IMPLICATION FOR OFFICE ENVIRONMENT ERGONOMIC INTERVENTION: 
A STUDY OF LOCAL GOVERNMENT OFFICES IN KATSINA STATE OF 
NIGERIA

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DEDICATION

This piece of work is entirely dedicated to my late father, Alhaji Saje Dangambo Katsina and his entire family both living and late.
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ABSTRACT

Work-related musculo-skeletal disorders among the office workers are issues of global concern as they account for over 40% of work place safety and health hazards. In Nigeria, back pains and upper extremities disorder as well as eyes syndrome are common epidemics among the office workers in the Nigerian Public Sector with negative effects on the workers’ output and the economy in general. The main objective of this research is to investigate the cases of work related musculo-skeletal disorders among the workers of Local Government offices in Katsina State of Nigeria in relation to the nature of office facilities, nature of office ergonomic policy and ergonomic awareness of the workers. Questionnaire approach was adopted based on 5 Likert scales. Qualitative approach using structured-unobtrusive observation was also adopted to support the findings of the questionnaire method. Thus, 250 questionnaires were distributed to 10 Local Governments out of 34 Local Governments of the state using randomised cluster sampling. 218 questionnaires were retrieved representing 86.55% mean response rate, while 210 were ready for the analysis. From the survey of the workers’ opinion and the observation of office ergonomic risk factors, it was found that there is a prevalence of work related musculo-skeletal disorders among the workers in Katsina State Local Government offices based on the mean opinion of 3.38, poor office facilities based on the mean opinion of 2.49, poor ergonomic policy based on the mean opinion of 2.35 and poor ergonomic awareness based on the mean opinion of 2.48. Similarly, the result of correlational analysis of the three elements of office ergonomic intervention (office facilities, office ergonomic policy and office ergonomic awareness) shows positive relationship of \( r=0.545 \), \( r=0.441 \) and \( r=0.44 \) respectively. It is therefore concluded that in order to solve the problem of work related musculo-skeletal disorders among the staff of Local Government offices in Katsina State of Nigeria, the three elements of ergonomic intervention must be improved at once in order to achieve sustainable office work environment for the overall productivity of workers.
ABSTRAK

Gangguan musculo-rangka yang berkaitan dengan pekerjaan di kalangan pekerja pejabat merupakan isu-isu yang menjadi kebimbangan global kerana mereka merupakan lebih 40% daripada isu keselamatan tempat kerja dan bahaya terhadap kesihatan. Di Nigeria, sakit belakang dan bahagian kaki ke atas serta mata adalah sindrom wabak penyakit biasa di kalangan pekerja-kerja pejabat di Sektor Awam Nigeria dengan kesan negatif ke atas produktiviti pekerja dan ekonomi secara umum. Objektif utama kajian ini adalah untuk menyiasat kes-kes gangguan musculo-rangka yang berkaitan dengan pekerja di pejabat-kerja Kerajaan Tempatan di Katsina State Nigeria berhubung dengan kemudahan di pejabat, dasar ergonomik di pejabat dan kesedaran ergonomik di antara pekerja. Pendekatan soal selidik telah diterima pakai berdasarkan 5 skala Likert. Pendekatan kualitatif menggunakan pemerhatian berstruktur tidak menonjol juga telah diguna pakai untuk menyokong penemuan kaedah soal selidik. Oleh itu, 250 borang soal selidik telah diedarkan kepada 10 Kerajaan Tempatan daripada 34 Kerajaan Tempatan yang terdapat di negeri ini menggunakan persampelan kelompok rawak. 218 soal selidik telah diambil mewakili 86,55% kadar tindak balas purata, manakala 210 bersedia untuk analisis. Berdasarkan kajian terhadap pekerja dan pemerhatian faktor risiko pejabat ergonomik, didapati bahawa terdapat satu kelaziman gangguan musculo-rangka kerja yang berkaitan di kalangan pekerja di pejabat Katsina Kerajaan Tempatan berdasarkan pendapat min 3.38, kekurangan fasiliti berdasarkan pendapat min 2.49, dasar ergonomik yang lemah berdasarkan pendapat min 2.35 dan kurang kesedaran ergonomik berdasarkan pendapat min 2.48. Begitu juga, keputusan daripada analisis korelasi daripada tiga elemen ergonomik pejabat (kemudahan pejabat, polisi ergonomik dan kesedaran ergonomik) menunjukkan hubungan positif $r = 0.545$, $r = 0.441$ dan masing-masing $r = 0.44$. Maka dengan ini dirumuskan bahawa untuk menyelesaikan masalah gangguan musculo-rangka kerja yang berkaitan di calangan kakitangan pejabat Kerajaan Tempatan di Katsina State of Nigeria, tiga elemen ergonomik akan ditingkatkan untuk mencapai persekitaran kerja di pejabat yang mampan untuk produktiviti keseluruhan pekerja.
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CHAPTER 1

INTRODUCTION

1.0 Introduction

Safety, healthiness and sustainability of work environment are issues that deserve great attention, as work environment becomes almost synonymous with other human environments. According to Alan (2010), average working adults spend more than one third of their daily hours at work. According to Saurin and Fereira (2009), a work environment covers the totality of the atmosphere where task is designed, supervised carried out and completed. From other environmental indices, a work environment is a physical or geographical location, as well as the interior and exterior surroundings of for example office environment. In the context of this study, office environment is considered in terms of the physical site of the office as well as the general activities within the building such the office layout, work design, working facilities, temperature and humidity, light intensity and other elements of work place safety and health (Visher, 2012).

