SAFETY AND RISK

The chief role of the engineer is to ensure safety and well being of society. The engineer has the liability to the society to produce or operate products that are safe.

Three categories of consumers-

1. **Active consumers**: consumers who have control in choosing the item or the manner in which it can be used safely. For example, appliances like washing machine, kitchen mixer etc.
2. **Passive consumers:** consumers who have less choice and less control over the use like electricity, water etc.
3. **Bystanders:** who are exposed to danger even without using them, like those living around polluting factories, slums and union carbide factory at Bhopal.

DEFINITIONS

1. **RISK:** the potential that something unwanted or harmful may occur. It is the possibility of meeting a danger or suffering harm or loss.

2. **SAFE:** protected from danger and harm. Not likely to cause or lead to damage, injury, loss etc.

3. **SAFETY:** the ability to make or keep something safe.

ENGINEERS AND SAFETY

As safety is an essential aspect for engineers. The following five criteria must be met to ensure a safe design. They are:

1. Designs must comply with applicable laws.
2. Acceptable design must meet the standard acceptable practices.
3. Alternative designs that are potentially safe must be explored.
4. The engineer must attempt to foresee any potential misuse of the product by the consumer and must design to avoid their problems.
5. Once the product is designed, prototypes as well as the final product must be rigorously tested not only with reference to the technical specifications but also for safety.

Three Mile Island accident

Three Mile Island accident, accident in 1979 at the Three Mile Island nuclear power station that was the most serious in the history of the American nuclear power industry. The Three Mile Island power station was named after the island on which it was situated in the Susquehanna River near Harrisburg, Pa. At 4:00 AM on March 28, an automatically operated valve in the Unit 2 reactor mistakenly closed, shutting off the water supply to the main feedwater system (the system that transfers heat from the water actually circulating in the reactor core). This caused the reactor core to shut down automatically, but a series of equipment and instrument malfunctions, human errors in operating procedures, and mistaken decisions in the ensuing hours led to a serious loss of water coolant from the reactor core. As a result, the core was partially exposed, and the zirconium cladding of its fuel reacted with the surrounding superheated steam to form a large accumulation of hydrogen gas, some of which escaped from the core into the containment vessel of the reactor building. Very little of this and other radioactive gases actually escaped into the atmosphere, and they did not constitute a threat to the health of the surrounding population. In the following days adequate coolant water circulation in the core was restored.

Three Mile Island accident

The accident at Three Mile Island, though minuscule in its health consequences, had widespread and profound effects on the American nuclear power industry. It resulted in the immediate (though temporary) closing of seven operating reactors like those at Three Mile Island. A moratorium on the licensing of all new reactors was also temporarily imposed, and the whole process of approval for new plants by the Nuclear Regulatory Commission was significantly slowed for years after the accident. No new reactors were ordered by utility companies in the United States from 1979 through the mid-1980s. The accident increased public fears about the safety of nuclear reactors and strengthened public opposition to the construction of new plants. The unharmed Unit 1 reactor at Three Mile Island did not resume operation until 1985. The cleanup of Unit 2 continued until 1990; damage to the unit was so severe, however (52 percent of the core melted down), that it remained unusable.

Chernobyl Accidents

Chernobyl, Near Kiev, Russia (April 1986) The RBMK (Acronym for water cooled and graphite moderated) reactors were graphite moderated and they use water tubes. A test on the turbine generator was planned to be conducted during a scheduled plant shut-down maintenance. To conduct the test, the power plant output was reduced to 700 MW. But due to a sudden and unexpected demand, the power output has to be raised.

1. To go ahead with the test, the reactor operators had already disconnected the emergency core-cooling system, ignoring the raise in demand situation.
2. Further, a control device was not properly reprogrammed to maintain power at 700-100 MW level
3. The test was conducted at 200 MW power out-put which is very low for the test. They should have shut down the reactor.

Chernobyl Accidents

4. The operators blocked all emergency signals and automatic shut-down controls, thus all safety systems were disconnected.

