



TOPIC 11
PROFESSIONAL PRACTICE,
EDUCATION AND ETHICS

UNIVERSITY INDUSTRY INTERACTION—AN EFFECTIVE TOOL IN TOTAL TECHNOLOGY RESEARCH FOR TRANSPORTATION (TTRT) IN CENTRAL ASIA

MOHAMMAD KERMANSHAH

Civil Engineering Department,
Sharif University of Technology
Tehran, IRAN

SATYA P. BINDRA

Civil Engineering Department,
Sharif University of Technology
Tehran, IRAN

Abstract

The paper outlines problems in transportation planning and engineering education and its possible causes. It presents an appraisal of the Central Asian regional transport system and its operation with a view to make more efficient use of the existing transport capacities. It highlights details of the TTRT approach of training in a transport industrial environment parallel to a balanced program of lectures and seminars pursued along with research of real life problems.

INTRODUCTION

Iran and its neighboring Central Asia region have witnessed dramatic changes especially due to collapse of former Soviet Union and with the emergence of Commonwealth of Independent States (CIS). Geographically Iran is located at the international cross-roads of the east-west and north-south transport corridors. These corridors are important and need to be improved internally towards a vital market through privatization and deregulation and also need to be reconstructed towards international integration through legal, institutional and technical adjustments.

Economic Cooperation Organization (ECO), a sub regional grouping comprising Iran, Pakistan, Turkey, Afghanistan and Central Asian countries of Azarbaijan, Uzbekistan, Kirgizstan, Khazakhstan, Turkmanistan and Tajikistan covers an area of over 7 million sq. km and accounts for a total population exceeding 300 million. Iran's broad based partnership policy to strive for and contribute to the cause of cooperation especially in the field of transportation has resulted in a number of projects related to:

- enhancement and extension of the domestic rail-road system to provide transit service between Iran and the Oman sea
- connection of Iran's rail and rail road networks to neighboring Pakistan and Turkey
- provision to provide piped gas to regional countries
- joint water resources development
- action in the six key sectors of trade related services: transport, trade information, telecommunication, business practices, customs and financial services

The major contributions of the above projects would be to enhance mobility vital for socio-economic development of region. Oflate, ECO meeting declared the period between 1994-2005 as the decade of transport and communication and decided to revitalize the ancient Silk Road. Implementation of these programs requires responses at individual, community, national, regional and global levels. It is, therefore, imperative that a cost-effective and people oriented education and training system be formulated.

AN APPRAISAL OF EXISTING SITUATION IN IRAN AND THE REGION

Mobility in Iran, ECO and CIS region is achieved through transportation of men and materials. The transportation technology is rapidly changing in these countries and the region. The impact of high technology in general has resulted in concentration of the available capacity resources and energy in large industrial establishments located in the urban areas. This has resulted in large scale neglect of the rural sector and thus of rural economy resulting in the exodus of population to cities.

Projections of the ECO of CIS region reveal that rural-urban migration mostly to the capital and metropolitan areas and also from town to city has seriously and adversely affected the cities. This migration has added to the problems of big cities resulting in over crowding, shortage of residential accommodations, congestions, delays, accidents, lack of sanitation and given rise to shanty towns, sarifas and squatter settlements within or on the periphery of the cities. Thus the labor surplus and capital scarce environment of the ECO countries, with a predominantly rural based economy has become a chronic problem for economists, technocrats and politicians. Dispersal of population and economic activity can be increased either by dispersal from the central to the outlying areas on the periphery or by the dispersal from city to the region. The first objective can be achieved by relocation of activity and development of the district centers within the cities. However, to achieve the second objective a lasting solution is to develop rural areas and to create new centers of industrial activity away from the existing cities.

Of all the major known challenges posed by the trends in urbanization of population, none is perhaps of greater concern to an average city dweller than the inadequacy of transport system. The

level of urbanization, in most Central Asian countries presently is of the order of 30 percent as compared to about 80 percent in U.K., 70 percent in U.S. and 85 percent Australia. It is likely to further increase if the past trends are any indications. There is a natural tendency for an average individual to feel attracted towards the urban centers as they provide social and economic infrastructure for the trade, commerce and industries together with better social amenities like education, living conditions, entertainment, medical care etc., besides providing avenues of employment.

The increase in urban population brings in an increase in the heterogeneous traffic which results in further congestion in the existing inadequate city streets. Provision of additional facilities in urban travel such as express ways or tube railways, besides being exorbitant in cost, are counter productive. They act like magnets and draw more people to the cities thereby soon absorbing additional capacity so created without affording the desired permanent relief from traffic congestion. The solution could be in decentralizing the population, channelizing the urban population into towns of small and medium sizes so as to achieve reduction in the overall transportation demand, reduced urban vehicular travel and improvement in the environment.