A safe working organization is the one that provides healthy outcome for its people through promoting occupational safety and health practice as its corporate policy to ensure that workers are physically and mentally safe (Hymel et al., 2012). In the design of work places, furniture, office layout and equipment, it is important to consider the features, sizes and biological make up and the capability of workers who will use them. This is exactly where the question of office ergonomics comes about. Ergonomics is the practice of designing products, systems or processes to take proper account of the interaction between them and the people that use them so that they do not inflict harm on them (Alan, 2010).
Ergonomics as a multidisciplinary field has contributions from Psychology, Engineering, Biomechanics, Industrial design, Human Resource Management, Anatomy and Physiology, and Anthropometry. Its thrust is the study of designing equipment and devices that fit the human body and its cognitive abilities. Therefore, the two terms "Human factor" and "Ergonomics" are essentially synonymous (Jeffress, 2000). Human beings, unlike machines or equipment, have no standard form and that their sizes, strengths and biological tolerances are important to consider when designing work places and work facilities (Kohn, 1998; Mc Glothlin, 2012).

Workers who complain of bad back or stiff –nakedness (which are attributable to the poorly designed tables, desks, chairs or work stations), such complaints could have been prevented if there is a proper application of Ergonomic and Anthropometric principles (Alan, 2010; Cavalho et al., 2014). Considering the poor OSH records of the third world countries and particularly Nigeria (Adeogun & Okafor, 2013), Local Government staff are more vulnerable to ergonomic injuries due to their physical exposure to certain safety risk factors resulting from poor office facilities and work policy.

Nigeria as a signatory to Geneva Conventions on Occupational Safety and Health in 1981, and in conformance with the international requirement, a Bill was passed in 2012 by the Nigerian Legislators called “Labour Safety and Welfare Bill” which empowers the National Council for Occupational Safety and Health to enforce and implement Occupational Safety and Health measures and awareness in Nigeria to cover both formal and informal sectors (Keith 2014). However, according to Nigerian legal system, this bill does not translate into National Law (Act) until it is ratified by the executive arm of Government (President). Due to neglect of safety and health issues in Nigeria, this Bill has not been accented by the president and it is therefore not enforceable. Therefore, based on this, it could be said that, the Occupational Safety and Health Bill of 2012 is ineffective in Nigeria and this makes the implementation of Safety and Health Laws very insignificant. With this scenario, occupational safety and health practice in Nigeria is very poor (Adeogun & Okafor, 2013).

This lack of implementation capacity of OSH in Nigeria exposes workers especially of the governmental offices to serious occupational or ergonomic risk factors and hence the complaints of musculo-skeletal pains become order of the day, and which they often associate with primordial factors (Adedoyin, 2009). This therefore makes it
necessary to carry out research with specific emphasis on governmental offices of Katsina State Local Governments in Nigeria to study their office environment in relation to office ergonomic scenario which comprises the issues of musculo-skeletal pains among the workers, office ergonomic facilities, ergonomic policies of local government offices and the level of ergonomic awareness of workers. This is with a view to studying their relationship, in order to suggest the guidelines on how to reduce the exposure of workers to risk factors capable of escalating the prevalence of musculo-skeletal injuries of back, neck, wrist, and shoulders so as to achieve safe, healthy and sustainable office work environment.

Local government is targeted in this study primarily because of its problems of under-funding (Kyenge, 2013) which becomes a serious obstacle to its effective functioning, including its inability to provide healthy, safe and conducive office environment for its workers. A study conducted by Okereke and Daniel (2010) further reveals the fact that Patani Local government, and three other Local Governments in the North Western Geo-political Zones including some sampled Local Governments in Katsina State are the ones with worst scenario of work environment in terms of office accommodation (Office Physical Environment), furniture, working facilities and that their safety and health measures are not reliable.

Based on this evidence, it can be extrapolated that the health issues of ergonomic (musculo-skeletal) disorders identified among the office workers could be attributed to the poor office environment with no ergonomic facilities to ensure their safety and health, low level of ergonomic awareness and poor ergonomic policy in Nigeria. These are the central issues which this study wants to address in order to ensure effective intervention for the health, safety and maximum productivity of the local government employees and other governmental offices in Katsina State of Nigeria.

1.1 Background of the Study

The prevalence of ergonomic injuries, especially the office work related musculo-skeletal disorders are issues of both local and global concern with grave socio-economic consequences. Serious intervention efforts are needed for the health, safety and overall productivity of workers. This is because, from the current global workforce of 2.9 billion,
around 1.95 to 2.3 million workers die across the globe as a result of work related or occupational injuries caused by exposure to work place risk factors. This epidemic is increasing at an alarming dimension. (Takala, 2002; ILO, 2005; Altwaiji, 2008; Lippincott, 2010).

From these cases, about 35% are victims of office work related musculo-skeletal disorders who are associated with computer and typing jobs (ILO, 2005; Kalla, 2010; Niu 2010; Ranasinghe et al., 2011). The number of millions of workers who are victims of work related musculo-skeletal disorders is expected to double by the year 2020 (Kalla, 2010).

Currently at local level, in Nigeria, according to the Report of Federal Ministry of Labour and Productivity Inspectorate Department, FMLPID (2014), there were about 31,830 cases of work related occupational injuries in between the period of 2002 to 2012 (average of 3,185 per annum), and significant percentage of these cases are work related musculo–skeletal injuries which accounts for the 4% reduction of the Gross Domestic Product (GDP) of the country which is estimated annually to be 510 billion US Dollars (Nigerian National Bureau of Statistics, 2014; Saidu et al., 2011). Still, occupational and work related injuries are under reported in Nigeria (Umeokafor et al., 2014).

