



# Ergonomics

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## Review Article

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## Abstract

The term Ergonomics comes from the Greek word “Ergon” meaning work and “Nomos” means laws. It means the “Science of work”. The work is to be systematically divided into various tasks and it should be aligned with the person who will be doing the work. People should be comfortable in their work setting in order to optimize their wellbeing and over all organizational performance. Ergonomics is often used in relation to the physical aspects of the organization, which consists of designing chairs, tools, machines, systems, tasks, jobs, and work environment for safe, comfortable, and effective human use. It complements the strengths and abilities of people and minimize the effects of their limitations. Hence, an appropriate ergonomics design, training and awareness are essential in order to reduce the ergonomics risk factors such as WRMSD (Work Related Musculoskeletal Disorder) which is one of the most prevalent occupational health problems. Major causes of MSDs arise due to high physical demands such as awkward working postures (e.g. Bending and twisting, kneeling, working with the arms above shoulder height etc.).

This paper emphasizes on how various situations like physical, cognitive, and organizational ergonomics can be aligned to suit the people who need to use it rather than forcing them to work in an uncomfortable, stressful and dangerous way. Primary outcome of this study is to enhance and improve safety, physical and mental health of the employees for effective performance and productivity by ergonomics solutions.

**Keywords:** Designing Chairs; Tools; Machines; Systems; Tasks; Jobs and Work Environment

## Introduction

Wojciech Jastrzebowski coined the word “Ergonomics” in 1857. This concept emphasizes to help workers and employees to operate more productively, and it got published in the beginning of 1900. Since then the term is being popular in organizations. “Ergonomic” refers to creating a conducive workplace by aligning job, equipment, and work environment for employees to become comfortable in the process and be productive in the system. Applying Ergonomic principles, on-the-job illness can be avoided, and job satisfaction can be created. There are various facets of it, like safety, comfort, ease of use, satisfaction and become productive etc. Organizations follow their own ergonomic principles to optimize their socio-technical systems and organization structures,

policies, and process in order to maximize efficiency and effectiveness. It also includes Communication, resource management, work schedule design, teamwork, quality conscious and community ergonomics. Mostly organizations adhere to the balance model where the integration happens. Changes in one element in the system impact other elements. With increasing competition rapidly changing demands and innovations in technology, understanding ergonomics is the need of the hour. This ground rule is followed across industries and companies. As one-size does not fit all, organizations adopt their own principles depending upon the nature of work, demography, and structure of their own workplace. It seems, in every organization nearly everyone in this digital world is spending a lot of time in front of a computer, which

can strain the eyes as well as other parts of the body. As this is the common feature of every organization researchers are interested to understand how Ergonomics can help in reducing computer related discomfort by becoming more aware of the body posture during computer work, adjusting the workstation and the screen-viewing habits. This is termed as Computer Ergonomics. Understanding computer ergonomics is must for every industry including IT and ITes, as IT professionals mostly do the desk job, the probability of all discomfort related to computers is at the higher side, hence needs special research.

The Indian IT industry is divided into four major segments, like: IT services, Business Process Management, Software products and Engineering services and Hardware. The IT and ITes sector are growing rapidly as global market is expanding. Indian IT and ITes companies have set up over 1000 global delivery centres in about more than 80 countries across the globe. Hence, IT sector is a key part in Indian economy since it has built up brand equity in the global market.

## Literature Review

According to R.S Bridger in his book "Introduction to Ergonomics" (2008) mentioned that the focus is on the interaction between the person, the machine and the design of the interface between the two. Interface designing is very important as it helps in smooth and ease functioning of the machine. In 1911 Frederick W. Taylor, Father of Scientific Management, in his book "The Principles of Scientific Management" also mentioned productivity could be increased by designing the way work is done and not just by using better machines. Whereas Anne D Kroemer and Karl H.E. Kroemer in their book "Office Ergonomics" (2001) [1] described ergonomics as designing entire office building, laying out individual work-station related components like, chairs, desks, computers, and computer mouse etc. This helps in enhancing both physical and cognitive wellbeing of people, streamlining work and doing it efficiently. They have also emphasized on the application of Scientific principles and methods in Ergonomics, which takes care of design of machines, systems, and environment rather than making people adjust with them. Andrew S. Nicholson and John E. Riddin in their book "Health, Safety and Ergonomics" (1988) mentioned about the importance of Ergonomics in the prevention of accidents and ill-health at the workplace. Proper design of the man-machine interfaces can reduce the chances of human error also as described by M. Butlewski & M. Jasiulewicz in their article "Design methods of reducing human error in practice" (2014). Human error is understood as only such action which was not purposefully intended by the human and is an action done in good faith, not a deliberate violation of the established rules. These errors