5. The operators raised control rods to increase power output and tried to continue the test. This made the reactor unsafe. The temperature of RBMK reactor increased and the fission rate increased.

6. The test should have been postponed but continued. The reactor core melted and due to the Hydrogen accumulation, the reactor caught fire and the radioactive waste began to spread out in USSR and also Europe.

COLLEGIALITY

Craig Ihara defines collegiality as "a kind of connectedness grounded in *respect for professional expertise and in a commitment to the goals and values of he profession*".

It is the tendency to support and cooperate with the colleagues.

Elements of collegiality

1. *Respect to the ideas and work of others:* This results in support and cooperation with one's colleagues. One gets back the support and cooperation in return, and this is mutually beneficial.

2. *Commitment to moral principles: Commitment is towards moral decisions, actions, goals of the organization and values of the profession.*

3. *Connectedness:* It means the shared commitment and mutual understanding. It ensures the absence of egoism and paves way for progress for both.

Generally collegiality should be encouraged among engineers because

a. It is an influential value to promote the aims of professions. Therefore it strengthens an engineer's motivation to live up to professional standards.

b. It is more valuable as many individuals jointly working for the goodness of the public and society.

Negative Aspects of Collegiality

- It may be misused or distorted.
- It may degenerate more groups of self-interest, rather than groups of shared devotion to the public good.
- It may focus on corporate goal of maximizing profit at the expense of the public good.

WHISTLE-BLOWING

Whistle blowing is an act of conveying information about a significant moral problem by a present or former employee, outside approved channels (or against strong pressure) to someone, in a position to take action on the problem.

Types of Whistle Blowing

External Whistle blowing: The act of passing on information outside the organization.

Internal Whistle blowing: The act of passing on information to someone within the organization but outside the approved channels. Either type is likely to be considered as disloyalty, but the second one is often seen as less serious than the latter. From corporations' point of view both are serious because it leads to distrust, disharmony, and inability of the employees to work together.

Open Whistle blowing: Individuals openly revealing their identity as they convey the information.

Anonymous Whistle blowing: Individual conveying the information conceals his/her identity.

Conditions to be satisfied before Whistle Blowing

Richard T. De George suggests the following:

The harm that will be done by the product to the public is serious and considerable.

The individual makes his/her concern known to his/her superiors .

If one does not get any proper response from immediate superiors, then one should exhaust the channels that are available within the organization including the board of directors.

One must have documented evidence that would convince a reasonable and impartial observer that one’s view of the situation is correct and the company policy is wrong.

There must be strong evidence that making the information public will in fact prevent the threatened serious harm.

INTELLECTUAL PROPERTY RIGHTS

Intellectual Property is a product of the human intellect that has commercial value. Many of the rights of the ownership common to real and personal property are also common to Intellectual Property. Intellectual Property can be bought, sold, and licensed. Similarly it can be protected against theft and infringement by others.

ELEMENTS OF INTELLECTUAL PROPERTY RIGHTS

Patents
Industrial Designs
Trademarks
Copy rights
Trade secrets
Design of integrated circuits
Geographical indications

CONFLICTS OF INTEREST

Conflict of Interest arises when two conditions are met:

The professional is in a relationship or a role that requires exercising good judgment on behalf of the interests of an employer or client .The professional has some additional or side interest that could threaten.

TYPES OF CONFLICTS OF INTEREST

Actual Conflicts of interest

Purchase Manager

Potential Conflicts of interest

Become Friend to supplier

Apparent Conflicts of interest

Design Engineer

AVOIDING CONFLICTS OF INTERESTS

Taking guidance from Company Policy.

In the absence of such a policy taking a second opinion from a co-worker or manager. This gives an impression that there no intension on the part of the engineer to hide anything.

In the absence of either of these options, to examine ones own motives and use the ethical problem solving techniques.