This underestimation of work related injuries is as a result of limited insurance coverage of workers and substantial cases of under reportage of certain injuries in record keeping system which is the common case in the third world countries (Barrientos, 2008). Another factor responsible for the under reportage of such cases is the personal reason and the fear of taking so many sick leave which is not favourable to the employee, as number of sick leave in a year is recorded and considered in annual employees’ appraisal and evaluation form and this can affect them negatively in their career advancement.

In Kano city alone, there is a study which discovered that substantial number of workers have experienced several cases of especially musculo-skeletal pains which have not been reported to the management of the organisation for one reason or the other and such injuries are body pains, discomfort in the lower back region, neck, shoulders etc., especially among the office employees (Saidu et al., 2011). Similarly, from the previous study on the survey of cases of lower back pains and neck disorder among workers conducted between South Africa and Nigeria, with 67% of the study conducted in Nigeria,
with 48% percent of samples covering office workers, there was a significant number of such cases from the Local Government workers (Louw et al., 2007).

The above scenario therefore calls for effective intervention so as to tackle this problem of work related musculo-skeletal disorder which is a common phenomenon among the typist, secretaries, personal assistants and other related computer and clerical jobs in the governmental offices in Nigeria. The emphasis for invention is on the Local Government offices where due to the problem of underfunding, the work environment is not equipped with good office facilities to take care of their safety and health (Kyenge & Okereke, 2013). This is a situation which if not taken seriously, can lead to further escalation of the epidemic of work-related musculo-skeletal disorders which as shown above, has devastating socio-economic consequences. (Sylvia et al., 2013). Hence, there is a strong need for effective intervention to save the situation.

Effective intervention as the focus of this study, involves the change and improvement in the level of office facilities of the Local Government offices which have serious health implication for the workers. Similarly, as highlighted above, the work policy of governmental offices in Nigeria has no consideration for human factor (Nnedinma, 2014) and this also has to be changed as a means of ergonomic intervention. Another stimulating issue in this research is that, to date, there is a limited literature and researches with respect to office ergonomics (Menendez et al., 2012), and the workers especially at the Local Government level are lacking in office ergonomic training and awareness (Ismaila, 2010). There is therefore the need to create ergonomic awareness as another model of intervention.

Hence, there is a strong need for researches in the various aspects of ergonomics, particularly office ergonomics as continuous researches have established a link between work place situations and development of musculo-skeletal injuries (Menendez et al., 2012; Verina et al., 2007; & Alan, 2013).

1.2 Problem Statement

The problem of office work-related musculoskeletal disorders has negative consequences on the workers’ output, and is regarded as one of the most common and most costly occupational health problems with grave socio-economic consequences.
The epidemic of this occupational health problem is common among the computer users, secretaries and other clerical workers in the governmental offices in Nigeria. The rising profile of this epidemic in the governmental offices is firmly connected to the poor nature of office facilities, poor nature of ergonomic policy as well as low level of ergonomic awareness among the workers of public sector in Nigeria (Adedoyin et al., 2009). These are three key issues as the focus of this study. These issues need to be investigated so as to curve the prevalence of work related musculo-skeletal disorders which has a devastating consequences on the office workers’ output and the economy in general as it accounts for the drop in the sectoral Gross Domestic Product of the country which is estimated to be $510 annually (Nigerian National Bureau of Statistics, 2014).

It was reported that from 2011 to date, the cases of work related musculoskeletal disorders accounted for 33% of all workplace injuries and illnesses, sprains, strains and tears accounted for 38% of injuries and that, such injuries which occur as a result repetitive motion mostly found in typing and other office jobs required a median of 23 days away from work. (Frush, Redlin & Cruze 2011).

Thus, based on the above, justification there is a great concern for effective ergonomic intervention in the office work environment of public sector, specifically the Local Government offices by way of improving the nature of office facilities, nature of ergonomic policy and boosting ergonomic awareness among the workers. From the study of Labedan et al. (2013) in the governmental offices in Nigeria, 70% of the office workers associated with computer work and other clerical activities have experienced musculo-skeletal pains in the neck, shoulder, back and wrist as a result of poor ergonomic facilities, poor ergonomic practice (policy) and poor ergonomic training (awareness). This is similar to the findings of the previous survey of Adedoyin et al. (2009) concerning the epidemic of musculo-skeletal pains among governmental office workers associated with computer work including Local Governments, which revealed that the most common complaints of musculo-skeletal pains were low back pain with 78%, finger pain with 10% and neck disorder (stiffness and pains) accounting for 12%.

The first issue is that, poor office environment of Local Governments in Nigeria which leads to poor office ergonomic facilities is a valid reason for ergonomic intervention in order to reduce the vulnerability of workers to risk factors for work related musculo-skeletal disorders. As a result of poor funding of Local Governments in Nigeria, the office
environment is equipped with poorly designed office facilities (Okereke & Daniel 2010; Abbass et al., 2012 Kyenge, 2013). Therefore, intervention is needed in order to change or improve the nature of office work facilities for the health and productivity of the workers.

