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A REVIEW STUDY OF ENGINEERING PSYCHOLOGY AND ERGONOMICS

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Abstract: **The Information Technology revolution has led to computers predominating almost every aspect of our lives from programming videocassette recorders and microwave ovens, to withdrawing cash from automatic teller machines, to purchasing rail tickets, and to performing most aspects of our work.**

The role of engineering psychology is distinct from both psychology and engineering in that it arises from the intersection of the two domains. Engineering psychology is distinguished from ergonomics in that "the aim of engineering psychology is not simply to compare two possible designs for a piece of equipment but to specify the capacities and limitations of the human from which the choice for a better design should be directly deductible".

In the present study, a comprehensive introduction and literature review of engineering psychology have been presented. The study was considered from different viewpoints which includes general introduction to engineering psychology; a comprehensive literature review that deliberates the present subject from the consideration of the need for a psychology of engineering, differentiation between engineering psychology, ergonomics, and importance of engineering psychologists.

I. INTRODUCTION TO ENGINEERING PSYCHOLOGY

The field of engineering psychology was originated as an area within experimental psychology that grew increasingly important during World Wars I and II. Early military applications of this field focused on building weapons designed to minimize human errors and increase accuracy. From that moment most people wake to when they shut their eyes for the night, they are immersed in a technology - saturated world. In addition to everyday interactions with home appliances, computers and telephones, people find themselves at the mercy of technology when they drive their cars, ride the subway to work, board an airplane or check into the hospital for surgery. How well a particular system is designed, has a lot to do with whether each of these experiences is smooth, safe and positive.

The rapidly growing field of engineering psychology offers a wealth of opportunities to students who are interested in the interaction between people and machines, tasks and environments. Moreover, the practical applications have their own rewards.

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 used. 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 friendlier.

Today, with the boom of the technological industry and consumerism, the field of engineering psychology has exploded. Machines, computers, and software surround the people, and it does not 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. 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 persons 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.

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 is 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.

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. Also, because an 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.

II. HISTORICAL BACKGROUND

Engineering psychology was created from within experimental psychology (Grether, W. F., 1962). Engineering psychology started during World War I (1914) (Schultz D. and Schultz E., 2010). The reason why this subject was developed during this time was that many of America's weapons were failing; bombs not falling in the right place to weapons attacking normal marine life (Grether, W. F., 1962). The fault was traced back to human errors (Grether, W. F., 1962). 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 who they were two of the first American psychologists called upon to help change how people and machinery worked together (Grether, W. F., 1962). One of their first assignments was to try to 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 (Grether, W. F., 1962).This occurred because the research that started in 1940 now began to show its fruitful outcome (Grether, W. F., 1962).

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 (Ludy T. Benjamin, 2007).

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 (McIvor A.J., 1987). 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.

III. THE NEED FOR A PSYCHOLOGY OF ENGINEERING

All of us are familiar with the frustrations that accompany one's use of technology in the home and at work. (Norman, 1988) provides an abundance of examples on this subject. The Information Technology revolution has led to computers pervading almost every aspect of our lives from programming Video Cassette Recorders (VCRs) and Microwave Ovens, to withdrawing cash from Automatic Teller Machines, to purchasing rail tickets, to performing most aspects of our work. Yet why do these devices, which are supposed to make our lives easier, seem to thwart our best intentions? One reason is that users of these devices perceive the problem to be with themselves rather than with the technology. People often blame themselves when failing to comprehend the manufacturer's instructions or when errors occur (Reason, 1990). Also, the problems are usually of a small, relatively trivial and individual nature, and do not affect other people. These problems are often only minor hassles compared to major events, such as incidents in the aviation and nuclear industries. On the face of it there is little comparison between errors with VCRs and errors on the flight deck of an aircraft. However, (Reason, 1990) argues that at the basic level of interfacing human thought processes with technology there are many similarities. Despite the obvious differences in training, level of skill and knowledge in operating VCRs and aircraft, basic error types such as 'mode error' (i.e. errors that occur when devices have different modes of operation and the action appropriate for one mode has different consequences in other modes: (Norman, 1986) have been found to occur in both environments.

