

## THE AREAS OF APPLICATION AND IMPORTANCE OF ERGONOMICS

Makun Yakubu Charles<sup>1</sup> and Yelwa Maryam Ummul-Khaiari<sup>2</sup>  
Department of Architecture  
Federal University of Technology, Minna, Niger State, Nigeria

### ABSTRACT

*The relevance of human factor engineering (Ergonomics), which deals with the consideration of human characteristics, expectations, and behaviours in the design of things people use in their work and everyday lives with the aim of ensuring efficiency and safety, is a necessity in the 21<sup>st</sup> century. This paper highlights the areas of application and importance of ergonomics. The paper concluded that ergonomics should be a new discipline in Nigeria to ensure efficiency and safety in various areas of our daily lives.*

### INTRODUCTION

The field of human factors engineering referred to as ergonomics deals with the consideration of human characteristics, expectations and behaviours in the design of the things people use in their work and everyday lives and of the environments in which they work and live. In simple terms, human factors have been referred to as designing for human use. The importance of considering human factors in the design of virtually all man-made things and environment that people use, including the built environments of building and communities, consumer products, health services, recreation equipment and facilities, production processes, transportation and communication systems is to enhance efficiency and safety between man and technology. Ergonomics is to contribute not only to the creation of optimal conditions of work and leisure, but also to the development of new cultural values and social conditions for an overall development of the human being. (Munipov,1979).

### DEFINITIONS OF HUMAN FACTORS

- i. The central focus of human factors relates to the consideration of human beings in carrying out such functions (i) the design and creation of man made objects, products, equipment, facilities and environments that people use. (2) the development of procedures for performing work and other human activities (3) the provision of services to people.
- ii. The objectives of human factors is the systematic application of relevant information about human abilities, characteristics, behavior and motivation in the execution of such functions.

### HISTORICAL DEVELOPMENT

#### Human factors in the past

Human factors had it's origins in the development by early humans of simple tools, utensils, shelters. Over the intervening millions of years, there were of course improvements in the design of the things people used, these improvements being the result of an evolutionary process, if a particular tool or device did not adequately serve its purpose, succeeding generations would tend to improve the design. Human work was performed primarily by hand, with the use of hand tools, until the industrial revolution which was brought about by the development of machines, Christensen (1976) characterised the machine age in terms of three phases.

- i. **The age of machines (1750 - 1890).** This period witnessed the transition from what Christensen called eons of tools to age of machines. It was characterised by machines in the textile industry and the broad application of steam power. In Great Britain, Watt designed, self-regulating governor for the steam engine, such control serving as the beginning of automation.
- ii. **Phase II power revolution (1870 - 1945).** This period was characterised primarily by major expansion in the use of power such as in the manufacturing, transportation and agriculture and the use of electric power for such purposes as well as communication. It was during the later part of this phase that the behavioural sciences became established. During World War I, for example there was considerable attention to the matter of selection and training of military personal in Great Britain and America, this effort being aimed at "fitting the man to the job." It was during World War II that human factors field started to become more delineated. In particular, it was found that many people could not operate some

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of the newly developed items of military equipment effectively or safely. This realization triggered efforts to design such equipment in terms of human considerations, this objective then represented a shift from "fitting the man to the job" to "fitting the job to the man"

- iii. **Phase III: Machines for minds (1945 -).** Christensen points out that the first two phases of industrial revolution had the effect of aiding, relieving and extending human muscles while the third phase deals more with efforts to aid, relieve and extend human mental capabilities.

### APPLICATIONS OF HUMAN FACTORS

Human factors experts generally deal with the design problems relating to specific items of the facilities and environments that people use in their work and everyday living. However, as discussed above, the application of human factors principles and data to specific problems should be viewed from the point of view of the implications for society as a whole keeping this point of view in mind, the specific areas of application of human factors generally fall into three classes.

#### MAN - MACHINE SYSTEMS.

We can consider man - machine system as a combination of one or more human beings and one or more physical components interacting to bring about, from given inputs, some desired output. In this frame of reference, the common concept machine is too restricted, and we should rather consider "machine" to consist of virtually any type of physical object, device, equipment, facility, thing or what have you that people use in carrying out some activity that is directed toward achieving some functions. In a relatively small form a man-machine system can be a person with a hoe, a hammer. Going up the scale of complexity, one can regard as systems the family automobile and office machine, a lawn mower each equipped with it's operator. More complex systems include aircraft, bottling machines, conveyor systems, telephone system and automated oil refineries along with their personnel. Some systems are less delineated and more amorphous, such as the servicing systems of gasoline stations and hospital or a highway traffic system. The essential nature of people's involvement in a system is an active one, interacting with the system to fulfill the function for which the system is designed.

