

ENGINEERING PSYCHOLOGY

Dr. Osama Mohammed Elmardi Suleiman Khayal

**Mechanical Engineering Department, Faculty of Engineering and
Technology, Nile Valley University, Atbara, Sudan**

Email address: osamamm64@gmail.com

September 2019

Introduction

Engineering psychology, also known as Human Factors Engineering, is the science of human behavior and capability, applied to the design and operation of systems and technology. As an applied field of psychology and an interdisciplinary part of ergonomics, it aims to improve the relationships between people and machines by redesigning equipment, interactions, or the environment in which they take place. The work of an engineering psychologist is often described as making the relationship more "user-friendly."

Engineering psychology is a field of psychology that focuses on the relationship between humans and the products that we use every day. Specialists in this field concentrate on exploring the relationships between man and machine, so to speak. They study how we interact with, perceive, and are influenced by everyday products and technologies. Engineering psychologists also play a role in making certain products easier to use and safer.

The Need to Engineering Psychologists

Today, with the boom of the technological industry and consumerism, the field of engineering psychology has exploded. We are surrounded by machines, computers, and software, and it doesn't seem to be going away any time soon. Consumers and businesses are now calling for technological devices and software that is safe and easy to use. Engineering psychologists are necessary, because they have a hand in making these products more user-friendly, more efficient, and easier to use.

Responsibilities of Engineering Psychologists

Engineering psychologists typically perform research and work as consultants in fields such as engineering, product design, and software development.

One of the main duties of engineering psychologists is to perform research on what consumers want and need when it comes to their products. Psychologists might do this by creating focus groups, test panels, and consumer surveys. In doing so, engineering psychologists are often able to study how people interact with products and spot potential problems, such as safety issues or difficult to use features. By

consulting with engineers and developers, engineering psychologists can help create products that are less likely to result in problems due to human error.

Demographics and user abilities are also a big part of engineering psychology. For example, engineering psychologists are often asked to research which types of people are more likely to buy certain products, based on looks and functionality. They might also be asked to help change a product so that consumers find it easier to use or more appealing.

Education Requirements to Become an Engineering Psychologist

Most engineering psychologists start their journeys with four-year bachelor's degrees in general psychology. Generally, though, the majority of the engineering psychology positions are filled with individuals that hold graduate degrees in this area. Before you enroll in an environmental psychology degree program, however, you should check to ensure that it's accredited by the Human Factors and Ergonomic Society.

Courses that you may take while working toward your engineering psychology degree often include general psychology, human factors psychology, industrial-organizational psychology, ergonomics, bio-mechanics, human-computer interaction, and statistics.

Engineering Psychologists job

As an engineering psychologist, you will most likely find positions open in a number of different fields. Engineering psychologists work in areas such as software development, computer science, engineering, and aviation. Because an the ease of use of medical equipment can often make the difference between life and death, engineering psychologist positions are also quite common in the medical field.

Historical Background

Engineering psychology was created from within experimental psychology. Engineering psychology started during World War I (1914). The reason why this subject was developed during this time was because many of America's weapons were failing; bombs not falling in the right place to weapons attacking normal marine life. The fault was traced back to human errors. One of the first designs to be built to restrain human error was the use of psychoacoustics by S.S. Stevens and L.L. Beranek were two of the first American psychologists called upon to help change how people and machinery worked together. One of their first assignments was to try and reduce noise levels in military aircraft. The work was directed at improving intelligibility of military communication systems and appeared to have been very successful. However it was not until after August 1945 that levels of research in engineering psychology began to increase significantly. This occurred because the research that started in 1940 now began to show. The history of engineering psychology continued in the 1940's, during World War II. The weapons used during this war were somewhat advanced for their time, but they were still not without error. For instance, weapon and equipment malfunction was not uncommon, and these

malfunctions often led to costly mistakes. The main reason for the majority of these errors was traced to human error. It was found that the machines and other technologies of the time were not built with the needs and abilities of the users at the time, and they were very difficult to use. To correct this problem, psychologists were brought in to help engineers create more user friendly designs.