PROBLEMS OF TRANSPORTATION ENGINEERING EDUCATION

Mobility is backbone of development. It is linked with transportation. All major transportation related problems are essentially unsolved development problems. Transportation facilities provision, extension and improvement are thus primarily an aspect of development. By approaching transport as isolated element, links between transportation related mobility and poverty; and environment and development have often been overlooked.

There is no ready made solution to transportation problems. Many developed countries had also suffered from severe mobility problems in past. But through an integrated approach to transportation development, these countries have been able to reduce the impact of immobility to a great extent. It took several decades for these countries to collect data and information, analyze, investigate, study and undertake research before evolving a series of actions for training and education most suitable to their countries. These developed countries are still continuously strengthening their transportation related techniques, tools, technologies and management capabilities. Central Asian countries have following major common concerns in transport technological areas:

- The optimal use of limited resources
- The effective transfer of appropriate technology
- The adaptation of relevant standards to local conditions
- The creation and retention of local skills

In all, these areas of transportation planning and engineering education has been always faced with problems in regard to quantity and quality. The supply of the planners and engineers and the demand for them varies with economic conditions, national priorities and international relations, resulting in an ever changing quantitative demand. The transportation engineering education authorities and the user agencies must address themselves the following questions:

1. Is the basic scientific content inadequate?
2. Is the planning and engineering content too theoretical in approach?
3. Does the instruction methodology used impede initiative and creativity; and
4. Are the graduates adequately equipped for the tasks required of them as professional engineers?

In brief, the problem of transportation engineering education is a problem of complexity, globality, universality, deep seatedness and gravity. In order to provide an optimal solution to this situation, it is essential to carry out scientific studies of transportation problems on a continuous basis, reviewing the situation from time to time. This is only possible with the assistance of a band of trained transportation professionals who should be identified in their qualities of leadership, sound judgment, easy communication and excellence in organization abilities. The level and

nature of transportation planning and engineering education must fit in the framework of social requirements and the level of prosperity attained and must be projected for the future to take into account expected advancements in science and technology.

The benefits of cooperations and coordination in transport research, information and training lies in the optimal use of resources to develop answers to local problems and bring into focus and highlight the local expertise and skills. In the past few decades, the trend has been for technical and professional knowledge to be transferred from Europe and North America to Africa and Asia.

Broadly speaking, technical cooperation is concerned with specific projects, the wider aspects of the transfer of practical technology, the schemes primarily related to professional education, and the imparting of technical skills. However, it is being increasingly recognized that technologies and regulations and designs developed for the fairly stable conditions of developed society, are inappropriate for the very different and rapidly changing needs of the developing countries. However, access to information regarding local conditions, practices, procedures and problems of Central Asia is necessary so that existing knowledge may be applied to their current and future problems.

Knowledge transfer essentially involves one society sharing its mobility improvement knowledge and technology with another, with the goal of mutually enhancing the capability of transport system management. However, international knowledge transfer is a difficult and complex process since it involves societies with:

- different needs
- different experiences
- different cultures
- different level of educational, social and economic development, and
- different geographical locations.

Though benefits appear real and lasting, are rather difficult to quantify as experienced through the creation and continuation of International Institutions such as World Conference on Transportation Research (WCTR), the Permanent International Association of Road Congress (PIARC), the International Road Federation (IRF) and the Organization for Economic Cooperation and Development (OECD) International Road Research Documentation (IRRD) which are notable examples of International cooperation and coordination in transport research information and training.

In view of the above it is important that technology transfer efforts be collaborative in nature. Both transmitting and receiving groups must work cooperatively in order to facilitate dissemination and transfer of knowledge.

Cooperating agencies in the transfer process must consider:

- what subject matter needs to be transferred
- who are the target groups, and
- how the knowledge transfer can be implemented

THE TRANSPORTATION SCENARIO IN CENTRAL ASIAN COUNTRIES

Population increases throughout these countries average 2.7 percent per annum compared with the world average at 1.7 percent. In the light of such tremendous increase it is important to consider its impact on transportation needs of the future. The major objective of transport policy for planned economic development of the Central Asian countries, is often thought in terms of achieving balanced growth of all the regions, dispersal of industries, and the extension of benefits of progress of the backward regions. However, the actual results of economic development in most of these countries have fallen short of both the planners objective and the people's aspirations.