There has been some concern in recent years about safety (Stanton, N. A., 1996). The incidents at Three Mile Island (in the USA) and Chernobyl (in the former USSR) are often cited in the press and technical literature. A recent near incident at a nuclear utility in the UK has seemingly reinforced this concern. Whilst these nuclear power plants employ different technologies, there is one common factor to these, and other, incidents: namely human beings. (Reason, 1990) reports that 92% of all significant events in nuclear utilities during the period 1983 - 1984 were caused by people and of these only 8% were initiated by the control room operator.

Thus, the scope of engineering psychology needs to consider all aspects of the human technology system. Consideration of the human element of the system has been taken very seriously since the publication of the President's commissions report on Three Mile Island (Kemeny J., 1979) which brought serious problems to the forefront. The summary of the main findings of the report highlights a series of human, institutional and mechanical failures. It was concluded that the basic problems were people-related, i.e. the human aspects of the systems that design, build, operate and regulate nuclear power. Some reports have suggested operator error as the prime cause of the event. However, the failings at Three Mile Island included:

1. Deficient training which left operators unprepared to handle serious accidents.
2. Inadequate and confusing operating procedures that could have led the operators to incorrect actions.
3. Design deficiencies in the control room, for example in the way that information was presented and controls were laid out.
4. Serious managerial problems within the Nuclear Regulatory Commission.

None of the deficiencies explains the root cause of the incident in terms of operator error, which is an all too familiar explanation in incidents involving human technology systems. (Reason J. T., 1987), in an analysis of the Chernobyl incident, suggested two main factors of concern. The first factor relates to the cognitive difficulties of managing complex systems: people have difficulties in understanding the full effects of their actions on the whole of the system. The second factor relates to a syndrome called 'groupthink': small, cohesive and elite groups can become unswerving in their pursuit of an unsuitable course of action. Reason cautions against the rhetoric of "it couldn't happen here" because, as he argues, one of the basic system elements (i.e. people) is common to all nuclear power systems.

IV. DIFFERENTIATION BETWEEN ENGINEERING PSYCHOLOGY, ERGONOMICS, AND 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.

Whilst engineering is concerned with improving equipment from the point of view of mechanical and electrical design and psychology is concerned with the study of the mind and behavior, engineering psychology is concerned with adapting the equipment and environment to people, based upon their psychological capacities and limitations (Blum, 1952)] with the objective of improving overall system performance (involving human and machine elements). As (Sanders and McCormick, 1987) put it, "it is easier to bend metal than twist arms", by which they mean that the design of the device to prevent errors is likely to be more successful than telling people not to make errors. According to (Wickens, 1992) the role of engineering psychology is distinct from both psychology and engineering in that it arises from the intersection of the two domains. He also distinguishes engineering psychology from ergonomics to suggest that "the aim of engineering psychology is not simply to compare two possible designs for a piece of equipment but to specify the capacities and limitations of the human from which the choice for a better design should be directly deductible" (Wickens, 1992) and (Poulton, 1966).

Ergonomics is distinct from engineering psychology in that it is multidisciplinary incorporating psychology, engineering, physiology, environmental and computer science, but the boundaries are fuzzy and ergonomics shares the overall goals of engineering psychology. The objectives of ergonomics (i.e. human factors) are shared by engineering psychology, 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 (Khayal OMES, 2019, 2020, 2021).

It is difficult to delineate the genesis of both engineering psychology and ergonomics, but both can be traced back to a general interest in problems at munitions factories during the First World War (Oborne, 1982). Machines that were designed to be operated by men seemed to have production-related problems when operated by women. These difficulties were resolved when it was realized that the problems were related to equipment design rather than the people operating them, i.e. they were designed to be operated by men and not women. The misreading of altimeters by pilots in the Second World War stimulated further interest in engineering psychology. A study by (Grether, 1949) illustrated that the traditional three needle altimeter (where the three pointers read 10,000s, 1,000s and 100s of feet respectively) not only took pilots over 7 seconds to interpret but nearly 12 percent of the readings contained errors of a 1000 feet or more. Grether showed conclusively that superior designs could dramatically reduce both reading time and error rates. This study, perhaps more than any other, indicates the importance of psychology in the design of devices. Despite this evidence, it is sometimes difficult to gain acceptance from the engineering community, and to change design, as the following quote from an accident report in 1958 shows: "The subsequent investigation showed that the captain had misread his altitude by 10,000 feet and had perpetuated his misreading error until the aircraft struck the ground and crashed."