One can look carefully into the professional codes of ethics which uniformly forbid conflicts of interest. Some of these codes have very explicit statements that can help determine whether or not the situation constitutes conflict of interest.

LOYALTY

Quality of being true and faithful in one's support.

Senses of Loyalty

Agency Loyalty

Identification Loyalty

Some duties of loyal employees:

To avoid conflicts of interest

To protect confidential information

To be honest in making estimates

To admit one's errors

PROFESSOINALISM AND LOYALTY

Acting on professional commitments to the public is more effective to serve a company than just following company orders. Loyalty to employers may not mean obeying one's immediate supervisor. Professional obligations to both an employer and to the public might strengthen rather than contradict each other.

CONFIDENTIALITY OR CONFIDENTIAL INFORMATION

Information considered desirable to be kept secret.

Any information that the employer or client would like to have kept secret in order to compete effectively against business rivals.

This information includes how business is run, its products, and which directly affects the ability of the company to compete in the market place.

Helps the competitor to gain advantage or catch up.

TERMS RELATED TO CONFIDENTIALITY:

Privileged information, Proprietary information and Patents.

Privileged information: Information available only on the basis of special privilege such as granted to an employee working on a special assignment.

Proprietary information: Information that a company owns or is the proprietor of. This is primarily used in legal sense. Also called Trade Secret. A trade secret can be virtually any type of information that has not become public and which an employer has taken steps to keep secret.

Patents: Differ from trade secrets. Legally protect specific products from being manufactured and sold by competitors without the express permission of the patent holder. They have the drawback of being public and competitors may easily work around them by creating alternate designs.

EFFECT OF CHANGE OF JOB ON CONFIDENTIALITY

Employees are obliged to protect confidential information regarding former employment, after a change of job.

The confidentiality trust between employer and employee continues beyond the period of employment.

But, the employee cannot be forced not to seek a change of job.

The employer’s right to keep the trade secrets confidential by a former employee should be accepted at the same time, the employee’s right to seek career advancement cannot also be denied.

OCCUPATIONAL CRIME

Occupational crimes are illegal acts made possible through one's lawful employment.

It is the secretive violation of laws regulating work activities.

When committed by office workers or professionals, occupational crime is called 'white collar crime'.

Most of the occupational crimes are special instances of conflicts of interest.

EXAMPLES OF OCCUPATIONAL CRIMES:

Price Fixing

1983, American State of Washington-Six Large Electrical Contractors

Endangering Lives

Manville Corporation, the large power producer of asbestos in U.S- During Million workers exposed – more than 1 lakh people died.

Industrial Espionage i.e. Industrial Spying

Acquisition of information of others' secret to one's benefit is espionage.

Information are secretly gathered/theft through spies.

PEOPLE COMMITTING OCCUPATIONAL CRIMES

Usually have high standard of education.

From a non-criminal family background.

Middle class male around 27 years of age (70% of the time) with no previous history.

Those who had troublesome life experience in the childhood (Blum).

People without firm principles (Spencer).

Firms with declining profitability (Coleman, 1994)

Firms in highly regulated areas and volatile market -pharmaceutical, petroleum industry.(Albanese, 1995).

PROFESSIONAL RIGHTS

The right to form and express one's professional judgment freely.
The right to refuse to carry out illegal and unethical activity.
The right to talk publicly about one's work within bounds set by confidentiality obligation.
The right to engage in the activities of professional societies.
The right to protect the clients and the public from the dangers that might arise from one's work.
The right to professional recognition of one's services.

EMPLOYEE RIGHTS

The rights that apply or refer to the status or position of employee. Types of employee rights:
Contractual Rights
Non-Contractual Employee Rights
Rights to outside activities
Rights to privacy

HV & E_UNIT 4

GLOBALIZATION

Globalization means integration of countries through commerce, transfer of technology, and exchange of information and culture. In a way, it includes acting together and interacting economies through trade, investment, loan, development schemes and capital across countries. In a different sense, these flows include knowledge, science, technology, skills, culture, information, and entertainment, besides direct human resource, tele-work, and outsourcing. This interdependence has increased the complex tensions and ruptures among the nations. For the engineers, the issues such as multinational organizations, computer, internet functions, military development and environmental ethics have assumed greater importance for their very sustenance and progress.