The conventional transport policy in Central Asian countries has focused almost entirely on meeting the development needs of the economy, to the relative neglect of the basic social component of transport demand. This has led in recent years to the decline of small and medium towns on the one hand, and great increase in the size of the larger towns on the other. With 1970-71 as the base year, the level of urbanization in most Central Asian countries was about 20 percent against 70 percent or more in the industrially advanced countries with Japan having 72 percent, U.K 78 percent, U.S. over 73 percent, and Australia over 85 percent.

Urban population in the Central Asian countries is, therefore bound to grow. According to an estimate by the year 2000 the urban population in ECO and CIS region would increase by 300 percent, compared with 66 percent in developed countries. Table 1 shows the trends in growth of urban and rural populations in developing countries. This is more than 4 times the populations increase of the previous 40 years.

Table 1 Trends in the growth of urban and rural population of the developing countries (millions)

	1920	1940	1960	1980	2000
Urban population (above 20,000)	69	128	310	(693)	1436
Percentage of total population	(6%)	(9%)	(15%)	(22%)	(31%)
Rural and small town population	1118	1346	1705	2431	3235
Percentage of total population	(94%)	(91%)	(85%)	(78%)	(69%)

STRATEGY FOR FUTURE TRANSPORT DEVELOPMENT AND SUGGESTED APPROACHES TO KNOWLEDGE TRANSFER

Transport by road is the dominant means of transportation, both in developed and developing countries. The investment in the development of rural, inter-urban and urban roads in developing countries form a large part of national development programs. Annual expenditure on highway construction and maintenance programs in the developing countries of Africa, Asia and Latin America is more than U.S.\$ M 10,000, while in Europe it is \$M 23,000 and in North America \$M 32,000. In some cases this investment exceeds, 30 percent of development budget. The outlay on new construction is generally much larger than on maintenance in developing countries, particularly in Central Asian and Africa, while in the majority of developed countries with a large existing network, the expenditure on maintenance and rehabilitation of roads is now overtaking that on new construction.

There are nearly 20 million kilometers of roads on the surface of the earth, of these 1.1 million kilometers are in Africa, 3.0 million in Asia, 4.0 million in Europe, 2.0 million in Latin America and 1.0 million in Oceanic. On the basis of roads per sq.km of area, Africa has a figure of 36 meters of motorable roads, Asia 66 m, Latin America 106 m and North America and Europe each about 400m motorable road per sq.km. The woefully inadequate system of roads in the developing countries compared to the developed countries is quite glaring when one compares the situation that the former with 74% of the world population have only 38% of the world's roads and 20% of the motor vehicle population as against the developed countries with only 26% of the world population have 62% of the world's roads and 80% of the motor vehicle population of the world.

In view of the above, there is need to review the existing transport system and to devise a strategy for its future development, keeping in view the environmental problem and the probable rise in population. It is necessary for transportation planners and engineers in Central Asian countries to adopt a system approach embracing the land, air, and water transport with regard to the planning,

design, construction and maintenance of the system and the interaction between and linkages within the system.

The transport planner and engineer committed to the development and management of this system in such a way that the service rendered to the community is as cost effective possible, during the life span of the system.

Because of the large investment of funds involved in this work the future transport engineers as agents of this gigantic and challenging work must be properly educated and trained. This approach has a tremendous potential for effecting savings in cost. The decisions about investment must be made on the basis of a sound appreciation of the interrelationship between the environment, construction standards, geometric standards and the operating costs of the transport carriers using the transportation network.

The main transport problems to be analyzed are: linkage between rural and urban transport; choice of transport, mode and intermodal transport coordination; identification of realistic objectives, and the evolution of standard and performance criteria for existing and future transport systems; adapting of research findings to the local conditions; urban mass transportation; urban traffic delays; rural transport systems; accidents and safety; integrated land use/transport planning; energy conservation and protection of the environment and preparation of long term transport plans.

Suggested approaches for knowledge transfer

In view of the above, it is evident that keeping in view of the complexity of the problem, there is no single correct approach to knowledge and technology exchange between developed and developing countries. For example, a specialist target group that needs in depth technical knowledge requires one type of approach; while the decision makers and administrator responsible for policy formulation may benefit from a different type of approach. Therefore it is necessary to consider major broad approaches like:

- Long term formal education program
- Short term training workshops and non-formal education programs
- Knowledge transfer through symposia, seminars, conferences, expert group meetings, etc
- Dissemination and flow of information
- Cooperative supporting research

CAUSES OF PROBLEMS IN TRANSPORTATION PLANNING AND ENGINEERING EDUCATION

Transportation planners and engineers have a vital role to play in stimulating action for development at the local level. There is evidence that trends towards economic instability and greater disparity in opportunities in countries will continue unless radical action is taken. Some of the main reasons for this are summarized as follows:

1. Lack of integrated approach to the national transport plan;
2. Over-centralized transport planning;
3. Non-participation of local people in the formulation of broad policies which effect their area;
4. Failure to detect and harness locally available human resources and abilities.
5. Shortage of experienced management staff to meet the demand of transport network administration.
6. Lack of coordinated planning and engineering management training programs and facilities.
7. Ineffective methods of personal selection and inadequate progressive 'on and off' job training at all levels, improper work methods and equipments operation.

