

Research report

[Business, Industries](#)



Name: Instructor: Course: Date: Research report Definition Engineering is a discipline, skill and profession that involve attaining and using scientific and practical knowledge in order to design and erect structures, technology and systems. Engineering uses the application of science and math to decipher problems. Engineering touches nearly all dimensions of life from normal activities to complex communication, transport and medical systems.

The engineering career consists of problem-solving individuals that have the purpose of making equipment work resourcefully, faster and cheaper.

Engineers, therefore, seek to make the modern life more comfortable.

Engineering has different branches according to the specialization that an individual chooses (Anbah, George & Carrol, 1965). Engineering is a broad discipline that has several sub-disciplines that are concerned with different areas of engineering. The main branches of engineering include chemical engineering that is the application of physics, biology and chemistry together with engineering values in order to implement chemical processes. Civil engineering is the drawing and construction of infrastructure like water supply, dams and buildings. Electrical engineering is the design and study of electrical systems like electrical circuits, motors and electromagnetic devices. The last branch is mechanical engineering that deals with the design and usage of physical and mechanical systems such as weapon systems, transport products, engines and aircraft systems.

Methodology The methodology in engineering applies physics and math to find sustainable solutions to problems or make developments to the existing engineering inventions. Engineers are everyday being brought to the challenge of having to stay updated on the knowledge of their relevant

sciences. As a result, the study in engineering is more or less an ongoing process, as engineers will learn new material throughout their job experiences. Engineers normally weigh different plan choices when presented with numerous options. This is the important part of any engineer: the decision-making process. Each engineer will have to recognize, comprehend and deduce the advantages and disadvantages of any design in order to come up with a successful outcome.

Some of the different restrictions that an engineer may undergo include the availability of resources, creativity, physical and mechanical drawbacks, the ability to draw up flexible designs that may be modified in the future as well as other minor constraints like safety requirements, productivity issues and costs. It is only when engineers can understand and integrate these requirements that they can develop specifications and limits within which a product can be created and used (Giannoccaro, Ludovico & Triantis, 2007). The problem solving skills required by engineers is a unique ability required by all individuals pursuing this career line. Engineers have to apply their knowledge of mathematics, economics, logic, science and tacit knowledge in order to come up with answers to a problem. The rational solutions to a particular design problem may be multiple, forcing an engineer to evaluate the different design options based on their benefits. They also enable engineers come up with the best solution among the many that would meet the requirements. This may involve the creation of appropriate mathematical models that would help them analyze as well as test the solution chosen. This rigorous process of selecting and adopting a particular solution over another is not sufficient to guarantee success.

Engineers need to predict how the design will deliver before entering the mass production stage. In performing this verification process, engineers use prototypes, models, stress tests and destructive tests to ensure that the products will work as designed. Engineers are also responsible for producing design that will ensure the safety of the public users. Engineers are therefore expected to design safe structures and equipment that will have to undergo forensic tests. This will avoid accidents like bridge collapses and machine malfunction that may cause harm to the users.

Educational program information Engineering is a highly competitive course all over the world. Individuals who are interested in studying any aspect of engineering can pursue their studies in most local and international institutions that offer degree and diploma in all the branches of engineering. Within most countries, the minimum period for any engineering course would be for years. The minimum qualification that employers would accept is a bachelor's degree.

The flexibility with which a graduate selects the next course of study after obtaining the first degree will determine how easily they are preferred by hiring companies. Most engineering graduates focus on one sub-section of engineering that will increase their demand. A mechanical engineering graduate that specialized in one aspect of the mechanical sub-field will be more flexible when employed as they can meet new recruitment needs (Ridgway, 2011).

The degree level is a basic point in engineering. Individuals who feel that they can pursue further studies have the option of taking Masters or

Doctorate courses within engineering. Most states assess individuals before considering them for these higher levels. This is done by issuing GRE tests that would either qualify or disqualify graduates from pursuing further studies.

The coursework for most engineering courses involves basic topics that are studied by all students regardless of their selected major. These include fundamentals of Analog Electronics Course, Quantitative analysis and other core courses. Apart from the core science subjects, engineers are also taught social sciences as humanities as an elective course within their program. After graduation, engineering graduates still have to pass through several training programs to ensure a smooth transition into the career. These training courses are not compulsory for all potential employees, but they strictly apply to specialized jobs that may require the application of academic knowledge in the real life situations. In order for engineers to advance in the field, they require more skill and knowledge. In the progression of these two elements, engineers may start to work on their own in making decisions, developing designs and coming up with solutions to problems. When an engineer gets enough experience, they may take up employment as technical specialists over a team of engineers.