For example, a report from Naira Forum (2015) highlighted one of the local governments in Nigeria where due to lack of decent office accommodation and basic office facilities, toilets were converted to offices for the local government staff. This scenario applies to almost all other Local Government Councils in Nigeria where for example, a report of Katsina State Ministry of Finance and Economic Planning (2005) highlighted that inadequate funding of local governments militated against the supply and maintenance of office facilities and general staff welfare. This is therefore, a strong confirmation of the poor office ergonomic environment of the Local Government offices and is the reason why the offices are equipped with poor ergonomic facilities. This situation is a good factor for the development of health problems, especially of work related musculo-skeletal disorders among the office workers.

Another issue in this investigation, is the issue of poor ergonomic policy of governmental offices in Nigeria. Intervention is needed in order to change or improve such poor office work policy which also applies to Local Government offices (Okolie & Okoye, 2012). The nature of work policy of governmental offices in Nigeria totally disregards human factor due to poor OSHA records of Nigeria (Diugwu et al., 2012; Idubor & Osiamoje, 2013). This is a good factor for the rising profile of musculo-skeletal complaints among computer related and secretarial jobs (Labeodan et al., 2013).

Another critical factor of study is the issue of low level of ergonomic awareness among the staff of governmental offices in Nigeria. Here also, there is an implication for ergonomic intervention in order to boost the level of ergonomic awareness among the office workers in Nigeria. According to Ismaila (2010), about 80% of office workers especially in the governmental offices are lacking in ergonomic training and awareness and this, could also be another factor for the epidemic of musculo-skeletal pains among the secretaries and computer users (Kalla, 2010). Poor level of ergonomic awareness was also confirmed by the findings of Ranasinghe et al. (2011) where it was indicated that 70.1% of the workers are lacking in ergonomic awareness. According to Menendez (2012), to date, literature and researches in office ergonomics are scarce and this might
generally account for the low level of ergonomic awareness of secretaries, typist and other related computer and clerical jobs.

These three key issues (Nature of Ergonomic Facilities, Nature of ergonomic Policy and Poor level of ergonomic awareness) form the basis of this research as they are considered to be critical factors concerning the epidemic of work related musculo-skeletal disorders which are common in governmental offices in Nigeria and in which guidelines for improvement need to be prescribed based on the research findings.

1.3 Research Questions

Based on the above issues, now the research questions are as follow:

1. What is the current ergonomic scenario of Katsina State Local Government offices?
2. What is the extent of cases of work-related musculo-skeletal pains among the workers of Katsina State Local Government offices?
3. What is the nature of ergonomic facilities, ergonomic policy and ergonomic awareness of staff in Katsina State Local Government offices?
4. What is the relationship among the three elements of office ergonomic intervention? (Ergonomic facilities, Ergonomic Awareness and ergonomic policy)

1.4 Research Objectives

From the above problem statement and research questions, this study seeks to achieve the following objectives:

1. To explore the current ergonomic scenario of Katsina State Local Government offices
2. To determine the extent of cases of musculo-skeletal pains among the workers of Katsina State Local Government offices.
3. To assess the nature of ergonomic facilities, ergonomic policies and ergonomic awareness of staff in Katsina State Local Government offices.
4. To analyse the relationship among the three elements of office ergonomic intervention (Ergonomic facilities, Ergonomic awareness and ergonomic policy).
1.5 Significance of the study

This study has both practical as well as theoretical significance. In the practical sense of it, it is an action oriented as well as public policy research needing the attention of all stakeholders towards embarking on ergonomic intervention considering the global as well as the local threats which occupational injuries pose on the quality of life of the working population as highlighted in the problem statement. This research will therefore provide guidelines or baseline information to be applied in overcoming the problems of office work related musculo-skeletal disorders caused by poor working environment at the Local Government level in Katsina State of Nigeria and other Governmental offices with related problem. Similarly, by recommending for effective ergonomic intervention schemes, workers safety; health and productivity will be improved. This is to say that there are signs of ergonomic significance in every aspects of work situations.

Similarly, this work will be a guide towards improving the educational process in Nigeria and elsewhere by recommending that Office Ergonomics as a field should be incorporated in the core curriculum of Business, Management, Secretarial, and Administrative studies to create more awareness on the issues of office ergonomics in Nigeria. This will train and equip the students with knowledge of such things as sitting posture and movement at work before going to the world of employment. By this, it will reduce the cost of further training of employees on ergonomic awareness as they are already equipped with such knowledge and awareness.

Lastly, this study carried out within the context of Local Government, is an addition to the few existing body of literature in office ergonomics as there are scanty literature and researches in office ergonomics as highlighted earlier in the background.

1.6 The Scope of the Study

The scope of this study is an investigation of office ergonomic situations of Katsina Local Government Secretariats offices in terms nature of office ergonomic facilities, ergonomic policies and an assessment of ergonomic awareness of the staff together with their relationship so as to come up with guidelines and suggestions which will help in
overcoming or reducing the cases of office work related musculo-skeletal pains among the workers.

Since according to the literature, the cases of work-related musculo-skeletal disorder has become a common epidemic among the workers in government offices (Federal, State and Local Governments) and as the study of ergonomic problems of all governmental offices in Nigeria will require a lot of time and resources which is practically not feasible, this study is taking Katsina State Local Government offices as a unit of study so as to make the research manageable within the limited time and resources.

Similarly, the study is to be undertaken within the context of Local Governments of Katsina State, as there are 776 Local Governments in Nigeria which is not possible to be covered by a single study. Thus, the area of this study is within the radius of Katsina State and within the context of Local Government offices.