8. Inadequate knowledge, investigation and specification of local conditions helped by inaction, lack of commitment etc.
9. Non-standardization of testing techniques and laboratories.
10. Lack of proper quality control at all stages of transport network construction.
11. Incorrect selection, weak management, inadequate maintenance, under-utilization and improper use of equipment.
12. Inadequate information sources and dissemination.
13. Lack of forward planning and insufficient provision of funds to meet growing road traffic demands.
14. Inadequate and ineffective financial methods and management of available financial resources.
15. Lack of efficient means of cooperation and coordination of resources of local knowledge, experience, manpower, materials etc. to the mutual benefit of Central Asian countries in the region.
16. In countries having abundant manpower, the lack of judicious balance between labor intensive combination techniques and mechanization in order to achieve the social objective and policies of the Central Asian countries.
17. The alarming cultural disorientation, social disorganization, class conflict, corrupt bureaucracy and individual apathy.

PROPOSAL FOR TOTAL TECHNOLOGY RESEARCH IN TRANSPORTATION (TTRT) FOR FUTURE

The development of transportation engineering education which is the key to economic and social development as well as peace and stability in the region demands the following:

1. The disciplines within an academic department concerned with transportation planning and engineering should embrace all the major engineering and planning aspects involved, or where several academic departments are concerned, the efforts devoted to transport studies should be properly integrated.
2. Wherever possible practical experiences should be used as the basis of research in well defined problem areas by active involvement of transport engineering industry resources, consulting engineers, public transport operators, government ministries, the physical distribution industry and commercial companies.
3. In addition to any course organized 'centrally' for the purpose of assembling in one place persons possessing the necessary skills and experience together with the ability to impart this knowledge to senior transport engineers / planners of the Central Asian countries, there is greater merit in training these engineers and / or otherwise within their own locality. This can be achieved by active cooperation between a main body situated in one university, with several other institutions of high academic reputation offering satellite courses within the locality where the individuals are located.
4. Full participation and involvement of the local inhabitants should be encouraged, although the general and detailed form of this involvement needs to be carefully worked out.
5. Evaluation of the effectiveness of the programs in achieving the objective should be taken up.
6. Education must be ethical (respecting moral values), contextual (relevant to society needs and structure), cooperative (integrated with the work place and other educational institutions), seamless (relating to other educational levels), empowering (encouraging creativity and entrepreneurial commitment), and professional (with commitment to rigor and discipline in skill mastery).

ROLE OF TTRT

Total Technology concept developed aims at motivating and educating talented high calibre students in close interaction with transport engineering industry. It prepares them to take up careers requiring broad based transport planning and engineering skills. The training program avoids too intensive training to restrict them to be narrow specialists. Instead the education and training program offer an opportunity to develop an awareness of a wide range of subjects relevant to their future working lives. Individually structured research projects help them to have a real chance of fulfillment in their careers. Steps are proposed to extend the present M.Sc. level program for up gradation to doctoral level. The objectives of Ph.D in total technology is to equip the student engineers with a firm foundation to become more effective practicing professional planners and engineers within the stipulated period of three years generally spent in entirely academic research.

The first year would be spent to train students in advanced courses through a balanced program of lectures and seminars covering the planning of transport systems, the flow and control of road traffic and the operation of multi modal public passenger transport, planning and legislation for movement of freight. During the next six months students are expected to prepare a detail brief for ensuring one and a half year program of research through a comprehensive review of literature in their chosen subjects in consultation with appropriate personnel in the relevant branch of the transport industry.

The one and a half to two years intensive period of research would be pursued in a transport industrial environment on a project selected and agreed by the university and industry in collaboration with the objectives set so that particular problem can be solved within a stipulated time. The jointly supervised project would be examined by the university in the usual way for doctoral degree.

