleviate Techno-Stress", Unpublished Assignment Submitted to the Department of Management, Faculty of Business, University of Botswana, as Part of Assessment for MGT 674

National Research Council (1983), Video Displays, Work and Vision, National Academic Press, Washington DC

National Research Council (2003), Musculoskeletal Disorders and Workplace, National Academic Press, Washington DC

NIOSH (1981), “Work Practices Guide for the Design of Manual Handling” National Institute for Occupational Safety and Health

Noyes J. (2001), Designing for Humans, Canada, Psychology Press Ltd

O’Brien J., and O’ Marakas J., (2007), Enterprise Information Systems, 13th Edition, McGawHill

O’Leary T., and O’Leary I., (2006), Computing Essentials, McGrawHill

Office Ergonomics Workbook (1998), Occupational Health Clinics for Ontario Workers Inc, MPH Graphics Line

Pribbenow K. (1990), “Techostress”, Educational Technology, Boise State University, US Department of Education, Technopho.

Santon N. (2005), Handbook of Human Factors and Ergonomics Methods, New York, CRC Press

Sauter S. L., (1985), “Improving VDT Work”, Department of Preventive Medicine, USA, University of Wisconsin.

Soopu, A. O., (2009) ‘Towards Reducing Common Ergonomic Hazards and Alleviating Techno-Stress in Botswana College of Agriculture’ Unpublished Assignment Submitted to the Department of Management, Faculty of Business, University of Botswana, as Part of Assessment for MGT 674