Three different perspectives on engineering psychology are offered, engineering psychology as: ergonomics, human computer interaction, cognitive engineering.

(Shackel, 1996) starts by distinguishing psychology from ergonomics, to propose that ergonomics is about fitting the device to the individual. He argues that industrialization has exacerbated many of the problems associated with device use. First there is the problem of operating industrialized systems. Second, there is the problem of tailoring mass produced devices to individual needs. Tailoring every device to everyone's needs may seem like an impossible goal, but if we know what the range of needs are, we may be able to design flexibility into devices so that they meet most people's needs most of the time. For example, in a relatively simple device, like a chair, we can offer height and backrest adjustments. The challenge is either to offer the same degree of customization for other more complex devices, like computer interfaces, or to design a standard interface that can be used by all.

Shackel argues that ergonomics, like psychology, suffers from being labelled a science of common sense. All too often, designers seem to prefer to consult their own intuitions rather than a professional ergonomist. Device testing tends to be very informal, only involving the designers themselves, rather than being based upon a sample of the end-user population and subjected to the rigor of statistical analysis. If, indeed, good design were common sense then we would not witness the extent of disasters due to poor design in human terms (see Reason, 1990). Shackel argues that a systematic and scientific approach to the analysis and design of devices is needed. Even apparently well design devices (such as the example given by Shackel) appear to benefit from this approach, although performance problems are normally the indication of poor ergonomics. Shackel considers the role of ergonomics in different kinds of work and this shows the links between engineering psychology and ergonomics (specifically both concerned with human-machine interaction and system performance)

(Payne, 1996) argues that technology and psychology have mutually beneficial relationship, but that advances in either can exist without the other. Payne thus suggests a situation of mutual benefit but not mutual dependence. However, the one without the other may lead to a poorer outcome for both. Payne asks the question of whether advances in psychology lead to advances in technology or vice versa. He suggests that we witness more of the latter, i.e. technological insights offer new insights for psychology. For example, the development of the Graphical User Interface (GUI: e.g. the use of Windows, Icons, Menus and Pointing devices: WIMP) owes little to psychological theory, but has enabled applied cognitive psychologists to develop greater explanations for the phenomenon of why the GUI is easier to use than character-based user interfaces (Norman and Draper, 1986). Payne argues that psychology is good at providing explanations for this kind of phenomenon but has not yet revolutionized technology. The WIMP/GUI interface might be considered a technological revolution, not a psychological one, whereas psychology can offer small evolutionary improvements.

Payne cites two examples where psychology has had modest success: in the development of the super book and the application of the GOMS model. In the first example, on-line versions of books are generated automatically with additional features that enable the book to be used with enhanced functionality. This functionality was based upon psychological research on human language to design a word search facility.

In the second example, the GOMS model (based on a cognitive theory developed by (Card, Moran and Newell, 1983) was used to determine the effectiveness of a new workstation. The theory driven evaluation (i.e. "to specify the capacities and limitations of the human from which the choice for a better design should be directly deductible") (Wickens, 1992) led to the company rejecting the new design.

Payne also notes the problem of coupling between cognitive psychology research and engineering concerns. This has led to a new, but related discipline: Human-Computer Interaction (HCI), which is more closely aligned to engineering concerns than cognitive psychology. Payne indicates that HCI is rather more unifying than cognitive psychology. The former is largely concerned with whole tasks, such as the operation of a device, from a videocassette recorder to a nuclear power station, whereas the latter tend to focus on isolated processes such as perceptual categorization, word recognition, (Long J. and Dowell J., 1996) etc.

Additionally, Payne suggests that cognitive psychology can benefit from advances in technology. The study of human interaction with technology, which Payne proposes, is the domain of human computer interaction supplies cognitive psychology with phenomena, which require explanation. As in the earlier example of the GUI, the success of the interface was poorly understood until applied cognitive psychologists addressed this conundrum. Development of theory in this area could lead to prediction of new technology. Whereas, design in the absence of theory leads to psychology chasing technology.

