

College and University Transportation and Logistics Programs

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In the transportation field today, it is evident that a new profession is emerging that is multimodal in perspective, multidisciplinary in approach, and multisectoral in application. The new transportation professional uses concepts and techniques from engineering, urban and regional planning, management, law, political science, and a variety of other disciplines to solve transportation problems. These problems affect shippers, carriers, travelers, international organizations, and national, state, and local governments and involve all modes of travel.

University transportation programs are facing the challenge of this new profession. Their goals are to provide instruction in the analysis, planning, and operations of the transportation systems that are the working domain of today's transportation professionals. In order to meet these goals, multimodal concepts should be incorporated into the program, a multidisciplinary approach should be used, and an attempt should be made to fuse the public and private sectors of the industry.

This presentation is a synthesis of university transportation and logistics programs. In December 1996, a questionnaire was sent to several universities eliciting responses about their transportation programs with regard to intermodalism, interdisciplinary aspects, course content, faculty involvement, and programmatic inadequacies; 37 responses were received. In addition, 30 websites were searched for information. The synthesis results are based on the combined survey responses and website searches of 67 programs. There are some aspects of the questionnaire that were only available

from the survey responses and not from the website searches.

Intermodalism is an important concept in transportation education. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) emphasized the efficient design and operation of transportation systems; linkages among travel behavior, urban form, and environmental quality; and the promotion of intermodalism. The Research and Special Programs Administration (RSPA) of the U.S. Department of Transportation (DOT) recently completed a study to provide information to DOT on the intermodal freight industry. The study suggested interactive methods to enhance the interface between the ITS program and freight industry initiatives. RSPA summarized that the intermodal system is not a system, but a collection of modal systems that are linked. The study concluded that there are several areas that the federal government could foster to affect the future of freight transportation in this country. Colleges and universities with transportation programs could consider suggestions from these recommendations to further develop their academic programs. The RSPA recommendations support (a) efficiency and global competitiveness, (b) encouragement of regional and corridor development efforts, (c) understanding of the freight sector, (d) a shared vision of technology benefits, and (e) a commitment to open ITS architecture. These recommendations were made to support ITS investments and improvements.

Last year, a strategic planning subcommittee of the ITS America Intermodal Task Force drafted a strategic plan for ITS America's prospective role in intermodal

transportation. The agenda and actions suggested by the task force included a broad range of activities, such as identifying resources needed to implement an action plan, ensuring responsive ITS architecture for intermodal needs, improving outreach efforts with modal associations, stressing transportation efficiencies through the use of ITS technologies, and developing research, program, and policy recommendations.

In December 1994, TRB assisted in organizing a major national conference on intermodalism sponsored by five key DOT administrations and the Office of Intermodalism. The conference stressed innovative approaches to making intermodalism happen, including innovative financing, development of partnerships, better understanding of the benefits to society associated with intermodalism, and better appreciation of the role of technological advances in fostering greater productivity and improving system performance.

Because of the commitment and importance of DOT and ITS, the needs and roles of the federal government and ITS America should be considered in the development of education, curriculum, and research agendas for the advancement of intermodalism. This intermodal developmental work can consider the following elements for further definition: connections to provide the transfer of people, choices to provide modal options, and collaboration to provide organizational partnerships.

The introduction of intermodalism into transportation, as reflected in the ISTEA legislation, resulted in a broad range of reactions from the surveyed institutions. On a percentage basis, reactions of the institutions included the following:

<i>Reaction</i>	<i>Percentage</i>
No change in program	13
Minor changes in program	16
Course additions to program	43
Always incorporated intermodalism	28

Although most schools do not include the terms "multimodal" or "intermodal" in their course titles, there are strong indications that the concepts are included in a vast array of courses. For instance, the terms "systems," "policy," "management," and "logistics" in course titles suggest the intermodal nature of the transportation program at universities. The majority of universities with transportation programs offer modal (airport, freight, public transportation) and transportation systems courses. About one-fourth of the programs include public policy, management, and logistics courses. Most of the survey responses specified that intermodalism is stressed in their programs, either as a result of the ISTEA legislation or as a long-term policy of the school.

Some of the new courses that were added to the transportation programs include public transportation systems, multimodal freight system analysis, intelligent transportation systems, demand management, and intermodal systems and safety. Existing courses have also been modified to incorporate concepts, principles, and analytical techniques to ensure that intermodal policy issues are addressed.

