# Technology Transfer: The Key to Progress

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## Abstract

The transfer of technology has been a technique of human survival and prosperity since prehistoric times. Today, the world recognizes the importance of technology transfer ($T^2$). The United States pushes hard to transfer technology to end users. Technology transfer refers to all the activities leading to the adoption, adaptation, or demonstration of a new product or procedure by any group of users. Due to political considerations, it is sometimes difficult to transfer technology to some parts of the world where relations are not friendly with the United States. In general, the United States willingly shares certain technologies with other countries. Most often the problem is a lack of resources in other countries to understand a technology and implement it. In the U. S., the implementation aspects of research products are channeled through federal agencies to the state level and back. The process that aims at convincing the public to use the improved technology to save time and resources, challenges both state and federal levels.

In this paper, we focus on $T^2$ Centers relevant only to transportation technology transfer programs. In the United States, there are many active T* Centers using short courses, video-based technology, and advanced technical training with aims to transfer the most vital practical knowledge into actual practice. State governments also make special efforts to help put research into practice for their cities and counties. This process is channeled by encouraging counties and cities to: a) establish an advisory panel; b) develop a prospectus for goals and guidelines; c) engage county and city administrators to set up educational sessions on how to learn and implement the technology; d) develop an in-house implementation plan to include slide tapes, video tapes, technical advisories or sometimes engage a consultant to prepare an implementation plan for their local areas. The project staff also works with various $T^2$ centers to get help in their implementation plans as well as get help in distributing more research information.

## The Problem

The biggest challenge of an outreach program in $T^2$ is in achieving its end objectives to:

- coordinate;
- identify effectiveness of and problems in information transmission;
- reduce fragmentation;
- maximize effectiveness;
- increase state and private sector roles; and
- address major transportation problems.

A major problem in T², particularly among institutionalized groups, is in a lack of communication stemming from a lack of trust. 'Another fundamental problem is the desire of some (particularly university) researchers to conduct basic research while sponsors (transportation agencies) need applied research. Other problems include the end user not being identified properly; a lack of communication with the industry; a usable research product not being identified thus getting "lost" in marketing strategies geared towards all products. Key problems in T² implementation programs are the lack of implementation planning along with a lack of involvement with the private sector.

## Introduction

The term "technology transfer" refers to all the activities leading to the adoption, adaptation, or demonstration of a new product or procedure by any group of users. Technology transfer is a team effort involving three very important groups of people: researchers, innovators and transfer agents. Researchers are the people who develop and investigate new ideas, products and practices in hopes that the end result will be beneficial to the end users. The innovators are ultimately the end users who are willing to. give new innovations a try. These are the people who take a chance and give the researchers a place to develop their ideas on a full-scale basis. The transfer, or change agents, as they are sometimes called, are the people who try to sell the new ideas of the researchers to the end users (*1*). These agents are crucial in making technological advancements due to people's natural resistance to change. This hesitance is one of the biggest problems faced in technology transfer. But through clear communication this resistance can be overcome.

Research is the key to all improvements, yet without application it is virtually useless. This is where the technology transfer centers and transfer agents come into play. Many technology transfer centers have been set up by the FHWA (Federal Highway Administration) to speed up the improvements on national highway systems. These centers identify, plan, package and promote new ideas and applications (2).

"In the United States, the FHWA has created an organized, efficient program of technology transfer, which serves as a bridge between research and the practical application of new technology" (3, p. 11). As a result of this system, the United States has one of the most efficient road systems in the world. Through the implementation of new and innovative ideas, the FHWA has set the standards in highway construction. The FHWA puts out an annual report called the *Nationally Coordinated Program of Highway Research, Development, and Technology*. This report has all the on-going research and new advancements in road construction and management. For example, the article on Corrosion Protection Project is "providing research and development for cost effective procedures and systems to protect new concrete members and cable stays from adverse environmental effects, and to rehabilitate deteriorated bridge members subjected to adverse environments" (4, p. 73). This article gives its current achievements and work still underway, To engineers who are designing bridges, this new technology would be beneficial in designing a new bridge.

