

ERGONOMICS AT 60 – A CELEBRATION

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INTRODUCTION

2009 represents a significant landmark for ergonomics as a science and as a profession, and also for the Ergonomics Society. We are celebrating 60 years of the Society by reviewing our past achievements and anticipating future challenges.

Ergonomics is about designing solutions to problems that are optimised for the people involved. Ergonomics can help people perform better and help them make less mistakes and safeguard their health, whether it is in a factory environment, a control room, a transport system or a hospital. The challenge for the modern ergonomist is to encapsulate within one organisation what our founding fathers discovered during their wartime collaboration – that they could achieve together what could not have been achieved by any one discipline. Their post-war meeting in 1949 which marked the formation of The Ergonomics Research Society was our first landmark. The subject is now well established – the next landmark will be when it becomes second nature for anyone to call for ergonomics input.

A DEFINITION OF ERGONOMICS

The International Ergonomics Association gives the following definition: “Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the

profession that applies theory, principles, data and methods to design in order to optimise human well-being and overall system performance.” We can all practise ergonomics. What makes ergonomics different from its constituent disciplines is that it is the interactions which we seek to understand and context is everything; from medical equipment and transport through consumer products and office equipment to submarines, aircraft and power stations. Ergonomics improves the way we work, the way we play, the way we live resulting in improvements in products, workplaces and homes that make our lives easier, safer and better. Organisations can be transformed if they apply ergonomic principles to the way their employees work.

IN THE BEGINNING – A BRIEF HISTORICAL SUMMARY

Ergonomics has a long and fascinating history and its origins tell us a lot about ourselves and the changes to our working lives. Although the modification of industrial processes to make them more efficient, the improvement of working conditions and the removal of health and safety hazards, have been going on for as long as the industrial process itself, the applied science of ergonomics stands out for its fresh approach and the combination of techniques it involves. The growth of industry during the last 200 years, whilst it has made human beings increasingly dependent on the machine, has helped them achieve a higher

standard of living and given them an increasing measure of control over their environment; it has also, however, brought hardships and suffering to workers. From the time when the first textile factories were built, industrial structures and machines have tended to be conceived with an eye to the process rather than the person who operates it.

Developments and scientific investigation were slow to evolve and efforts to combine the man-machine complex more successfully were mainly directed to improved productivity. The need to pay equal attention to the human factor in industry developed very gradually.

It took two world wars to stimulate positive action. It was not until the First World War that attempts were made to investigate human performance in industry and scientific investigations were made into the relationship of working conditions to health. For instance, concern about fatigue in munitions factories in the United Kingdom led to the establishment of the Industrial Fatigue Research Board, and physiologists and psychologists conducted investigations into the effect of working conditions on health and efficiency. These pioneering studies had relatively little impact on industry in the 1920s and '30s and progress was slow, possibly because a surplus of labour removed the demand for economy in labour.

The Second World War gave impetus to the study of human performance, because the

extreme demands that were placed upon responsible personnel led to difficulties in the control and operation of radar, anti-aircraft tracking systems, high speed aircraft and other intricate military equipment. The complexity of these devices, the need for effective design of operations plotting rooms and for the development of suitable clothing for extreme weather conditions, the establishment of design criteria to satisfy the human requirements of tank drivers for protection, visibility and efficiency, and similar problems all emphasised that technical developments had reached the stage at which the capacities of the operator rather than the potentialities of his equipment were setting limits to the performance of men and machines working together. If further progress was to be made it was therefore necessary that these human limits should be studied and that equipment should be designed in relation to them.

In the 1950s technological developments in industry, often associated with the concept of automation, resulted in the construction of machines which threatened to make excessive demands on their human operators; some of these turned out to be too complex for a man to control effectively. In consequence, ergonomists have increasingly been called on to make their findings available as a guide to design engineers. It was thus that ‘human engineering’, or ergonomics, first came into prominence.

ERGONOMICS TAKES THE VOTE

Although the UK Ergonomics Society was the first such organisation of its kind in the world its formation was followed by the International Ergonomics Association and the French, Dutch and Australian societies in the 1960s. However, the name for the UK society was hotly debated. There was an overwhelming majority initially in favour of including the word 'Research' in the name. This points clearly to the thinking of those who founded the Society: that it was an association of people working in the field of research. The creation of an applied science of ergonomics was not envisaged at that time. It was the emergence of the idea that an ergonomist can be an individual applying research results rather than being engaged on research which caused so much heart-burning over subsequent years and led to the change of name to The Ergonomics Society.