#### PHYSICAL ENVIRONMENT

The physical environment people use includes two general categories. The first consist of physical space and related facilities, which people use, ranging from the immediate environment (such as a workstation, a lounge chair, or a typing desk through the intermediate (such as a home, an office a factory, a school or stadium) to the general (such as a neighbourhood, a community, a city or a high way system). The second category consists of the various aspects of the ambient environment such as atmospheric conditions (including pollution) and noise. It should be noted that some aspects of the physical environment that we live and work are part of the natural environment and may not be subjected to modification.

#### PERSONAL AND PROTECTIVE ITEMS

The third class of man-made thing's people use consists of many types of personal items (such as apparel, hand bags, and skis) and protective equipment and gear (such as safety shoes and hats, safety goggles, astronaut suits and gloves). The human involvement with such items is typically passive. Although, their design can also impose certain constraints on the behaviour of man or predetermines the nature of certain aspects of behaviour.

#### DISCUSSION

Aside from these three categories of the man-made accoutrements and trappings of civilization, there are some other odds and end that tend o defy nice, neat categorization, such as playing cards. Aside from the complication, of classification, however, we would live to reinforce the central point that whatever the nature of human involvement with man made features of civilization, the specific design features therefore can influence, for better or worse, their functional utility or some relevant human value.

#### THE ROLE OF PEOPLE IN A MAN-MADE WORLD

It has been traditional in the human factors field to view the activities of people in a machine system with human beings and mechanical devices operating in an interactive fashion to bring about some desired objectives. The interaction logically brings up the question as to the roles or functions that people perform in such system.

### MANUAL SYSTEMS

A manual system consist of hand tools and other aids which are coupled together by human operator (usually a craft worker) who controls the operation, operators of such systems use their own physical energy as a power source to transmit to their tools and receive from them a great deal of information, typically operate at their own speed, and can rapidly exploit their ability to act as a high variety system.

### MECHANICAL SYSTEMS

These systems (also referred to as semi automatic systems) consist of well integrated physical parts, such as various types of powered machine tools. They are generally designed so as to perform their functions with little variation. The power typically is provided by the machine, and the operator's function is then essentially one of control, usually by use of control devices.

### AUTOMATED SYSTEMS

When a system is fully automated, it performs all operational functions, including sensing, information processing and decision making and action. Such a system needs to be fully programmed in order to take appropriate action for all possible contingences that are sensed. But monitoring, programming and maintenance must be manned by man.

### THE NEED FOR HUMAN FACTOR ENGINEERING

Since humanity has somehow survived for many thousand years without people specializing in human factors, one might wonder why at the present stage of history it has become desirable to have human factor experts who specialize in worrying about these matters. As earlier mentioned the objective of human factors are not new, history is filled with evidence of efforts, both successful and unsuccessful, to create tools and equipment which satisfactorily serve human purposes and to control more adequately the environment within which people live and work, but during most of the century of history, the development of tools and equipment depended in large part on the process of evolution of trial and error. Though the use of a particular device – an ax, an oar, a bow and arrow it was possible to identify its deficiencies and to modify it accordingly, so that the next generation of device would better serve its purpose. It has been the increased rate of technological development of recent decades that has generated the need to consider human factors early in the design game, and in a systematic manner. Because of the complexity of many new and modified systems it frequently is impractical to make changes in them after they are actually produced. The cost of retro fitting frequently is exorbitant. Thus, the initial designs of many items must be as satisfactory as possible in terms of human factors consideration. In effect, then, the increased complexities of things people use (as the consequence of technology) place a premium on having assurance that the item in question will fulfill two objectives of functional effectiveness and human welfare. The need for such assurance requires that human factors be taken into account early during the design development process in reflecting about the things people use it is relevant to add a special comment about a matter that is of increasing concern, that of the product safety. In many countries courts are focusing attention on the liability of organisations that offer goods and services to the public regarding the potential hazard to users. One important aspect of such liability is that relating to the human factors aspect such goods and services. Looking toward the future (when human factor disciplines are likely to become more involved with the impact of technology on society as a whole) human factors could well have a very substantial influence on the quality of human life.

### CONCLUSION

Products and activities are being imported or created locally, is there any discipline responsible to check how the man fit's into the job or activity? This can only be answered by introducing ergonomics' as a discipline in our society only then can we beging to see reasons for change to make sure that job and activities suit the man.

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