MULTINATIONAL CORPORATIONS

Organisations who have established business in more than one country, are called multinational corporation. The headquarters are in the home country and the business is extended in many host countries. The Western organizations doing business in the less-economically developed (developing, and overpopulated) countries gain the advantage of inexpensive labor, availability of natural resources, conducive-tax atmosphere, and virgin market for the products. At the same time, the developing countries are also benefited by fresh job opportunities, jobs with higher remuneration and challenges, transfer of technology, and several social benefits by the wealth developed. But this happens invariably with some social and cultural disturbance. Loss of jobs for the home country, and loss or exploitation of natural resources, political instability for the host countries are some of the threats of globalization.

MNCs and Morality

The economic and environmental conditions of the home and host countries may vary. But the multinational institutions have to adopt appropriate measures not to disturb or dislocate the social and living conditions and cultures of the home countries. A few principles are enlisted here:

1. MNC should respect the basic human rights of the people of the host countries.
2. The activities of the MNC should give economic and transfer technical benefits, and implement welfare measures of the workers of the host countries.
3. The business practices of multinational organisations should improve and promote morally justified institutions in the host countries.
4. The multinationals must respect the laws and political set up, besides cultures and promote the cultures of the host countries.
5. The multinational organisations should provide fair remuneration to the employees of the host countries. If the remuneration is high as that of the home country, this may create tensions and if it is too low it will lead to exploitation.
6. Multinational institutions should provide the necessary safety for the workers when they are engaged in hazardous activities and ‘informed consent’ should be obtained from them. Adequate compensation should be paid to them for the additional risks undertaken.

The pros and cons of multinational companies from the point of view of ethics

Cons

1. Mixing of the foreign nationals with locals, may attract and influence the people, especially the young, towards the free exchange of ideas and more freedom for women etc., sometimes leading to declining of culture or discipline.
2. Economic disparity between those employed by MNC and those employed by locals, might lead to social conflicts.

Pros

1. The MNC might spend money on projects for the social development of people, and eradicate health and safety problems.
2. 2. Increased employment opportunities for the people will reduce ethical conflicts/ problems.

ENVIRONMENTAL ETHICS

Environmental ethics is the study of

(a) moral issues concerning the environment, and

(b) moral perspectives, beliefs, or attitudes concerning those issues. Engineers in the past are known for their negligence of environment, in their activities. It has become important now that engineers design eco-friendly tools, machines, sustainable products, processes, and projects.

These are essential now to

(a) ensure protection (safety) of environment

(b) prevent the degradation of environment, and

(c) slow down the exploitation of the natural resources, so that the future generation can survive. The American Society of Civil Engineers (ASCE) code of ethics, has specifically requires that "engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of professional duties" The term sustainable development emphasizes on the investment, orientation of technology, development and functioning of organizations to meet the present needs of people and at the same time ensuring the future generations to meet their needs.

Compaq Computer Corporation (now merged with HP) was the leader, who exhibited their commitment to environmental health, through the implementation of the concept of 'Design for environment' on their products, unified standards all over the world units, and giving priority to vendors with a record of environmental concern.

Engineers as experimenters have certain duties towards environmental ethics, namely:

1. Environmental impact assessment: One major but sure and unintended effect of technology is wastage and the resulting pollution of land, water, air and even space. Study how industry and technology affect the environment.
2. Establish standards: Study and to fix the tolerable and actual pollution levels.
3. Counter measures: Study what protective or eliminating measures are available for immediate implementation
4. Environmental awareness: Study on how to educate the people on environmental practices, issues, and possible remedies.