Eventually, experienced engineers can opt to practice their own trade by starting their own engineering firms (Nickola & Mc Grath, 2009).

Occupational information It is evident that the impact that engineering and modern science have had on earth is of great benefit to humanity in numerous ways. Thee benefits that accompany engineering has as an

occupation are equally worth noting. Earnings and other benefits of engineering The payment for engineers depends on where they work the kind of job and education and experience of the engineer. However, it is without doubt that engineers are some of the highest paid professionals in the working industry. Within America, as of 2011, different categories of engineers were being paid substantial salaries. Engineers who had gotten jobs after graduation received from between \$40, 000 to \$50, 000, those who had four to six years of experience earned from between \$70, 000 to 100, 000.

The most experienced and skilled engineers who had over ten years experience could receive as much as \$180, 000. Other benefits apart from salaries include basic allowances on housing and transport. Other special benefits include vacation, paid holidays, retirement plans and insurance covers for employees and their families. Caution must be made in reviewing the benefits awarded to engineers. They vary with each organization, country and type of employment that an engineer is subjected to by their firm. It is most likely that in developing areas, engineers may enjoy far less benefits than those enjoyed by similar professionals in developed countries. Advancement opportunities For engineering graduates to be able to benefit from their skills by practicing their trade, they must obtain licenses from the state.

Different states have different requirements. The United States requires that an individual has to graduate from an ABET- accredited course or program, collect over four years of experience and pass a state assessment for them

to get a license. These two exams administered by the state through the NCEES.

The engineering sector employment rates are, however, on the rise within most developing states if compared to other occupations. The biomedical, civil and environmental branches of engineering hold the promise for the biggest growth (Boyles, 1997). This is because most countries are in the pursuit of better health facilities and systems that are more efficient as well as cheaper and require the services of biomedical engineers. Civil engineers will mostly be required in the planning and implantation of long-term urban plans in many countries that have expansion and development needs. Environmental engineers will find employment in the conservation of the ecosystem by innovating and discovering new methods, materials and techniques through which mechanical activities can be performed. The fields of petroleum and geological engineering are also similarly lucrative (Boyles, 1997).

Working conditions for engineers The job description for engineers varies with the area specialized by an individual. However, for every engineer there are certain common conditions to be expected. The job type for engineers will require a high degree of physical mobility as most of the projects are situated in different locations.

An engineer may have to travel between towns or cities in order to inspect a proposed site for a manufacturing plant. The mobility also means that an engineer should be ready to travel oversea into different countries depending on the location of the job. Specific branches like mechanical or

aeronautical engineering may involve engineers working with or around heavy machinery. Engineers' job description is mainly scientific in nature. Therefore, any engineer should expect to work with and around different electrical equipment. Engineers, therefore, need to be comfortable with computers and their related applications like computer-aided design (CAD) programs, hand-held tools like screwdrivers, spanners and pliers, safety clothing like helmets and overalls, as well as testing equipment. Engineers have regular working hours like other professionals but this may be slightly stretched into the weekend or late into the night in order to beat deadlines.

At the work place, engineers may be assigned other colleagues or they may work independently (Landis, 2007). Most of the work done by engineers is done individually. The designing is done by one engineer in his office or laboratory. However, later in the project, contact with other experts is inevitable.

The engineer has to interact with government city officials, safety officials as well as contractors to get feedback on how his / her work is developing, make any corrections and receive input. Some of these stakeholders include community groups, environmental groups, private consultancies and local authorities. These working conditions may require engineers to be in good health and constantly ready to live in temporary residences such as hotels and lodges. The work conditions of engineers might also be highly confidential and dangerous. Sometimes, engineers are brought in to work on harmful chemicals and gases that might be used for chemical or biological warfare.

Similarly, mechanical engineers can be used by the state, and other bodies to create technological weapons of mass destruction. This requires the engineers and other staff to take oaths of silence, have security guards and be very careful on leaking out their information. This may pose a threat to the life and freedom of engineers, as they have to maintain confidentiality.

Personality types Although the requirements for engineers are mostly academic in nature, the personality of an individual also contributes towards a successful employee in an engineering firm or organization. The engineers' personality is not an element that is subject to accurate analysis that is common of elements in pure sciences. However, there are certain common traits that assist an engineer succeed. An engineer should be very curious and eager to discover how equipment functions and how to answer different problems. He or she should not be content with the situation of things but should instead be interested in how to better them.