Again, as the area of office ergonomics is very wide, the focus of this study is concerned with exploring the ergonomic scenario of the Local government offices by determining the extent of cases of work related musculo-skeletal pains among the workers, assessment of nature of ergonomic facilities, nature of ergonomic policies and ergonomic awareness of staff of the Local Government offices, together with the evaluation of the relationship among these elements of ergonomic intervention (Ergonomic facilities, Ergonomic policy and Ergonomic awareness).

The subjects of the study are the Local Government typists, secretaries, personal assistants and other related clerical activities. This is because, the literature identified this category of workers with the problem of work-related musculo-skeletal pains in the governmental offices in Nigeria. Hence, they become the focus of this research within the context of Katsina State Local Government offices.

1.7 Thesis Organisation

The thesis is organized according to this order:

Chapter one of the research has presented the introduction of the whole work, background and problem statement, research questions, research objectives, scope and the significance of the study. Therefore, chapter one is laying the foundation of the entire
research as it provides an insight into the research problem and clear definition of the research objectives and the outcome.

In chapter two, relevant literature concerning the research topic is reviewed with headings and sub-headings. It has an integrated view of the authors of past researches.

In chapter three, a clear statement of the research methodology has been made. The chapter has provided a step-by-step blueprint on how the research questions have been addressed. This includes the research flow, the sampling strategy, and instrument for data collection and the tools for data analysis and presentation.

In chapter four, the data is presented and analyzed together with the interpretation of such data. It also covers the results and the main findings of the study.

Chapter five is the last chapter of the work as it shows the summary of the main findings, conclusion and recommendations, implications of the findings, contributions, and the limitations of the study.

1.8 Conclusion

This chapter is the focal point of the research where the background and the research problem and objectives are precisely defined and these are connected with the research findings and conclusions. It is the root of the entire research in which objectives are defined, research questions formulated and the scope of the research clearly delineated. It therefore shows the organisation of the research at a glance and harmony in the flow of activities in this chapter is necessary for the research to have a focus and direction.
CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

As the research foundation is laid down by the previous literature, it is therefore pertinent to approach this study by reviewing the literature from such researches which have good relevance to the issues under investigation. This research has as its main objective the study of relationship among the elements of ergonomic intervention in order to propose a way of overcoming the problems of work related musculo-skeletal disorders in Katsina State Local Government Offices and other Governmental Departments with similar cases in Nigeria. Therefore, the literature to be reviewed which is considered to have direct bearing with the issues in the topic as well as the problem statement is presented and organized in headings, sub-headings, and in natural order such that, one step leads to another sequentially.

2.1 Definition of Concepts

Certain concepts and search words are used in the review of the literature and these words or concepts need to be clarified in order to avoid any doubt or chance of being misused. Most of these key concepts are procured from google scholar, libraries and conference papers and journals. These key concepts are as follow:
(a) **Ergonomics:** A scientific discipline or approach 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 products in order optimize human well-being and overall system performance (Michelle *et al.*, 2012) It is called with so many names such as human factor design, human capable designs, human factor engineering, friendly design, functional design etc. It is a field of work design that takes human factor into consideration. Thus office ergonomics, is the proper application of ergonomic principles in the design of office layout, work stations, furniture, as well as ensuring that all the aspects of office work environment are in tune with the capability and limitations of the workers in such a way that no injury is sustained by the worker (Menendez *et al.*, 2012).

(b) **Musculo-skeletal Injuries:** Musculo-skeletal injuries in the context of office ergonomics are injuries which a worker sustains in an office as a result of unnatural posture, repetitive work activities such as typing job that can bring carpal tunnel injuries. Injuries of this nature are back pain, neck pain, lower back disorder, pains in the shoulders, elbows as well as eye syndromes from computer use (Karsh, 2005). These injuries are not fatal per-se, but can impair the quality of life of the worker. They are also called cumulative trauma disorder or ergonomic injuries (Kumar, 2001 & Alan, 2010).

(c) **Ergonomic Intervention:** This is a deliberate attempt to alleviate the cases of prevalence of musculo-skeletal injuries, especially in the office environment. This could be achieved by changing the nature of work policy, designing training programmes aimed at educating workers on how to change their work behaviour that can bring injuries at work such as incorrect sitting posture, as well as by providing work facilities that are ergonomic in nature such as ergonomic chair, table and work station (Mehrparvar *et al.*, 2014).

(d) **Office Environment:** This relates to the totality of office work environment or a general view of the entire elements within the office setting that can affect workers’ health such as ventilation, light, noise, furniture and general work
facilities, temperature etc., (Gregory, 2011). The concern here is to ensure that good office environment is provided for in such a way that workers’ health is not endangered. In short office environment is the place where office task is carried out.

(e) **Ergonomic facilities**: These are general work facilities for the health and comfort of the office workers. Office ergonomic facilities include things such as ergonomic chair, ergonomic table, ergonomic work station, ergonomic computer screen, ergonomic keyboards, ergonomic mouse, etc. Various researches have linked the prevalence of ergonomic or musculoskeletal injuries with poor office facilities. Similarly, introduction or provision of these facilities within the office environment and training workers on how to use them can have significant effect in the reduction of complaints of musculo-skeletal pains such as back pain and neck disorder (Menendez et al., 2012).

(f) **Local government offices**: Local government offices are the various offices within the Local Government Secretariat where clerical and other administrative duties are being carried out for the effective administration of local government as a tier of government in Nigeria. The offices are scattered into departments and units or sub-units.