Recently Iranian endeavor has initiated Transport Watch for sustainable development of Islamic World with the intention of extending awareness of the current use and potential of new technology in land, air and water transport and traffic application. Some of the Total Technology Transport Research projects being proposed are:

1. Cooperation for Integrated Traffic Management and Information Exchange System (CITIES)
2. Cooperative Management for Urban and Regional Transport (COMFORT)
3. Dedicated Road Infrastructure for Vehicle Safety in ECO Region (DRIVE)
4. Integrated Road Transport Environment (IRTE)
5. Parking Guidance and Information (PGI)
6. Public Transport Passenger Information Services (PTPIS)
7. Road Management System for ECO (ROMANSE)
8. Road Transport Informatics (RTI)
9. Traffic Information and Guidance for ECO Roads (TIGER)
10. Traffic Message Channel (TMC)
11. Traffic Sign Regulations and General Directions (TSRGD)
12. Traffic and Travel Information Center (TTIC)

Care is being exercised in planning the education of the future, by consultation of the requirements of client agencies like the transportation department. The generation of skills must be commensurate with both the social and economic requirements of the future. The needs of the transportation sector have hitherto not been well integrated in to engineering education programs mainly due to the lack of involvement of client agencies. Engineering education becomes fruitless if it is not properly matched with required skills, which in turn depend upon future needs and targets. There is, thus, a great need for interaction and cooperation between the client agencies and the educational institutions to ensure the proper education and training of engineers.

In order to evolve an efficient need oriented transportation planning and engineering education system, planners, technologies research and development organizations, transportation departments and educationists must reach an agreement on the following points:

1. The type of transportation system needed in the future.
2. The manpower requirements for the future.
3. Techniques for training the required manpower, and
4. The contents of proposed education and training programs.

The agencies such as transportation department and private agencies, should develop an appropriate technology to suit the needs of the transport sector of the Central Asia region. They should in turn convey their requirements to the educational institutions. Further, the client agencies should actively collaborate with engineering institutions at the research and development level, and jointly evaluate professional education at the implementation level. The type, level and requirements of new transport technology so evolved, should form the basis for refresher courses, workshops, seminars, specialist courses, sponsored courses etc., to act as continuing education for serving planners and engineers, besides providing the framework for training of new engineers. This can be achieved by suitable representation of client agencies on the academic bodies of institutions. In order to evaluate the so developed education system, a high level national transport planning cell may be set up to study the interaction between the educational institutions and the client agencies.

ROLE OF HIGH TECHNOLOGY TEACHING AIDS

Recent developments in technology hold good promise for their use in education. The present and growing availability of micro computers, computer graphics and terminals with a high degree of intelligence, videodiscs, fiber optics, lasers, communication satellites that operate with inexpensive receiving terminals and many devices that function with telephone lines, provides the basis for developing new approaches to learning and create new opportunities and applications that were not feasible either technically or economically even in the recent past. Thus the task now is to develop and apply the technology in ways that improve the transportation education and training in using wide area region distance education technologies and research tele conferences.

Central Asia region can reap the benefit of high technology by establishment of the trade point network where entrepreneurs can find under the same roof, or through electronic connection every trade related services they need; customs, foreign trade institutes, chambers of commerce, banks, insurance companies, transport forwarders, etc. The trade point would also serve as source of business information i.e market opportunities, potential trading and/or investment partners, trade data, commercial regulations, etc for the Central Asia region. It is hoped the trade point would serve as a gateway for central Asia to global networking and help to trade more efficiently.

CONCLUSION

The desperate and deteriorating transport environment in most Central Asian countries at the present time is a result of benign neglect, selfishness, mismanagement, lack of purpose and objectivity, and misguided priorities. In view of the increasing seriousness of situation urgent steps must be taken now to arrest this worsening situation and if possible, reverse it. The paper has briefly described the transportation scenario in Central Asian countries and put forward some ideas as to how education and training might develop as per TTRT concept in order to accommodate the apparent need for the transport professionals in particular to have a greater understanding of the social context of their work.

The experiences of transportation system management in different countries show the necessity to develop real programs for training and education based on the available resources of the country.

TOPIC 11**PROFESSIONAL PRACTICE, EDUCATION AND ETHICS**

There exists a wide spectrum of target groups who need to be trained and educated on transportation system development, expansion and management.

Suggestions for planning of future transport planning and engineering education and training to inculcate the desired sense of responsibility and accountability at the community level are given. The approach advocated is based on the concept of the need to integrate communication, humanities and social sciences into technical programs. It is hoped that suitable steps will be taken in the future concerning the appropriate use of resources through industry institute interaction (3I's) for the effective transfer of appropriate technology, the adaptation of relevant standards to local conditions and the creation and retention of local skills.

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