Globalization of Engineers' Ethics and Code of Conduct

Dr. C. G Krishnadas Nair*

Introduction

Engineers play a significant role in the application of science and technology for growth of human civilization, enhancing quality of life wealth and welfare. However unwise and unethical application of science and technology can lead to harmful effects causing injury to humans, animals and environment, and affecting sustainability. It is imperative that engineering education in addition to imparting technical knowledge and skills, must educate engineers on their ethical responsibilities and to act responsibly. Engineers' ethical code of conduct should make engineers responsible to avoid harm to society, animals and environment and also ensure sustainable development. Many professional societies have formulated engineers' ethical code of conduct. However these do not form part of engineering curricula. Engineering education mostly concern with imparting scientific and technical knowledge and skills and do not train engineers to resolve moral dilemmas, pressures from vested interests, and conflicts of interests and act responsibly.

General Morality and Engineers' Professional ethics

Human civilizations have evolved in different parts of the world at different times, and these set their standards of morality. Communities depending on their circumstances modified and adapted their own particular set of rules of conduct. Religions had a profound influence on setting standards of general morality. Village and tribal chiefs, kings, emperors and various socio-political organizations influenced general morality from time to time. In the modern era, communism, capitalism and liberalism have also made their impacts, so general morality is not standard and universal. General morality appears to be diverse from community to community and place to place, although there is a great convergence with respect to the fundamentals. All religions advise human beings to be good natured and pure in thought and action and be 'GOD like'. The fundamental moral codes of conduct are really secular and are of virtuous commonsense values. Good personal ethics are

* *The author is Former Chairman of Hindustan Aeronautics Ltd., a Padmasree Awardee and Prime Minister's Trophy for sustained excellent performance, best Chief Executive and Life Time Achievement awardee in engineering from INAE, Chairman of a number of public and private sector industries, Research and Academic Governing Councils. He has authored 160 research and management papers and 17 books. e-mail: cgkn@siati.org*

developed on the basis of these secular codes. Professional ethics are moral code of conduct as applicable to persons belonging to a particular profession, for example engineering.

Most of the Engineers' professional associations across the world, who have published engineers' code of ethics, emphasize engineers' paramount responsibility as protecting the human beings and human society from harmful effects of technology and to do so while fulfilling their professional obligation for adding value to society and enable the advancement of civilization. Some do not put similar emphasize on protection of animals and environment. There is a need to evolve a globally accepted code of ethics with respect to engineering responsibility for protecting the society and environment including animals.

Engineers must be responsible environmentalists. The engineer's work (application of technology) is essential for progress and growth of our civilization, bringing comfort and prosperity. But it can also lead to environmental problems. For example design and execution of a hydro-electric project, may destroy forests. An irrigation project may destroy forests, land and adversely affect the eco-system. Design and execution of a fertilizer plant, is very much needed for improving agricultural yield and eradication of poverty, may cause pollution to the neighboring environment. Mining of coal, minerals and metals, very much needed for industrial growth, will also disturb the local eco-system and destroy forests. Automobile exhausts continuously poison the air. Yet can we live without automobiles, without electricity, without coal, minerals, metals, chemical & fertilizers, dams and irrigation? While technology is needed for progress, and in the process it causes environmental issues, technology can also be used to reduce/eliminate the environmental problems. For example the poisonous gaseous emissions from the automobile engine exhaust can be controlled by design improvements of the engine and change of fuel. The pollutants from industries can be neutralized by chemical treatments & disposed. The lost forests can be regenerated. Engineers, while implementing technology for progress, must endeavour to design and execute projects, processes & products in such a way to eliminate or reduce the threats to environmental integrity. Engineers as private citizens have the responsibility like other citizens to protect the environment from degradation. In addition as agents of application of technology they have professional responsibility for protecting environment from degradation & destruction. Engineers are expected to uphold steadfastedly the safety of environment and the principle of sustainable development. While performing their professional duties engineers are also required to inform their superiors, employers, and clients of possible harmful consequences to safety, health, and environment as and when their professional judgment and actions are overruled by vested interests.