The vision offered by the perspectives are of a problem-driven focus of engineering psychology with concerns about the performance of human-device systems. Technological advances are likely raise issues in the areas of advanced transportation, co-operative work, teleworking, health, pollution and leisure. Recent research effort has called for more theory-based approach from the discipline, in the design practices and processes, in the evaluation and understanding of the way in which devices support human thought. There is an inextricable link between engineering psychology and the science of technology and is up to engineering psychologists to rise to these challenges.

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 (Stanton N. 1996). Engineering psychologists strive to match equipment requirements with the capabilities of human operators by changing the design of the equipment (Schultz D. and Schultz E., 2010). 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 (Schultz D. and Schultz E., 2010). 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 workers to easily use either hand to distribute the workload between both wrists (Schultz D. and Schultz E., 2010).

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 (Licht D., D. Polzella, K. Boff., 2011) An example of an ergonomics study is the evaluation of the effects of screwdriver handle shape, surface material and work piece orientation on torque performance, finger force distribution and muscle activity in a maximum screw driving torque task (Kong Y. K., Lowe B. D., Lee S. J. and Krieg E. F., 2007). Another example of an ergonomics study is the effects of shoe traction and obstacle height on friction (James Jeremy, Houser, Leslie, Decker, Stergioub Nicholas, 2008). 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 (Grether, W. F., 1962). 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 (Licht D., D. Polzella, K. Boff., 2011). This field utilizes knowledge from several fields such as mechanical engineering, psychology, and industrial engineering (Licht D., D. Polzella, and K. Boff., 2011) 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 (Wickens C. and Hollands J., 1999).

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 (Stanton N. 1996).

V. IMPORTANCE OF ENGINEERING PSYCHOLOGISTS

5.1 Introduction

Since the majority of engineering psychologists are employed in the private sector, the performance and growth rate of companies has a strong influence on job growth and demand in this field.

As corporations become increasingly aware of the valuable role that engineering psychologists can play in the design and development process, the demand for qualified professionals continues to grow.

The American Psychological Association (APA) identifies engineering psychology as a post-grad growth area. The APA suggests that this is a rapidly growing area with many potential opportunities to study and work with the interaction between humans, tasks, machines, and environments.

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 (Schultz, Duane P. Schultz, and Sydney Ellen, 2010).

5.2 The Demand for Engineering Psychologists

The demand for engineering psychologists is thriving because industries are realizing that involving psychologists in the design process helps final products be more functional and enjoyable to use, says Ronald G. Shapiro, PhD, manager of IBM's Enterprise Technical Learning Curriculum. Further, a product or system that is well designed from the start will help eliminate frustrated customers and costly redesigns, increasing the company's bottom line.

"Part of the reason engineering psychology is so hot is that people are really starting to understand there is a need for psychologists, and specialists who can evaluate data on a product's or system's use and provide recommendations," says Carl Smith, a fifth - year doctoral student at George Mason University who worked at Motorola designing cell phone interfaces. "What many companies are realizing is that engineers can't account for every interaction within a system because they aren't as familiar with the human system."

Recent media reports on medical errors have also increased demand for engineering psychologists, says Haydee Cuevas, PhD, a research associate at S.A. Technologies, a human factors consulting company. Engineering psychologists help design medical equipment and the layout of operating rooms to minimize the risk of errors, she says.

Because engineering psychologists often work in private industry, the job outlook closely tracks the economy. However, demand has been steady, and at times, very high, says Boehm - Davis, a psychology professor at George Mason University. Some of her students have received job offers while still on their internships, she noted.

Engineering psychologists work in a variety of environments, including academia, the government and private industry. Whether their specialty is human factors, ergonomics, human-computer interaction or usability engineering, engineering psychologists aim to improve lives.

"We tend to work in places where we are most needed, like aviation, which is safety critical. By understanding the abilities of the pilot, we can design away safety problems," notes Prada, who has helped evaluate systems used in the cockpit at Boeing.

Engineering psychologists also advise car companies, the U.S. Department of Transportation, the Federal Highway Administration and NASA. In addition, they consult with architects and designers of consumer products like telephones, cameras and home appliances.

5.3 Training and Educational Requirements

The training and education needed to become an engineering psychologist can vary depending upon the specialty area in which you choose to work. Just a few of the main specialty areas include human factors, ergonomics, usability engineering, and human-computer interaction.