Disasters in Global issues

1. Plastic Waste

Disposal In our country, several crores of plastic bottles are used as containers for water and oil, and plastic bags are used to pack different materials ranging from vegetables to gold ornaments. Hardly any of these are recycled. They end up in gutters, roadsides, and agricultural fields. In all these destinations, they created havoc. The worse still is the burning of plastic materials in streets and camphor along with plastic cover in temples, since they release toxic fumes and threaten seriously the air quality. Cities and local administration have to act on this, collect and arrange for recycling through industries.

2. e-Waste Disposal

The parts of computers and electronic devices which have served its useful life present a major environmental issue for all the developing countries including India. This scrap contains highly toxic elements such as lead, cadmium, and mercury. Even the radioactive waste will lose 89% of its toxicity after 200 years, by which time it will be no more toxic than some natural minerals in the ground. It will lose 99% of its remaining toxicity over the next 30,000 years. The toxic chemical agents such as mercury, arsenic, and cadmium retain toxicity undiminished for ever. But these scraps are illegally imported by unscrupulous agencies to salvage some commerciallyvaluable inputs. Instead of spending and managing on the scrap, unethical organizations sell them to countries such as India. This is strictly in violation of the Basel Convention of the United Nations Environment Program, which has banned the movement of hazardous waste. A recent report of the British Environment Agency,13 has revealed that the discarded computers, television sets, refrigerators, mobile phones, and electrical equipments have been dispatched to India and Pakistan in large quantity, for ultimate disposal in environmentally-unacceptable ways and at great risk to the health of the labour.

2. e-Waste Disposal (Cont.)

Even in the West, the electronic junk has been posing problems. Strong regulation including (a) pressure on industries to set up disassembling facilities, (b) ban on disposal in landfill sites, (c) legislation for recycling requirements for these junk and (d) policy incentives for eco-friendly design are essential for our country. The European Union through the Waste Electrical and Electronic Equipment (WEEE) directive has curbed the e-waste dumping by member countries and require manufacturers to implement methods to recover and recycle the components. Indian Government expressed its concern through a technical guide on environmental management for IT Industry in December, 2004. It is yet to ratify the ban on movement of hazardous waste according to the Basel Convention. A foreign news agency exposed a few years back, the existence of a thriving e-waste disposal hub in a suburb of New Delhi, operating in appallingly dangerous conditions. Our country needs regulations to define waste, measures to stop illegal imports, and institutional structures to handle safe disposal of domestic industrial scrap.

3. Industrial Waste Disposal

There has been a lot of complaints through the media, on (a) against the Sterlite Copper Smelting Plant in Thuthukkudi (1997) against its pollution, and (b) when Indian companies imported the discarded French Warship Clemenceau for disposal, the poisonous asbestos compounds were expected to pollute the atmosphere besides exposing the labor to a great risk, during the disposal. The government did not act immediately. Fortunately for Indians, the French Government intervened and withdrew the ship, and the serious threat was averted!

5. Global Warming

Over the past 30 years, the Earth has warmed by 0.6 °C. Over the last 100 years, it has warmed by 0.8 °C. It is likely to push up temperature by 3 oC by 2100, according to NASA's studies. The U.S. administration has accepted the reality of global climate change, which has been associated with stronger hurricanes, severe droughts, intense heat waves and the melting of polar ice. Greenhouse gases, notably carbon dioxide emitted by motor vehicles and coal-fired power plants, trap heat like the glass walls of a greenhouse, cause the Earth to warm up. Delegates from the six countries — Australia, China, India, Japan, South Korea and US met in California in April 2006 for the first working session of the AsiaPacific Partnership on Clean Development and Climate. These six countries account for about half of the world's emissions of climate-heating greenhouse gases. Only one of the six, Japan, is committed to reducing greenhouse gas emissions by at least 5.2 per cent below 1990 levels by 2012 under the Kyoto Agreement. About 190 nations met in Germany in the middle of May 2006 and tried to bridge vast policy gaps between the United States and its main allies over how to combat climate change amid growing evidence that the world is warming that could wreak havoc by stoking more droughts, heat waves, floods, more powerful storms and raise global sea levels by almost a meter by 2100.