Good engineers should be able to use logic to scrutinize thoughts and come up with hypotheses that might offer explanations. Engineers are generally identified as being anti-social, meticulous and perfectionist in nature. The perception that is borne by most people stems from the fact that engineers spend most of their time in laboratories where they work in isolation.

Engineers should have good concentration skills especially on a particular subject. Science is the most preferred subject among many scientists and one should have a passion for it. Successful engineers should have interest in engaging in constructive academic debates and arguments on different scientific topics. The nature of work involved in engineering is very detailed,

and as an engineer, one should be highly organized and possess good structures in tackling problems.

Apart from these positive qualities, engineers also need to avoid being partisan or biased, being attached to particular irrelevant theories or structures and resistance to change. Other personality requirements for engineers are that they should be analytical and cooperative. Most engineering jobs are done in projects that include different groups of engineers working on one thing. Being cooperative will help an individual to get along with other colleagues and ensure the success of the project. Engineers also need communication skills as they may need to work with other experts outside the engineering field who may not decipher their technical jargon (Petersen et al, 2006).

Other pertinent information Regions where employment is most likely The private sector is the biggest employer for most of science and engineering graduates. These private, profit-oriented companies employ about 62% of the world engineers at the degree level and 58% at the Masters level (Tsapogas, 2004). The education sector also employed big numbers of engineers mainly as lecturers but some education institutions hired engineers to install and maintain database systems within their IT infrastructure and mechanical equipment like generators.

The rate of employment was higher for postgraduate engineering students than undergraduates. Most of the postgraduates in engineering-related courses were working full time, but only half of the undergraduates were doing so, most of who were engaged in part time jobs with different firms.

The engineering and manufacturing opportunities open to such graduates are mostly in newly created niches that have attracted recent attention and need contemporary skills that are wielded by new graduates.

Recent challenges such as infrastructure revamping, handling population growth and climate change have many opportunities for engineering graduates (Kumar & Buglass 2009). Most universities have also began making close connections with potential employers for their engineering students in order to understand the market's requirements better, as well as creating higher chances for their graduates to be employed immediately after school (Rickard, 2007). Safety issues Given the nature of work done by engineers, they are exposed to different types of occupational risks.

These risks ultimately influence the productivity of an engineering employee. Engineers develop and maintain a range of equipment, systems, products and structures. Today's engineers spend a lot of time behind computers as they design and develop innovations.

However, other engineers are in direct contact with the machinery and electrical equipment that exposes them to different hazardous chemicals for instance asbestos, carbon monoxide and sulfuric-based chemicals. This can lead to respiratory complications in the long term (Muriel & Hilda, 2012). Apart from these types of risks, there are also physical dangers that are present. Engineers can fall from elevated surfaces such as ladders, cliffs or tall buildings. Injuries or deaths can also occur because of the collapse of unstable grounds, excavations, buildings or materials. Electrical engineers

are exposed to electrocution by faulty wires during inspection rounds. An engineer can also be hit by heavy machinery or vehicles working on the site.

The overall effect of constantly maintaining strenuous work may lead to stress and other psychological problems (Kim & Stig, 2012). Within the engineering field, there is a branch called reliability engineering. This discipline is concerned with the study of safety and reliability of systems. It is also closely related to safety engineering in that both use similar methods in their analysis.

However, reliability-engineering aims at reducing the losses accrued from system downtime, replacement of spares and personnel and other legal lawsuits. Conversely, safety engineering involves anticipating and mitigating hazardous conditions by developing appropriate controls that are included within a safety plan of the organization. Safety engineers have the function of ensuring that the personnel and the firms' property are protected from all forms of threats. Therefore, safety is a multidimensional aspect that may call upon the services of other experts like lawyers, security firms and quality assurance firms (Kletz & Paul, 2010).

Conclusion Engineering as a career requires the interest and ability to solve problems using mathematical and scientific models. Engineering has contributed to the improvement of lives, the increase in employment opportunities and the achievement of individual, group and state goals of being developed. The number of people employed yearly by the engineering sector alone within each state is a good indicator of the significance of science and technology in society.

Efforts should be made to strengthen the presence of this subject in tertiary institutions to increase its quality. The achievement of this objective is, however, not without its limitations. The successful completion of any engineering course requires a lot of money for paying the tuition fees. Even at the cheapest universities or colleges, the cost of engineering courses is still beyond the reach of many households. Reference Anbah, S. A, George V. C., and Carrol M.

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