Several universities suggest majors (or career goals) in transportation studies such as the following:

- Transportation Planning, Transportation Analysis, Transportation Design, Transportation Policy, Transportation Facilities, Transportation Economics, Transportation Logistics, Transportation Management, Transportation Engineering, Transportation Administration, Transportation Systems and Technologies, and Transportation Intermodal Systems
 - Traffic Engineering
 - Modal Transportation
 - Mass Transportation
 - Urban Transportation
 - Highway Engineering/Operations
 - Intelligent Vehicle and Highway Systems (IVHS)

In addition, there are core courses that students must take to complete their degree requirements. These courses cover the range of planning, policy, network analysis, statistics, traffic studies, transportation, demand management, public transportation, economics, and logistics. Many universities list core courses for the major areas of study. As an example, New Jersey Institute of Technology (NJIT) has aligned the following core courses with each of the major areas of study:

<i>Major</i>	<i>Core Courses</i>
Transportation Engineering	Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Traffic Studies and Capacity Public Transportation Operations/Technologies Traffic Control
Transportation Planning	Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Transportation Demand Management Mass Transportation Systems Multimodal Freight Transportation Systems Analysis

<i>Major</i>	<i>Core Courses</i>
Transportation Systems and Technologies	Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Traffic Studies and Capacity Multimodal Freight Transportation Systems Analysis Intelligent Transportation Systems

An expansion of both the major areas of study and associated core courses may be helpful for the students in planning their programs. The enhancement of existing courses with intermodal concepts will further strengthen the education of tomorrow's transportation professional.

The incorporation of intermodalism into university transportation programs is also reflected in research activities. Courses are linked with research activities. Real-world problems have been used as case studies in relevant courses to provide students with experience in working on practical transportation problems that expose them to the importance of intermodalism. More intermodal problems are being advanced as research projects than before. Methods and theories from other fields such as economics, engineering, marketing, finance, logistics, information systems, management, social science, and law have been extensively applied to transportation research. Coordination with other programs on research projects is becoming more widespread. The extent that intermodalism has been incorporated into programs varies with organizational features of the program. In most cases, programs are on a graduate level.

Although intermodalism is being added to and emphasized within the existing transportation and logistics programs, new programs have been started in this field. For example, an optional program, Global Trade, Transportation, and Logistics (GTTL), was established at the University of Washington. It is tied to the needs of government and industry for people trained in the methods of today's global commerce. It is overseen by a special interdisciplinary committee whose members are drawn from the university and the private and public sectors. In the program, particular attention is directed to activities involved in the flow of goods from point of origin to point of consumption across international boundaries. These activities involve maritime, aviation, and overland modes of transport and the intermodal connections between them, as well as logistics and management. Included in the studies are communications, technical, environmental, energy, regulatory, and other systems that facilitate international trade.

Several new organizations were established to facilitate education and research in the transportation field.

The National Center for Transportation and Industrial Productivity (NCTIP) at NJIT was established by ISTEA. The Center focuses on increasing productivity through transportation improvements ranging from improving private and public carrier fleet productivity through better scheduling of activities and equipment management to improving personal productivity by reducing congestion and improving safety on our nation's highway and transit systems.

Even though the institutional features of university transportation programs vary, there are some organizational similarities among them. Most transportation programs are interdisciplinary, with either participating faculty from other departments or course requirements from other departments. Most programs coordinate with other departments on courses. The disciplines and academic departments involved with the transportation programs include engineering (all schools), planning, economics, architecture, geography, operations research, business, social science, and physical science. Faculty from different interdisciplinary groups work together on teaching and research. The equivalent full-time dedicated faculty varies with the magnitude of the program, from no dedicated faculty to nine, and averages about three.

In most cases the transportation program is on a graduate level, either the master's or doctoral degree. Traditionally, transportation is a specialization of the civil engineering discipline. Even if it has become an interdisciplinary program, in many cases it offers degrees in other disciplines with an emphasis on transportation. Joint degrees are offered, such as an M.S. in industrial engineering with a major in transportation, an M.B.A. in transportation management, or a master of urban planning in transportation. NJIT and Rensselaer designate M.S. and Ph.D. degrees in transportation engineering.