A master's degree in a related field is generally considered the minimum needed for entry into the field, although opportunities and pay are often much higher for those with doctorate degrees.

A number of universities offer graduate programs specifically in engineering psychology. Such programs include coursework in areas such as cognition, engineering, perception, statistics, research methods, and learning.

5.4 Earnings Outlook

Salaries are highest for engineering psychologists in private industry and lowest for those in academia, with government work falling somewhere in between, according to the Human Factors and Ergonomics Society (HFES) 2005 Salary and Compensation Survey. Doctoral level engineering psychologists working at for profit businesses earned an average of $111,368 that year, while those in academia earned an average of $92,614. With the same level of education, average salaries were $107,314 for engineering psychologists with government jobs. Master's-level professionals earned $90,164 in business settings, $90,500 in government and $75,150 in university positions. Starting salaries across all sectors range from $48,000 to $75,367.

Consultants with PhDs who work in industry fared the best, earning $179,160 on average.

About 70 American universities offer HFES accredited graduate programs in engineering psychology, according to their online listing. Students come into these programs with a wide range of undergraduate degrees, including psychology, engineering, computer programming and product or web design says Boehm – Davis.

Although master's level workers can find good jobs in industry, she adds, engineering psychologists with a PhD often have higher salaries and greater control over their projects. Academic and some government positions also require PhDs.

Graduate students take courses in human cognition, development, learning and perception. In addition, they should seek out classes in research methods and statistics, says Patricia DeLucia, PhD, a psychology professor at Texas Tech University. "Engineering psychologists need good analytical abilities to figure out how to approach a problem, attack it and interpret the results," she adds.

Strong oral and written communication skills are the key to communicating your ideas with team members or supervisors, she adds, and they are among the top things employers seek in new hires.

Engineering psychology students should also be open to taking classes or training in areas far afield from psychology, Prada says. For example, both Prada and Smith attended flight-training sessions at a commercial airline to inform their communication with pilots and learn about cockpits firsthand. To design medical equipment that incorporates what psychologists know about depth perception, DeLucia once observed a gall bladder removal.

Engineering psychologists also recommend cultivating a professional network by volunteering with related societies and organizations, like Div. 21, HFES and the Usability Professionals' Association, attending conferences and getting real-life experience through internships with the military or consumer product corporations.

5.5 Pros and Cons of Engineering Psychology

That the field is relatively new is both a boon and a drawback. On one hand, engineering psychologists are free to apply their expertise to countless areas, but on the other hand, they must also know how to market themselves.

"Not all companies understand what we do," Smith notes. "You have to come in and educate them on how what you do can provide a benefit for the company."

Engineering psychologists can work on many kinds of projects, with timelines that range from two days for a corporate design to several years for a long-range academic project. One common challenge in industry is that employers want things done quickly and with the least amount of money in order to maximize their own bottom line, says Shapiro, D. (1994).

"In industry there is a lot of time pressure," says Cuevas. "Often we're trying to juggle completing a monthly report for one project with an annual report for another while dealing with a hectic travel schedule to meet with clients and continuing to write proposals for new funding."

Additionally, some corporate structures make it difficult for psychologists to share their expertise, says Prada. "It's not everywhere you have the authority to go up to an engineer and tell them you have a better way for them to do things."

Challenges aside, says Boehm-Davis, the major benefit of a career in engineering psychology is the pride of making a difference in people's everyday lives (Casey S., 2006), (Cooper A., 2004), (Norman D. 2002), (Salas E., and Fiore S.M., 2004) and(Vincente K. 2004).

VI. CONCLUSIONS

The rapidly growing field of engineering psychology offers a wealth of opportunities to students who are interested in the interaction between people and machines, tasks and environments.

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 used.

One of the main duties of engineering psychologists is to perform research on what consumers want and need when it comes to their products. Demographics and user abilities are also a big part of engineering psychology.

While engineering is concerned with improving equipment from the point of view of mechanical and electrical design, psychology is concerned with the study of the mind and behavior, and engineering psychology is concerned with adapting the equipment and environment to people, based upon their psychological capacities and limitations

Ergonomics is distinct from engineering psychology in that it is multidisciplinary approach, which incorporates psychology, engineering, physiology, environmental, and computer science, but the boundaries are fuzzy and ergonomics shares the overall goals of engineering psychology.

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