6. Acid Rain

Large emissions of sulphur oxides and nitrous oxides are being released in to the air from the thermal power stations using the fossil fuels, and several processing industries. These gases form compounds with water in the air and precipitates as rain or snow on to the earth. The acid rain in some parts of the world has caused sufficient damage to the fertility of the land and to the human beings.

COMPUTER ETHICS

Computer ethics is defined as (a) study and analysis of nature and social impact of computer technology, (b) formulation and justification of policies, for ethical use of computers. This subject has become relevant to the professionals such as designers of computers, programmers, system analysts, system managers, and operators. The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right, and physical as well as mental harm. There appears to be no conceptual framework available on ethics, to study and understand and resolve the problems in computer technology.

Types of Issues

Different types of problems are found in computer ethics.

1. Computer as the Instrument of Unethical Acts

(a) The usage of computer replaces the job positions. This has been overcome to a large extent by readjusting work assignments, and training everyone on computer applications such as word processing, editing, and graphics. 98 A Textbook on Professional Ethics and Human Values.

(b) Breaking privacy. Information or data of the individuals accessed or erased or the ownership changed.

(c) Defraud a bank or a client, by accessing and withdrawing money from other's bank account.

2. Computer as the Object of Unethical Act

The data are accessed and deleted or changed.

(a) Hacking: The software is stolen or information is accessed from other computers. This may cause financial loss to the business or violation of privacy rights of the individuals or business. In case of defense information being hacked, this may endanger the security of the nation.

(b) Spreading virus: Through mail or otherwise, other computers are accessed and the files are erased or contents changed altogether. 'Trojan horses' are implanted to distort the messages and files beyond recovery. This again causes financial loss or mental torture to the individuals. Some hackers feel that they have justified their right of free information or they do it for fun. However, these acts are certainly unethical.

(c) Health hazard: The computers pose threat during their use as well as during disposal.

3. Problems Related to the Autonomous Nature of Computer

(a) Security risk: Recently the Tokyo Stock Exchange faced a major embarrassment. A seemingly casual mistake by a junior trader of a large security house led to huge losses including that of reputation. The order through the exchange's trading system was to sell one share for 600,000 Yen. Instead the trader keyed in a sale order for 600,000 shares at the rate of one Yen each. Naturally the shares on offer at the ridiculously low price were lapped up. And only a few buyers agreed to reverse the deal! The loss to the securities firm was said to be huge, running into several hundred thousands. More important to note, such an obvious mistake could not be corrected by some of the advanced technology available. For advanced countries like Japan who have imbibed the latest technology, this would be a new kind of learning experience.

(b) Loss of human lives: Risk and loss of human lives lost by computer, in the operational control of military weapons. There is a dangerous instability in automated defense system. An unexpected error in the software or hardware or a conflict during interfacing between the two, may trigger a serious attack and cause irreparable human loss before the error is traced. The Chinese embassy was bombed by U.S. military in Iraq a few years back, but enquiries revealed that the building was shown in a previous map as the building where insurgents stayed.

(c) In flexible manufacturing systems, the autonomous computer is beneficial in obtaining continuous monitoring and automatic control.

Computers In Workplace

The ethical problems initiated by computers in the workplace are:

1. Elimination of routine and manual jobs. This leads to unemployment, but the creation of skilled and IT-enabled service jobs are more advantageous for the people. Initially this may require some upgradation of their skills and knowledge, but a formal training will set this problem right. For example, in place of a typist, we have a programmer or an accountant.
2. Health and safety: The ill-effects due to electromagnetic radiation, especially on women and pregnant employees, mental stress, wrist problem known as Carpel Tunnel Syndrome, and backpain due to poor ergonomic seating designs, and eye strain due to poor lighting and flickers in the display and long exposure, have been reported worldwide. Over a period of long exposure, these are expected to affect the health and safety of the people. The computer designers should take care of these aspects and management should monitor the health and safety of the computer personnel.
3. Computer failure: Failure in computers may be due to errors in the hardware or software. Hardware errors are rare and they can be solved easily and quickly. But software errors are very serious as they can stop the entire network. Testing and quality systems for software have gained relevance and importance in the recent past, to avoid or minimize these errors.