Engineer's Professional Career and growing Ethical Responsibilities

Most engineers after their academic course and training start their job in the first level of managerial hierarchy, working as supervisors, process planners, junior engineers, inspection engineers, designers, maintenance, and service engineers. As they advance in career, they

take up positions of greater responsibility and authority, as middle level managers, senior managers, General Managers, Directors on the Board, and CEOs. Some engineers pursue a formal management education and graduate as MBA, and start their career as managers and advance in career in the managerial hierarchy. Some pursue research and development, or teaching and advance as scientists/academicians and become professors, engineer - scientists, directors of research labs etc. Some enter State/ Central Government Administrative Services. Some may become entrepreneurs and start their own engineering firms, consulting firms and industries and become employers of other engineers. As the power and authority grow, the negative impact of wrong decisions/actions and devastation to the society and environment will grow in greater intensity and the size of the affected people and environment will also be enormously larger.

Engineers as Managers

The term manager is used in broad sense to include supervisors and managers of employees, works and projects etc., and also management at the higher level such as General Management, Board level Executives, CEO's etc. Managers are often concerned with speedy task completion, reducing expenditure and maximizing the profit. There will be temptations for cutting corners with respect to production processes, testing and quality control, pollution control, etc. and compromise on safety at work place. They may direct engineer employees to comply with these demands in the name of loyalty to the organization. This is unfair to the employees and is unethical. Engineer managers are responsible for ethical conduct of their subordinates and should act as responsible leaders. They should never persuade their subordinates to do what is ethically wrong. They should not hide mistakes/lapses on ethical conduct either committed by them or by their subordinates. However, the emphasis should not be on fixing the people who made the mistake but on correcting the systems to avoid hazards to society and environment. Ask why it went wrong and how it went wrong and correct the same instead of looking for people to punish. Manager-Engineers are responsible for the safety of the people working with them and they should periodically review the work environment and recommend to higher management for continuously improving safety in the work place and also safety for the environment.

Engineer managers at the corporate level as Directors and CEO's must ensure good Corporate Governance fulfilling their responsibility to the society in addition to other stake holders such as the shareholders, customers and employees. In this context they must also institute an appropriate policy for protecting 'Whistle Blowers'.

Engineers as Administrators

Administrators have an ethical responsibility to formulate and implement appropriate policies for ethical conduct of engineers. They must endeavor to ensure good ethical, individual, and corporate conduct and protect society and environment from hazards. They should develop and implement State laws against corruption/ bribery, extortion and ensure pollution control. Administrator-engineers who take up administration as a career may also encourage professional societies of engineers to

develop a code of conduct and adopt the same at the State level. They should consider their position of power and authority as a position of responsibility and service.

Engineers as Entrepreneurs/Employers

An engineer as an employer and entrepreneur will be responsible for several employees. In this role as the entrepreneur / employer, the engineer will have considerable power, over people. This power should be used to encourage ethical conduct of employees. They should not exploit the loyalty of employee engineers to persuade them to act in favor of gains for the employer with adverse effect on the society and environment.

Risks, Safety and Liability

Engineers have a paramount responsibility to protect life and environment from hazards. Risks of hazard and safety in the work place are well recognized and there are statutory provisions in many countries to be complied with to minimize risk and maximize safety. Engineers, managers and owners of business are liable for legal action for violations. Engineers must prepare for dealing effectively and responsibly with issues of risks, safety and liability.

Client Professional Agreements

Engineers on their own or employee engineers on behalf of their employer provide design, consultancy, audit and such other professional services. In such cases the sensitive/confidential information provided by the client and information generated by the consultant during the specific work are protected through confidentiality agreements. The engineer's code of ethics requires strict compliance to such agreement.

Non-Disclosure Agreement (NDA) / Know-How Transfer, etc.

When engineering firms negotiate to collaborate, or purchase know-how of a product information is exchanged on the basis of NDAs. Both parties, and engineers involved are bound to maintain confidentiality of such information exchanged. Know how purchased from the licensor should be used only for the license, and it should not be transferred to others unless rights for transfer to third parties are specifically mentioned in the know-how transfer agreements. Engineers involved in the know-how utilization should adhere to the terms and conditions of such agreements, and act as per the intellectual property rights.

Intellectual Property Rights

Intellectual properties are generated through research, design and development. It may be a product or technology and is protected in many ways such as trade secrets and patents. Most companies make their engineers/scientists to sign agreements by which all such trade secrets and patents, are the properties of the employer, even though these are developed by the employee engineers/scientists. Even in the case of organization which shares the IP rights with the employee inventors/designers the right to sell/transfer etc vests with the organization, the employee sharing only the sale value and royalties. As per such agreements and also as per code of ethics, engineers are to act with integrity and loyalty to the employer

organization in IPR matters. Also employee engineers will also have access to such vital data and information if they are involved in the application of such inventions / designs / technologies. Engineers should not reveal such data to others, except with the permission of the IPR holding organization.