may be skill-based errors or mistakes. All said and done, all errors, be it Skill based error or mistakes will lead to poor product quality and less output. Ergonomic issues not only impact productivity of the employees in the organization but also affect health of employees. There are various ergonomic risk factors:

Cumulative trauma Disorders (CTDs) are defined as physical injuries, which develop due to repeated stress or pressure on a body part. It results in discomfort, impairment, or persistent pain in joint muscles. Musculoskeletal disorders (MSDs) are referred to as repetitive motion that affect the muscles or nerves. According to the Canadian Centre for Occupational Health and Safety in "The Official magazine of the NSC (2017) workers can develop MSD from bending, gripping, straightening, holding, twisting or reaching with their arms and hands. Hence, these movements can be there in every workplace at any level. Particularly, when people work in office mostly, they use computers. In IT and ITES, employees are mostly dependent on computers, so more care is to be taken by ergonomists by :Positioning the computer in proper height, Keeping the mouse close to the key board, Placing the monitor about an arm's length in front of the person, keeping the necessary items closer in order to avoid unnecessary stretching throughout the day. The article "Ergonomics in the Workplace" by Jeffrey E. Fernandez and Michael Goodman (2018) elaborates ergonomic issues such as: anthropometry, Seat design, workplace principles, manual material handling and cumulative trauma disorders. The ergonomic approach to workplace design must be recognized at the earlier stage and be considered as one of the most essential factors in designing the workplace, and it is the most important one for controlling sources of workplace stress. According to Dias & Coble, application of ergonomics principles to the design of man, machine interfaces, including displays of plant and process information, control devices and panel layout need to be considered seriously in designing best ergonomic design for the workers [2-5].

Hence, Ergonomics is to fit task to the individual but not to fit an individual to the task. Since the focus is on individuals, management can take precautions by following Ergonomics in their workplace. Simply by following Ergonomics may not solve the purpose of management, at the same time people should make understand the importance of it. Not only at the workplace at home also they should follow it in order to keep themselves Accident -free. There are three approaches towards this accident occurrence and prevention.

Firstly, creating an accident-free or a safety environment can also be possible by monitoring employees' behavior. As viewed by Heinrich (1931). Secondly, this was also supported by Haddon (1964) in 'Accident Research – methods and Approaches. He believes that the working environment acts on the employees to cause the accident at the workplace. The

Haddon method of lowering accident rates is with design solution. The third aspect mentioned by Cohen (1977) is that *“Management commitment to safety, that is its overt concern and support for safety activities, represents a dominant factor in safety experience.* Whereas Herzberg in his *“Two factor theory”* considers a safe working environment as a hygiene factor, thus it does not motivate if it is in place and is only an issue if missing. For management, the lack of a safety program can have regulatory compliance issues, influence company morale, make recruiting difficult and impact the bottom line. Therefore, continuous management support for understanding Ergonomic issues, implementing it in the organization and creating awareness among employees is a critical part of a successful safety program.

#### Objectives:

1. To understand uses of Ergonomics in organizations
2. To analyze the impact of Ergonomics on health and safety at workplace
3. To understand how Ergonomics can be improved to increase productivity.