### 2.2 The Definition and Domains of Ergonomics

Ergonomics, like many other disciplines emerged with the emergence of human civilization. Its concern is to make labour or work easier and comfortable for human beings. It is the practice of designing products, systems or processes to take proper account of the interaction between them and the people that use them in such a way that the products provide comfort of use to the workers and at the same time, without losing productivity (Alan, 2010). That is optimization of use (International Ergonomic Association, 2004). This is another way of saying that we take account of human factor in terms of human capability and limitations when designing or assigning a work.
According to International Ergonomic Association (2014), ergonomics (human factor) 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 optimize human well-being and overall system performance. Based on this, ergonomics is called with various names and applications which in some countries or contexts, are being used interchangeably. For example, ergonomics is called human factor engineering, human capable designs, worker-friendly design, functional design, etc. Ergonomic is helping to harmonize things that interact with people in terms of recognizing people’s needs, capabilities and limitations.

Human Factor Engineering and Ergonomics are terms that are being used interchangeably, especially in the United States (Alan, 2010) and are employed to fulfill the ultimate goals of occupational health and safety to achieve optimum productivity. It is relevant in the design of such things as safe furniture and easy-to-use interfaces to machines and equipment. Proper ergonomic design is necessary to prevent repetitive strain injuries and other musculoskeletal disorders, which can develop over time and can lead to long-term disability.

Ergonomics is a multidisciplinary field and has received a lot of contributions from Psychology, Engineering, Biomechanics, Industrial design, Physiology and Anthropometry. In essence it is the study of designing equipment and devices that fit the human body and its cognitive abilities. Therefore the two terms "human factor" and "ergonomics" are essentially synonymous, and each can be used to denote the concept of human and machine fit. That is why, the basic tenet of ergonomics is about fitting the work to the human and not fitting human to the work (Institute of Ergonomics and Human Factor, 2008). The ultimate goal of human factor consideration in a work place is to immune workers from injury by ensuring that there is a good “fit” between the user, equipment and their environments. It takes account of the user's capabilities and limitations in making sure that task, functions, information and the environment suit each user.

In order to assess the fit between a person and the used technology, human factor specialists or ergonomists consider the job (activity) being done and the demands on the
user; the equipment used (its size, shape, and how appropriate it is for the task), and the information used (how it is presented, accessed, and changed). As such, ergonomics borrows a leaf from many disciplines in its study of humans and their work environments. It is a conglomeration of fields such as Anthropometry, Biomechanics, Mechanical Engineering, Industrial Engineering, Industrial Design, Information Design, Kinesiology, Physiology, Cognitive Psychology, Industrial and Organizational Psychology.

According to Marmaras et al. (1999) & Alan (2010), the foundations of the science of ergonomics is said to have emerged within the context of the Ancient Greek Culture. A good deal of literature and evidences pointed out that Greek civilization in the 5th century BC used ergonomic principles in the design of their tools, jobs, and workplaces. An outstanding example of this claim can be found in the Hippocratic suggestion and description of how a surgeon's workplace should be designed and how the surgical instruments he uses should be arranged and organized so as to give maximum comfort while carrying out a surgery work. In similar dimension, certain archaeological records have also shown that the early Egyptian Dynasties developed tools as well as household equipment that have some elements of ergonomic principles.

The origin of the terminology itself, could also be traced to the Greek expression Ergo (work) and Nomos (Natural Law or Ethics). In essence, it refers to the principles, ethics and humanistic concern and sympathy for the worker so much so that he is not injured in the process of carrying out his work (Imada, 2010). Guttman (1983) also hinted that word the “ergonomics” was first introduced as a modern concept when Polish Scientist Wojciech Jastrzębowski used the word in his 1857 article, entitled “The Outline of Ergonomics”, which denotes “Science of Work, Based on the Truths Taken from the Natural Science”. The introduction of the term to the English lexicon is widely attributed to British Psychologist Hywel Murrell, at the 1949 meeting at the UK's Admiralty, which led to the foundation of the Ergonomics Society. He used it to encompass the studies in which he had been engaged during and after World War II. (International Ergonomics & Human Factor, 2008; Alan, 2010).

In the 19th century, Frederick Winslow Taylor, was the pioneer of the "Scientific Management" method which proposed a way of finding the optimum method of carrying
out a given task. Taylor found that a worker could for example, triple the amount of coal that workers were shoveling by incrementally reducing the size and weight of coal shovels until the fastest shoveling rate was reached and this approach leads to the development of the principles of "time and motion study". This approach aimed to improve efficiency by eliminating unnecessary steps and actions. However this approach to efficiency by Taylor has been criticized by Human Relation School of Management, and later by Russian researchers such as Vladimir Bekhterev, who saw Taylor’s methodology as too mechanistic and dehumanizing, and thus focus on the wellbeing of the workers rather than treating and using them like the extension of rational machines (Moray, 2005).