International Context (Cultural, Traditional and Social practices)

Different countries and communities may have different values and practices with respect to common morality. This may lead to conflicts in adhering to engineer's professional code of conduct. Some countries pay less to female employees compared to male employees, some discriminate women from men for employment and for holding superior positions. In some countries business relations are built upon and nurtured through personal relations involving social visits, get-togethers, and exchange of gifts. Corruption is prevalent in some countries. Some practice questionable compromises on the basis of economic conditions and cultural traditions and prevailing levels of corruption which need to be satisfied to get things done. This is absurd and must be resisted.

However, the engineers' code of ethics in many countries generally prohibit giving and accepting high value gifts with respect to one's vendors and customers and consider it a form of bribe. The engineer's code of ethics does not permit working under intoxication, and consuming alcohol at work place.

There can be exceptions to the rule, but those exceptions must be morally justifiable. More and more engineers are working in countries other than their home countries. They are engaged in design, manufacturing, construction, marketing and in other services and management. There is an increasing need for evolving a common code of ethics for engineers which is accepted worldwide as standards of quality such as ISO 9000.

Economic Conditions

Sometime lower economic development of a country is used to justify applications of lower standards for safety, health and environment compared to economically advanced countries. This prescription is used by some unscrupulous entrepreneurs / managers and engineers from the advanced countries, to reduce their expenditure and enhance profits and it is clearly unethical. A responsible engineer from an industrially and economically developed country while engaged in a project in a less developed country must aim for the same high standards for safety and environment as in his own country. But if it is an informed consent by the Government and people of the developing country, restrained temporarily due to economic constraints, some flexibility in standards could be accepted. For example automobiles produced/used in many Indian cities now comply to emission standards which are lower than specified in many other countries. But there is a plan to come to world standards of Euro 3 and Euro 4 eventually. While automobile manufacturers from other countries, who are setting up manufacturing facilities in India, may use this lower standard it is nobler for these companies to straight away adopt the higher standards just as they comply with, in their home countries. Similar relaxations may be made with respect to an irrigation project or a hydroelectric project, a fertilizer plant etc., on a cost - benefit/utilitarian

approach. But it must be a conscious decision of the Government and people of the concerned country, with a plan for revising the standard at a future date.

Engineer's Rights

Engineer's professional responsibility to adhere to professional ethics must be supported by legal and moral rights. Responsibility without authority and legal rights and recognition by all concerned will be difficult to implement. All concerned include the government, society, employers, colleagues and engineers professional associations. Engineer's must be provided not only legal protection, but also financial and social protection against vengeful action by vested interests. Engineers' rights with respect to professional responsibility include:

- Right of refusal to involve directly or indirectly in activity in violation of professional ethics
- Right of professional judgment and advice/ inform all concerned.
- Right of speaking, writing and acting in public interest, in accordance with engineers professional ethics.
- Right to protect client and employer confidentiality obligations, without sacrificing public interest.
- Right to professional recognition and to engage in activities of engineers professional associations
- Right to protect environment and public from harmful effects of technology in general and more specifically from own, employers and client's work.
- Right for legal, financial, and professional protection from threats, coercion, attacks, retribution, loss of job and such other activities by clients, employers and their agents.
- Right for claiming support in respect of the above from public, the state and engineers professional associations.

Roles of Professional Associations

Professional Associations may institute awards for engineers and employers for exemplary ethical conduct. Professional Societies should provide moral, physical and financial support to engineers who are unfairly treated by their unscrupulous managers/employers for adhering to high ethical standards. Professional societies can play a major role in educating the public on the risks and benefits of new technologies and on safe practices, and sustainable development, etc. Professional societies must also interact with similar societies of other countries and endeavour to develop common code of ethics applicable internationally. More and more engineers work in countries other than their home country and face new working environment with different cultural, religious values, customs, traditions and practices, influencing the local moral standards. Professional Societies across the world should endeavour to develop an internationally accepted code of ethics for engineers.

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#10, Sirur Park 'B' Street
Seshadripuram,
Bangalore - 560 020
E-mail: navbarat@gmail.com