ENGINEERS AS MANAGERS

Characteristics

The characteristics of engineers as managers are:

1. Promote an ethical climate, through framing organization policies, responsibilities and by personal attitudes and obligations.
2. Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.
3. Social responsibility to stakeholders, customers and employers. They act to develop wealth as well as the welfare of the society. Ethicists project the view that the manager's responsibility is only to increase the profit of the organization, and only the engineers have the responsibility to protect the safety, health, and welfare of the public. But managers have the ethical responsibility to produce safe and good products (or useful service), while showing respect for the human beings who include the employees, customers and the public. Hence, the objective for the managers and engineers is to produce valuable products that are also profitable.

Managing Conflicts

In solving conflicts, force should not be resorted. In fact, the conflict situations should be tolerated, understood, and resolved by participation by all the concerned. The conflicts in case of project managers arise in the following manners:

(a) Conflicts based on schedules: This happens because of various levels of execution, priority and limitations of each level.

(b) Conflicts arising out of fixing the priority to different projects or departments. This is to be arrived at from the end requirements and it may change from time to time.

(c) Conflict based on the availability of personnel.

(d) Conflict over technical, economic, and time factors such as cost, time, and performance level. (e) Conflict arising in administration such as authority, responsibility, accountability, and logistics required. (f) Conflicts of personality, human psychology and ego problems. (g) Conflict over expenditure and its deviations.

Most of the conflicts can be resolved by following the principles listed here:

1. People Separate people from the problem. It implies that the views of all concerned should be obtained. The questions such as what, why, and when the error was committed is more important than to know who committed it. This impersonal approach will lead to not only early solution but also others will be prevented from committing errors.
2. Interests Focus must be only on interest i.e., the ethical attitudes or motives and not on the positions (i.e., stated views). A supplier may require commission larger than usual prevailing rate for an agricultural product. But the past analysis may tell us that the material is not cultivated regularly and the monsoon poses some additional risk towards the supply. Mutual interests must be respected to a maximum level. What is right is more important than who is right!
3. Options Generate various options as solutions to the problem. This helps a manager to try the next best solution should the first one fails. Decision on alternate solutions can be taken more easily and without loss of time.
4. Evaluation The evaluation of the results should be based on some specified objectives such as efficiency, quality, and customer satisfaction. More important is that the means, not only the goals, should be ethical

MORAL LEADERSHIP OF ENGINEERS

Engineers provide many types of leadership in the development and implementation of technology, as managers, entrepreneurs, consultants, academics and officials of the government. Moral leadership is not merely the dominance of a group. It means adopting reasonable means to motivate the groups to achieve morally desirable goals. This leadership presents the engineers with many challenges to their moral principles.

Moral leadership is essentially required for the engineers, for the reasons listed as follows:

1. It is leading a group of people towards the achievement of global objectives. The goals , as well as the means, are to be moral. For example, Hitler and Stalin were leaders, but only in an instrumental sense and certainly not in a moral sense.
2. The leadership shall direct and motivate the group to move through morally desirable ways.
3. They lead by thinking ahead in time and being morally creative towards new applications, extension and putting values into practice. ‘Morally creative’ means the identification of the most important values as applicable to the situation, bringing clarity within the groups through proper communication and putting those values into practice.
4. They sustain professional interest, among social diversity and cross-disciplinary complexity.

They contribute to professional societies, their professions, and to their communities.

Moral leadership in engineering is manifested in leadership within professional societies. The professional societies provide a forum for communication and canvassing for change within and by groups.