## Role of the Technology Transfer Centers

Technology transfer centers have been established in the fifty states and Puerto Rico. The FHWA has 55 T² centers and describes their operation to:

1) Develop comprehensive mailing lists of local officials;
2) Distribute a quarterly newsletter on new technology and training;
3) Provide information and materials to local agencies in response to inquiries;

4) Conduct training; and
5) Evaluate their programs. Centers direct their communications on technology and training to elected officials, county engineers, road superintendents, and road maintenance supervisors, technicians, and engineering staff.

A sampling of the comments received from the states showed that the T* center: a) provides information and training to local governments; b) enables local highway personnel to use the most recent techniques for design, construction, and maintenance; c) aids local engineering staffs which are very small and do not have time to hunt for information on new technology; d) eliminates some of the assistance previously provided by the state, and e) has the ability to disseminate information to a large number of potential users through a comprehensive mailing list it has developed (5).

A sampling of comments provided by users shows that the T* center: a) provides courses designed for local roads; b) provides training to local personnel on site; c) provides ready accessibility to technology transfer information; d) serves as a valuable resource center, and e) encourages sharing of information with and between rural counties and towns. All of the users polled felt that the establishment of $T^2$ centers has been a boon to the T* process (5).

## Role of Other Professional Agencies

In the U. S., there are many other organizations that play a significant role in the process of T*. They are: a) professional society groups, such as American Society of Civil Engineers (ASCE), the Institute of Transportation Engineers (ITE), and the National Association of County Engineers (NACE); b) trade associations such as the Asphalt Institute and Portland Cement Association (PCA); and c) other organizations such as AASHTO and APWA (5).

## Obstacles Cited by $T^2$ Centers

Obstacles to the $T^2$ process are: 1) lack of resources; 2) problems targeting the audience; 3) communications; and 4) difficulty in determining the needed translations (5)

Problems cited by users are: 1) lack of resources; 2) too much information to transmit; 3) lack of input into research and implementation needs by end users; 5) lack of state finding; 6) lack of regular follow-up by the $T^2$ agent; 7) lack of information updates on a regular basis; and 8) lack of evaluation methodology (5).

## Conclusions

A $T^2$ pipeline runs from the Federal level to the state department of transportation level and back. Secondary lines run to interested private industries and vendors. The end-user is the general public. Those within the $T^2$ process must become more aware that the true “end-user” is the general public.

The success of a T* plan depends on a sound implementation plan. It is important to include in every research proposal a plan and a process for the implementation of the research results.

Communication is the key between end users, the researchers, and $T^2$ agents. It is essential to involve the private sector and general public. In addition to newspaper articles and television advertisements, it is necessary to interact with local service organizations (e.g., Rotary Club, Lions Club, PTA, etc.) revealing the availability of technology sharing. Other activities that the $T^2$ agent can provide include presentations to high school classes, science fairs and even to small town government officials who are often unaware of $T^2$ programs and their benefits.

The developing nations must take advantage of free technology transfer available in the United States as well as Europe. The developing countries should take advantage of the $T^2$ process done in a six-step process: 1) identification; 2) planning; 3) packaging; 4) promotion; 5) evaluation; and 6) adoption.

$T^2$ is similar to the "distance learning" process using Internet, video-based technology, World-Wide Web applications, the video conference format, transmission via satellite, etc.

There are many $T^2$ subjects available in the area of highway safety, traffic operation, intelligent vehicle-highway systems, pavement management, structures, materials and operations policy, motor carrier transportation, planning, environment, and right-of-way.

## References


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KEITH GREG BOWYER is senior civil engineering student. Bowyer is highly interested in $T^2$. He belief is that it is one of the best vehicles for transferring available technology to the end user, and that we must try to use the available technology whenever possible to serve mankind in the most economical manner and to save resources.