There was a good deal of criticism of the term 'ergonomics'. It was thought to be ugly, apt to be confused with economics, and incomprehensible. Sometimes similar criticisms are heard today and, in part, have resulted in present moves to change the name of the Society to The Institute of Ergonomics and Human Factors. The formulation of the rules made the objectives of the new society reasonably clear. At that time, the intention was to conform to the pattern of a learned society with the emphasis on both scientific meetings where research results could be presented and discussed. and at the same time, an emphasis on communicating results to industry. These are still the aims of the Society today.

SOME EXAMPLES

Control rooms

Ergonomists have been involved in the design of control rooms for power stations, chemical plant, steel works, air

traffic control, emergency services, railway operation and for many other situations.

Transport

Ever since World War Two ergonomics has had a strong role in all aspects of transport air, sea, road and rail. The Society has recently set up a Special Interest Group on motorcycling.

Sports Ergonomics

An ergonomics perspective is crucial in securing the safety and enhancing the performance of participants in sports. Sports ergonomics is concerned with optimising the relationship between the individual, the task, the equipment, and the sport and training environment. Success at all levels of competition is more likely to be realised when this harmony is achieved; at the elite level ergonomics factors often determine the outcome.

Physical aspects

Ergonomists have had great success in this area and the EU has produced directives on manual handling and work with computers.

Military equipment

There have been requirements for ergonomic factors to be considered in the design of all kinds of military equipment.

APPLYING ERGONOMICS

The work of ergonomists has directly or indirectly led to improvements in the way we live and has had a major influence on us all, often with little or no realisation on our part, and can make us healthier, safer, more productive and make life more pleasurable. Listed below is a selection of the headlines generated by this work in the past:

- A systems approach to design gains popularity in many domains such as safety and healthcare ergonomics.
- Ergonomists were involved in the development of a hospital

bed, which later became a British Standard for the NHS.

- Reaction times, speed and efficiency of older persons were studied, and later their job satisfaction and problems adjusting to new working environments.
- A systems approach within the military is applied to the design of ships' operations rooms, vehicle environments aircraft cockpits and fleet information systems.
- In the home, ergonomists are involved in the development of domestic appliances including electric drills, electric carving knives, record players and hairdryers.
- Trials of alternative layouts led to the control room design for the ESSO refuelling depot at Heathrow Airport.
- The relationship between circadian rhythms and physiological changes has been investigated in relation to shift work patterns, design of rotating shift systems and individual selection.
- Analysis of accident patterns within the steel industry allowed for accident avoidance and reduced absence.
- The Flixborough chemical plant disaster changed the emphasis on safety to the causes of accidents and disasters, which led to the development of health and safety legislation.
- Studies consider the effect of in-car radio, mobile phone use and other concurrent tasks on driving, and the implications of fatigue during prolonged driving on the impairment of skill.

RECENT DEVELOPMENTS

Over the last decade or so there has been a big increase in the application of ergonomics to railway operation following the Ladbroke Grove accident and the associated inquiry.

Health care is another area where there has been an increase due to the recognition

of the huge number of design-induced errors in hospitals resulting in many people suffering health problems.

There is an increasing interest in the socio-technical approach where it is the total organisation which is studied.

There is continuing consideration of the role of the human being in relation to the technology. How far should we go towards complete automation whether it be driving a car or controlling air or rail traffic?

THE FUTURE

All too often, in the past, the importance of ergonomics has only been appreciated after disasters such as the Ladbroke Grove railway accident, the many aircraft crashes due to bad cockpit design and the failures of many large scale IT systems to meet their full potential due to difficulties with their user/machines interface

Hopefully, in the future, we will consider the user at the start of designing any system or piece of equipment. We will cease to blame the worker for a design-induced error or put in health improvements only after the damage has been done. Perhaps ergonomics and its potential benefits for mankind will deserve increased attention by Parliamentarians in the future?

The anniversary is being celebrated by an exhibition at The Design Museum from 18 November to 14 March 2010

For a definitive chronology of the Society, see the Ergonomics Society website at www.ergonomics.org.uk > About the Society > History.

