

PUBLIC POLICY ENGINEERING - OPERATIONS RESEARCH IN DECISION MAKING

[Dr. Achilles C. Kanellopoulos](#)

Dean and Director of Studies
Southeastern College
Athens, Greece

The history of Mankind is associated with the applications of human knowledge. Knowledge itself, in the form of science, might be practically useless without the engineering skills.

From the very first technological developments such as the wheel or fire, the engineer has offered a certain contribution to society. At the same time, he has also been criticised for the negative effects on the technological applications. From the Bronze Age to the age of nuclear weapons, engineers have dealt with applications raising the quality of standards of human life but at the same time creating serious problems for society.

A systematic study of the role of technology in society is the aim of the subject called "Technology and Society" which is taught as a course either during the first or last year of the engineering degree studies in the US system of university education.

The history of technology, the descriptions of the various engineering specialisations, the role of research and development in engineering, the code of ethics are some of the topics examined in the subject "Technology and Society".

The theory of problem solving in engineering can be divided into the problem definition, the simplification of the problem to a model problem, the mathematically expressed problem. The examination of the validity of the solution of the model problem in the real problem represent the last step of the theory of problem solving in engineering.

Decision Making and Operation Research are essential for the study of a series of problems in modern society.

Everyday decision of people, such as buying or selling, voting for a political leader, going for holidays, or reading and communicating, can be studied using the theory of problem solving.

Since a series of decisions consists of a policy, the systematic study of the decisions of the public represents an area in engineering which is called Public Policy Engineering (PPE). Another term used for the same subject is Human Factors Engineering.

From the first energy crisis of the early seventies, people dealing with PPE were worried about the future of Mankind. The so-called "Club of Rome", the "Report Global 2000", and other similar efforts represent the work of people concerned about getting answers to the following:

How many years can the fossil fuels last on Planet Earth? How many years can coal be used as an energy source? Which kinds of alternative energies can offer solutions to future problems? What is the potential of nuclear energy in the future? How can we control a nuclear plant? How can we face the dilemma between waste disposal management and a plutonium nuclear plant which can be used for military applications? Or other problems such as: How much copper has remained on Planet Earth? Which kind of chemical elements are gradually vanishing? How much paper or wood will be needed after 50 or 100 years?

And also to some more critical problems: How does population increase on our planet? How can we find, produce or substitute food for the billions of people in the future? Can new cultivation or manufacturing methods offer a solution to the future starvation problem? How can medical developments which have led to the increase of the average length of human life implicate the overpopulation problem?

Or other social issues: How can communications and information technologies affect the characteristics of each ethnic group? How can we solve the social problem of unemployment created by automation? How might computers create problems with privacy as far as information processing is concerned?

For a better understanding of the role of Public Policy Engineering, four analytical method case studies are presented:

Case A: Egypt (A case studied in the last two years at Southeastern College.)

Egypt used to be a farming country - a major starch exporter. Now Egypt faces an overpopulation problem and imports food. By studying this overpopulation problem it was revealed that farming methods in Egypt required a lot of labour. Large families offered a solution for better farming but only on short-term basis. On long-term basis, for a typical Egyptian family, this land is not

enough; urban immigration can of course solve the problem, particularly in an agricultural country.

The role of the village religious leader can be considered as dominant for the solution of this problem as well as for issues such as birth control.

Case B: Zoning of Nuclear Energy Plants

We see how nations can suffer from the operation of nuclear plants without having the benefits of cheap energy. International co-operation can allow a zoning of nuclear energy plants, and a common policy in zoning of nuclear reactors might solve the energy problem.

Case C: Acid Rain

Pollution of the environment requires a certain common policy. Acid rain created by the industrialised countries of Western Europe affect the archaeological monuments in south-eastern Europe.

Which policy can allow Mankind to maintain those monuments as a heritage for the generations to come?

Case D: Artificial Intelligence and Thinking Machines

How can logical loops be used by the new generations of computers?

How can authoring programs in education promote teaching or substitute a teacher? Is it possible to replace teachers with machines?

How can automation, Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) offer better quality and lower cost in every day products?

How can intelligence be used in preventive, diagnostic or therapeutic medicine? How are Scanning Electron Microscopy units or laser cutters helping medical professionals?

CONCLUSION

All four case studies create question marks. How can Public Policy Engineering contribute solutions to future problems? If we want to be optimistic, we might say that another Golden Age might come for Mankind. Since, in Classical Athens slaves afforded time and money for the Athenians to talk, discuss, philosophise and reach the levels of Socrates, Euripies, etc., modern machines which act as our slaves might allow future people to reach higher standards of living.

Professor **Achilles C. Kanellopoulos**, Dean of Southeastern College, Athens, obtained his Diploma in Mining and Metallurgical Engineering from the Technical University of Athens and his Ph.D. from the University of Capetown. He has acted as Managing Director of Middle East Development Consultants and Technical Advisor in the Ministry of Public Works. He has published articles on mining, especially of quartzite.