### Research Methodology

For the collection of data both the primary and the secondary sources were used. Primary data were collected by circulating the questionnaire, at the same time direct face to face interaction also helped in revealing certain facts. Books, journals, articles, files of the organizations and periodicals also served the purpose of providing secondary information for the study. 73 samples were taken for the study specifically from IT and ITes, as the fact that mostly people sit for a long time with laptops and desktops. It is needed for them to understand the principles of Ergonomics and its negative impact on health. A questionnaire was developed with 12 questions by taking open-ended, Dichotomous, and close ended questions by referring literatures. After data collection, analysis was done by taking the help of statistics with SPSS. Some relevant analyses were put here in the paper. Convenience sampling technique was used for collecting data from the population that is IT professionals [7-12].

### Data Analysis and Interpretation

Total 85 respondents were given questionnaire for the survey. Out of them 73 relevant samples were used, as others were either half-filled or were not properly filled to be used for analysis purpose. Out of the total sample 95% are of the opinion that they have some discomfort in the continuous sitting postures. When they were interacted through face to face interaction, they told that the work pressure is too high for them, so they do not get time to get up from the chair most of the time. The chairs provided to them are also not comfortable for them. The collected respondents were 38.4%

female and 61.6% were male. These respondents were part of the relevant analysis. The researchers wanted to get the information from various groups; hence categorization was done in four different age groups according to the respondent's age, that is, Below 25 years, 25 to 35, 35 to 45, 45 and above. Maximum respondents were from the age group of below 25 that is 50% and 45.8% are from 25 to 35 age group, rest were from other two groups, as maximum young population are the demand of the IT and ITes Sector. Most of the respondents (72.6%) between age group of 25-35 and less than 25 years who prefer to do their work in right hand. When the question was asked about discomfort they are experiencing during the work more than 60% respondents replied that they have pain in either of the body parts like, right arm followed by left, right, upper, lower and mid part of elbows, eyes, legs, shoulders and wrists also discomfort in back and neck as well. 53.4% stated that their seating arrangement is such that feet is flat at 90 degrees with 2-3 inches gaps between back of legs and edge of the chair with neutral wrist and shoulder pulled back but they have (65.3%) claimed that there is no blue light on computer screen but there is significant distance of 50 cm between eyes and screen, 74% stated this. The researchers have also found that they (55.6%) don't have lumbar support to the lower back while they (86.3%) have all the items within reach but this group of people's perceptions (61.1%) toward lifestyle is sedentary at work. Lastly it is also observed that no ergonomics training program is conducted in any of the sample companies, (80.8%). Interestingly, maximum presented responses were from these two-age groups, both below 25 and within 25 to 35 age group.

### Conclusion & Recommendation

In the present digital era sitting in front of the computer for work either in office or at home is most common. Hence, the need to understand ergonomics is most relevant and need of the hour. At workplace this is the utmost responsibility of the top management to implement it in order to have effective and efficient productivity. Creating awareness among employees by providing training to follow ergonomics principles is also important to have safe and accident free workplace. As rightly found out from the research also that is 80.8% people feel the need of training in the organizations. Training will help employees to understand, demand and follow ergonomic principles while doing the work, sitting in front of computers. Computer related discomfort can be reduced by adjusting the workstation and viewing habits to avoid related problems. Good workplace ergonomics will help people to work in a relaxed, comfortable and hassle free and minimize the accidents to happen. This is possible only when both management and employees work hand in hand and take care of processes, systems, structure, and environment. The researchers when interacted with

respondents few suggestions came from them. In the present competitive globalized environment people are very much conscious about the environment they are working, the place where they are sitting and the tools they are using. They are well informed about the facilities provided by other organizations in the same vicinity. Hence, some suggestions like, recreational facilities should be there in the organization, as continuous sitting will not help employees to be physically fit. In between they should get a chance to get up from their chair and relax themselves for a while. Separate meeting rooms help employees to forcibly take few steps away from their chair and make them active. Some IT giants follow ergonomics in such a way that they have wellness coach who comes directly near to the employee, if he feels the person is sitting continuously for a longer period. He starts engaging the person in some activities, where the person is bound to stand up and unwind himself. Nevertheless, Proper chair, suitable sitting arrangement, appropriate environment, and necessary equipment's are recommended to have ergonomics in place.

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