Although there may be a "transportation center" at the university, 90 percent of the surveyed centers had their primary focus on the research program, not the administration of the education program. With the centers focused on research, administration of the degree programs was usually performed by a department. In most cases the Civil Engineering Department performed this function. Other departments included those in business, geography, planning, and graduate logistics management. The transportation program at NJIT is unique among those in the country. It is one of the 10 percent of the surveyed schools that has a transportation center acting as the administrative unit for research and conferring degrees for the university. From its inception, NJIT's transportation program was developed as an interdisciplinary program. Administratively, it was never housed in any academic department, but it was structured and administered by the Executive Committee for the Interdisciplinary Program in Transportation. Currently, the academic program is administered by the Institute for Transportation (IT), and it offers

designated M.S. and Ph.D. degrees in transportation. The admission of graduate students into the transportation program and certification of their meeting degree requirements are IT's responsibility. Although the Executive Director reports directly to a dean for the degree program, all of the faculty associated with the program have academic homes in various departments. To create a core transportation faculty, the provost created transportation slots in various departments. These faculty devote all of their time to the development of the transportation program.

Cooperation in the universities between the transportation program and other departments is generally the rule. However, there were several negative responses describing the limited cooperation that exists in some universities. These comments included "protectionism" within departments, often caused by budget cuts; university priorities; core requirement problems; lack of a reward system; questionable cooperation; limited departmental cooperation; and lack of state financial support, which discourages cooperation.

The involvement of several academic departments in the interdisciplinary program could foster bureaucratization. For example, in a particular university, any change in the transportation program has to be reviewed by each department's curriculum committee, each college's curriculum committee, the university's curriculum committee, the faculty senate, the graduate school, the university council, and then approved by the Board of Regents. It took 2 years to change the name from "Transportation Planning" to "Transportation." Efforts to resolve these issues include improved procedures and policies in the university to resolve department protectionism, core requirement problems, and the lack of a reward system. The administration's reevaluation of financial needs and budgetary allocations can resolve the lack of financial support and university priority issues.

Although interdisciplinary research and education is encouraged, in some universities the reward structure that acknowledges the contributions does not exist. Departmental incentives motivate faculty to focus on departmental activities. Usually, faculty associated with the interdisciplinary program have their home departments. Their service to the interdisciplinary transportation program is taken into account for promotion, tenure, and merit salary increases by their home departments.

Although the administrations of some universities strongly support interdisciplinary programs (with seed funds or building programs), about half of the interdisciplinary programs have very limited or no support. Many of the respondents stated that moral support and encouragement were all that the administration offered. To enhance the interdisciplinary program, financial and cooperative support from the administration must be

forthcoming. Most of the programs do not receive funding, which has caused problems for some programs in attracting faculty.

In general, university transportation programs are adjusting to meet the new requirements of the profession. Although progress has been made, problems still exist. The research suggests the following:

- Transportation programs are available as graduate programs in many schools. They are generally located within the Civil Engineering Department.
- Although "intermodal" is not a term used in course titles, many schools include the concept in their transportation program.
- DOT and ITS America are anxious to develop support for and incorporate the concepts of intermodal systems.
- Several universities have added or modified a variety of courses in response to the stressing of intermodalism in ISTE.
- Although interdepartmental cooperation in fostering the transportation program is widespread in universities, there are several programs in which the interaction between the departments is weak.
- Administrative support for interdisciplinary programs is sporadic.

The findings resulted in the following suggestions:

- Collaboration with the DOT and ITS America should be pursued to enhance the educational program.
- The curriculum section of the survey revealed several transportation majors. In addition, core subject matter associated with these majors was also incorporated. Guidance can be obtained in structuring a program by reviewing these items. Means to overcome the institutional barriers to interdepartmental cooperation and achieve administrative support for the programs should be pursued. Some of the suggestions offered include additional funding, cooperation and improved university procedures to achieve parochial departments, improved university policies and procedures to address core requirement issues, and institution of reward systems.

The following studies (cited in this presentation) are suggested reading for those interested:

1. *Intelligent Transportation Systems and Intermodal Freight Transportation*. Report FHWA-JPO-97-008. U.S. Department of Transportation, Dec. 1996.
2. *Strategic Plan*. ITS America, Intermodal Task Force, March 15, 1996.
3. *Conference Proceedings 11: National Conference on Intermodalism: Making the Case, Making It Happen*. TRB, National Research Council, Washington, D.C., 1996.