Ergonomics as a field of study or specialization has three main domains (International Ergonomic Association, 2014; Alan, 2010; Menendez; et al., 2012) as follows:

(a) Physical Ergonomics

Physical ergonomics is the science of designing user friendly equipment and workplaces to fit the user. It is therefore concerned with human anatomy, and some of the anthropometric, physiological and bio mechanical characteristics as they relate to physical activity where human motion is involved (IEA, 2014). Physical ergonomic principles have been widely used in the design and specification of both consumer and industrial products. Physical ergonomics is also found to be very useful in the medical field, particularly to those that are diagnosed to suffer physiological ailments or disorders such as carpal tunnel syndrome as a result of daily occupational repetitive activities. This generates musculo-skeletal pains and ergonomically designed products are also used or recommended in both the prevention and treatment of such pains and disorder. The Occupational Safety and Health Administration (OSHA) has discovered a lot of evidence that well-designed ergonomic programmes can reduce workers' compensation costs, increase productivity and decrease employee turnover (Jeffress, 2000). Therefore, in order to have a well-designed ergonomic programmes, it is necessary to collect relevant data to identify jobs or work conditions that are most problematic and not amenable to human factor, by using viable sources such as injury and illness logs, medical records, job analyses and
observational methods of identifying such clinical syndromes and complaints as in this study which is based on the self-reports from workers using questionnaire approach

(b) Cognitive ergonomics
Cognitive ergonomics as the name implies indicates the study of issues to do with mental processes and activities, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system. The key issues to consider here are mental workloads, decision-making, skilled performance, human reliability, work stress and training as these may relate to human-system and human-computer interaction design (International Ergonomic Association, 2014).

(c) Organizational Ergonomics
Organizational ergonomics on the other hand is covers the aspect of the review and optimization of socio-technical systems, such as organizational structures, policies, and processes (International Ergonomic Association, 2014). Activities that are involved here are styles of leadership and communication, crew resource management, nature of work design, design of working times, teamwork and cooperation, participatory design, community ergonomics, cooperative work, new work programs, virtual organizations, telework, and quality management. According to Driessen et al. (2010), Proper organisational ergonomic intervention is proven to be much the same as effective as physical ergonomic intervention in alleviating the cases of low back pains and neck disorders among office workers, especially those performing managerial level tasks.

2.3 Micro and Macro Ergonomics

As ergonomic is a very wide area of discussion, the above categorization of the three domains of ergonomics can further be sub-divided or viewed from two dimensions: Micro and Macro ergonomics. Macro-ergonomics requires that there should be equal consideration for all major components of the system such as human, hardware, software, and organizational structures. (Kazemi et al., 2014). Macro ergonomics centres around the totality of work environment including the dynamics of external environment as it will affect the organization and its structures and consequently the workers within it. In this
direction, and when viewed from to the perspective of Murphy, Robertson & Carayon, (2014), in order achieve macro ergonomics, all aspects of the work system must be thoroughly evaluated without restrictions and this must be based on the employees perception including their experience of their organizational climates and their interface with such a climate. Karsh et al. (2014) relates macro ergonomics to the socio-technical theory which encompasses the following

(a) Human – Machine/technology interface (Hardware ergonomics)
(b) Human - Environment Interface (Environmental Ergonomics )
(c) Human- Software Interface (Cognitive ergonomics)
(d) Human- Job Interface (Work designs Ergonomics)
(e) Human Organization Interface (Social Ergonomics)

Macro ergonomics is an all-encompassing approach to ergonomics as it focuses on the holistic aspect of organizational work as a system and therefore suggests the application of knowledge, methods, and tools from a number of research areas, including socio-technical systems, Industrial/Organizational Psychology, Cognitive Ergonomics, Physical ergonomics, Systems engineering, and Social Psychology (Carayon, 2009; Karwowski et al., 2002; Kleiner, 2004). For example, application of the knowledge of Organizational Psychology provides an insight towards improving motivation and job satisfaction, enhancement of organizational climate and leadership styles, and encourages social work activities that will foster team work and industrial harmony. By using such approaches, and many others, the central goal of macro ergonomics is to come up with the principles of work designs systems that are in good harmony with an organization's socio-technical system characteristics (Domingues et al., 2012)

As pointed out earlier, the discussion of macro ergonomics must also recognize the presence of external work environment, which according to Hendrick (2002), consists of elements from outside that can infiltrate an organization and to which an organization must be responsive in order to survive and to be successful. Thus, the changes that organization under goes as a result of certain factors which are extraneous to the original work setting, i.e. the general environment, must in one way or the other affect the ways it
organizes work, its leadership styles, policies and other socio-technical aspects of the organizations (Jordan, 2006).

On the other hand, micro ergonomics relates to ergonomics at individual or sub-system level. It is concerned with the understanding and application of concept of how a piece of technology is in harmony with user’s working environment. Thus, a “micro-ergonomics” is a strategy which focuses on the man-machine system, and works towards the improvement of workspace and interface design to prevent risk of injury in the system’s day-to-day work activities. To this effect, micro-ergonomics therefore relies on three major scientific fields: Anthropometrics, Physiology, and Cognitive Psychology. (Morel, 2009).

An approach to micro-ergonomics therefore emphasizes a detailed analysis and evaluation of the man-machine interface as opposed to external factors, and other socio-technical aspect of the organizational setting. Cognitive ergonomics, as highlighted above has fallen within the genres of micro ergonomics. It is an aspect of ergonomics concerned with making human-system interaction compatible with human cognitive abilities and limitations, particularly in a work situation that demands greater use of decision making, data imputing, system analysis and conflict resolution. According to the comment of Budnick & Micheal (2001), “Cognitive ergonomics,” tries to understand the harmony between human cognitive abilities and limitations and the machine, task, environment, etc. It involves giving task which is easier to handle and designing software which makes work easier and friendly, such as statistical packages that simplifies normal data handling and analysis.