Lillian Gilbreth combined the talents of an engineer, psychologist and mother of twelve. Her appreciation of human factors made her successful in the implementation of time and motion studies and scientific management. She went on to pioneer ergonomics in the kitchen, inventing the pedal bin, for example.

In Britain, the two world wars generated much formal study of human factors which affected the efficiency of munitions output and warfare. In World War I, the Health of Munitions Workers Committee was created in 1915. This made recommendations based upon studies of the effects of overwork on efficiency which resulted in policies of providing breaks and limiting hours of work, including avoidance of work on Sunday. The Industrial Fatigue Research Board was created in 1918 to take this work forward. In World War II, researchers at Cambridge University such as Frederic Bartlett and Kenneth Craik started work on the operation of equipment in 1939 and this resulted in the creation of the Unit for Research in Applied Psychology in 1944. Engineering Psychology, Ergonomics, & Human Factors Although the comparability of these terms and many others have been a topic of debate, the differences of these fields can be seen in the applications of the respective fields.

Engineering psychology is concerned with the adaptation of the equipment and environment to people, based upon their psychological capacities and limitations with the objective of improving overall system performance, involving human and machine elements Engineering psychologists strive to match equipment requirements with the capabilities of human operators by changing the design of the equipment. An example of this matching was the redesign of the mailbags used by letter carriers. Engineering psychologists discovered that mailbag with a waist-support strap, and a double bag that requires the use of both shoulders, reduces muscle fatigue. Another example involves the cumulative trauma disorders grocery checkout workers suffered as the result of repetitive wrist movements using electronic scanners. Engineering psychologists found that the optimal checkout station design would allow for workers to easily use either hand to distribute the workload between both wrists.

The field of ergonomics is based on scientific studies of ordinary people in work situations and is applied to the design of processes and machines, to the layout of work places, to methods of work, and to the control of the physical environment, in order to achieve greater efficiency of both men and machines An example of an ergonomics study is the evaluation of the effects of screwdriver handle shape, surface material and workpiece orientation on torque performance, finger force distribution and muscle activity in a maximum screw driving torque task. Another example of an ergonomics study is the effects of shoe traction and obstacle height on friction. Similarly, many topics in ergonomics deal with the actual science of

matching man to equipment and encompasses narrower fields such as Engineering Psychology.

At one point in time, the term human factors was used in place of ergonomics in Europe. Human factors involve interdisciplinary scientific research and studies to seek to realize greater recognition and understanding of the worker's characteristics, needs, abilities, and limitations when the procedures and products of technology are being designed. This field utilizes knowledge from several fields such as mechanical engineering, psychology, and industrial engineering to design instruments.

Human factors is broader than engineering psychology, which is focused specifically on designing systems that accommodate the information-processing capabilities of the brain.

Although the work in the respective fields differ, there are some similarities between these. These fields share the same objectives which are to optimize the effectiveness and efficiency with which human activities are conducted as well as to improve the general quality of life through increased safety, reduced fatigue and stress, increased comfort, and satisfaction.

Importance of Engineering Psychologists

Engineering psychologists contribute to the design of a variety of products, including dental and surgical tools, cameras, toothbrushes and car-seats. They have been involved in the re-design of the mailbags used by letter carriers. More than 20% of letter carriers suffer from musculoskeletal injury such as lower back pain from carrying mailbags slung over their shoulders. A mailbag with a waist-support strap, and a double bag that requires the use of both shoulders, has been shown to reduce muscle fatigue.

Research by engineering psychologists has demonstrated that using cell-phones while driving degrades performance by increasing driver reaction time, particularly among older drivers, and can lead to higher accident risk among drivers of all ages. Research findings such as these have supported governmental regulation of cell-phone use.