The field of micro ergonomics also touches on the discipline of Anthropometrics. Anthropometry, originated from the Greek coinage Anthropos (Man) and Metron (measure) which refers to the measurement of the human individual. It was an early method to the study of Physical Anthropology, and had been used for identification in order to study the complex, human physical variation in size, volume and dimension in Paleoanthropology with a view to correlating the physical, racial and psychological traits (Genong, 2001). In short, Anthropometrics is all about measuring in order to design for the humans, which is a central concern of the discipline of ergonomics.
Anthropometry plays a very vital role in industrial design, clothing design, ergonomics and architecture where statistical data about the distribution of body dimensions in the population are used to optimize products. This is rejecting the concept of an average person where products are designed not based on any precise measurement in the assumption that they will fit the majority of the population. In the practice of ergonomics, human data concerning their body size, length, width etc., must be accurate so that it can be used in the design of work place facilities. It has always been argued that changes in lifestyles, nutrition, and ethnic composition of populations can bring about significant changes to the distribution of body dimensions (e.g. obesity epidemic), and this will make it necessary to have a regular update of anthropometric data collections. Based on this, and as argued by Bes-Ratrollo et al. (2011) relying on self-reported anthropometric data is often the most viable of way of studying large populations.

According to Farkas (2005), Anthropometrics is the scientific study of human body measurement in terms of size, volume and dimension for the purpose of Anthropological classification and comparison. However, Ryan (2013) views Anthropometrics as the study of the human body and its movement, which often involves research into measurements relating to people. It also involves collecting statistics or measurements relevant to the human body, called “Anthropometric Data”

2.4 A Review of Work Related Musculo-Skeletal Pains/Disorders

Work related musculo-skeletal disorders/injuries are injuries which a worker sustains as a result of exposure to ergonomic risk factors in the office environment. The injuries develop over time as a result of awkward or un-neutral posture, forceful exertion or strain contact pressure, exposure to vibration, exposure to intense heat or cold Kumar, 2001) Work related musculo-skeletal injuries are variously known as Repetitive Stress Injuries (RSIs), Repetitive Motion Injuries (RMIs), Musculoskeletal Disorders (MSDs), Cumulative Trauma Disorders (CTDs), or Cumulative Trauma Injuries (CTIs), occupational overuse injuries. They are injuries of the soft issues such as tendinitis or tenosynovitis or a situation of verve compression leading to the development of Carpal
Tunnel or Cubital tunnel injuries (Alan 2010). However, in most of the occupational safety and health terminology, the name given to these injuries is “Work Related Musculo-Skeletal Disorders”. In the postulation of Kumar (2001) these injuries are better differentiated from disorder. Injury can cause disorder or malfunctioning of a body system which can disappear with the healing process of the injury. So injury and disorder are two independent variables of analysis.

Whatever angle of analysis we take, the focal point here is about the physical impairment and or deterioration of workers’ health as a result of their contact with a work environment and the concern of this work is that workers must be protected from becoming the victims of such injuries. According to Niu (2010), Major office ergonomic injuries can be in any of this form:

(a) **Carpal Tunnel Syndrome**: This an injury or disorder as a result of extended periods of repetitive forceful work, and making the same movements of hand, especially if the wrist is pronated and bent down (hands going down lower than the wrists), or making the same wrist movements over and over again involving vibration, and extreme postures of the wrist. This happens during the typing job and use of mouse due to the pressure on the median nerve which controls movement and feeling (Alan, 2010). The nerve is the main coordinator of movement between the thumb and the first three fingers. In this kind of injury, there is an acute pain in the hand and fingers as a result of compression of a major nerve where it passes over the carpal bones through a tunnel or passage at the front region of the wrist, alongside the flexor tendons of the hand (Karsh, 2005). As highlighted above, this condition may be caused by repetitive movements over a long period, or by fluid retention, and its major symptoms are sensations of tingling, numbness, or burning and some people may experience pains in their arm between their hand and their elbow most especially at night. (Kumar, 2001; Faucett; 2005). Figures 2.1 and 2.2 below indicate the acute conditions of carpal tunnel syndrome:
(b) **Acute Tenosynovitis**: This occurs to the hand and wrist as a result of the inflammation of the fluid-filled sheath (called the synovium). This fluid sheath surrounds a tendon and the symptoms of tenosynovitis include pain, swelling and difficulty in moving the particular joint where the inflammation occurs. When the
condition causes the finger to "stick" in a flexed position, this is called "stenosing" tenosynovitis commonly known as "trigger finger" (Pille, et al., 2009). This condition is often present with comorbid tendinitis due to repetitive movements, forceful exertion and extreme postures of the wrist. It is therefore a disorder which occurs as a result of overuse of fingers in a repetitive work activities and is common among office workers, dentists, musicians and carpenters.

(c) **Cubital and Radial Tunnel Syndrome**: Also known as ulna neuropathy is caused by increased pressure on the ulnar nerve, which passes close to the skin’s surface in the area of the elbow commonly known as “funny bone”. It is also likely to develop due to the workers habit of resting the mass of the body on the elbow (Palmer, 2010). The most common symptom of cubital tunnel syndrome is the pain and numbness in the elbow, tingling in the ring and little finger. In acute cases, there is the weakness affecting the ring and little finger, and the general disability in overall hand grip. Figure 2.3 below shows the region of pains as a result of cubital tunnel injury.

![Figure 2.3: Elbow Pains from Cubital Tunnel Injury](Source: Pain Health Management Centre, 2014)

(d) **Lower Back Pains/Disorder**: This is a lumbar region of the body between the hips and the loins. Lower back disorder can occur as a result of a variety of factors such as longer sitting time in an office and working with an office chair without
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