

# WHY AND HOW TO DEVELOP A ROAD TRANSPORTATION TECHNOLOGY TRANSFER CENTER?

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# 1. INTRODUCTION

Down through history, economic development and social advancement have inevitably involved transportation of one form or another. Whether it is wagoons carrying farm products on roads to market, rivers and canals facilitating the economical movement of industrial products, or streets easing the passage of village and urban dwellers, similar principles of engineering and transport design have been in use all over the world. As road practitioners have faced and overcome obstacles and challenges in road building and road operations, there has been a recognition that colleagues in the next country or half-way around the world have developed solutions that may have application beyond the original location. As the travel demands of modern society have increased exponentially, there also has been a recognition that haphazard and informal sharing of experiences may no longer be the best approach to improve roads and road transportation. As budgets continue to be inadequate for the task, it becomes incumbent upon road officials and engineers to gain from the developments of colleagues around the world, rather than "re-inventing the wheel" or making the same mistakes that others have made over and over again.

## 2. TECHNOLOGY TRANSFER

This process of openly gaining and freely sharing experiences, solutions, technologies, and innovations has come to be understood as “technology transfer”. Technology transfer can occur in many ways and different forums. At its simplest form, technology transfer happens when someone reads about a “new” technique in a report or a technical magazine from another place. Technology transfer happens when a university professor in one country learns about and teaches an innovative design method from another country. Technology transfer also can occur when a new product or material is included in a road project by a contractor or consultant from another continent, or another industry. Regardless of the form, ultimately technology transfer is aimed at using the benefits of someone else’s successful research, development or experience to benefit roads locally – often at a fraction of the original development cost. Technology transfer in the transportation sector, as in any field, can be a catalyst for long term change.

Regular meetings of professional societies and trade associations historically have been fertile ground for technology transfer and technical advancement. Where such professional societies or associations are not active, or where there is a need to energize the process, Transportation Technology Transfer Centers have emerged as effective agents in such processes for continuous improvement. Successful centers have been operating in North America and Latin America for the past decade or two. The potential for expanding this success around the world is already underway in Africa and Eastern Europe. The membership of the World Road Association (PIARC) has recognized the value of Technology Transfer Centers, and the Association has introduced a programme to encourage the development of new centers.

# 3. PIARC AND TECHNOLOGY TRANSFER

The World Road Association's (PIARC) commitment to technology transfer is the crux of its philosophy and mission from the very beginning, nearly 100 years ago. That commitment has evolved, with the Association, from information sharing between developed industrialized countries to include developing nations and countries in transition. At the 1987 World Road Congress in Brussels, PIARC passed a resolution formally affirming the commitment to technology transfer. Over the years that commitment has led to more cooperation, programmes and information dedicated to achieve that goal. The 1995 and 1999 World Congresses in Montreal and Kuala Lumpur reaffirmed those goals in the PIARC Strategic Plan.

During the same time period, the idea of Technology Transfer Centers and regional networks around the world grew into a proven and effective mechanism for information and resource sharing. In 1999, PIARC Council passed a resolution that includes initiatives to foster the establishment of Technology Transfer Centers. This commitment demonstrates the Association belief that these centers can play a constructive role in facilitating technology transfer.

As part of this effort, this document was developed to:

- promote the concept and benefits of Technology Transfer Centers and networks, and encourage the development of new centers,
- provide access to resources with expertise to facilitate the process, and shorten the planning and learning curve of new centers.

This document serves as a brief introduction to Technology Transfer Centers and includes contact information for selected centers, and references to in-depth written and electronic resources that can be consulted. It is to be expected that a Technology Transfer Center will develop and mature over time. As a center begins operations, not all of the elements described in this document may be present.

# 4. WHY A TECHNOLOGY TRANSFER CENTER?

Road transportation professionals and organizations (public and private) worldwide need information and knowledge that will enable them to advance their processes, incorporate new products into existing programmes, and increase technical know-how that produces positive change and impact on road systems. A huge universe of institutional and technical knowledge exists and continues to be developed that can be tapped to fulfill varying information and resource requirements. Typically, this knowledge has been passively stored in libraries or research institutions. Unless individual practitioners know what to look for and where to search, this knowledge remains unknown to them.

Where technical libraries and research institutes exist, they are a natural base from which Technology Transfer Centers may evolve. Technology Transfer Centers can serve as a focal point and an institutionalized catalyst for **active** dissemination of technical documents and other technology transfer activities. They should be considered as part of a larger process of the ongoing technology transfer process, and not the sole vehicle for it.

Their primary **objective** is to systematically and actively facilitate the acquisition and dissemination of technology, practice and policy knowledge and know-how that is relevant to a local operating road transportation environment. They can be general in handling all road transportation topics, and adapting techniques to local conditions, or they can be specialized if desirable or necessary.

The **benefits** of a Technology Transfer Center are:

- 1 - **learning** of beneficial policies, technologies, programmes and developments earlier and more **systematically**,
- 2 - **reducing or eliminating duplication** or redundancy of products and process development by road agencies, thereby conserving resources,
- 3 - maintaining a **continuing process** for seeking technology from elsewhere,
- 4 - having a proven mechanism for **evaluating and adapting** foreign technology to local needs,
- 5 - rooting and supporting the change process within the **local** road community that knows its own needs and circumstances,
- 6 - **improving skills** of practitioners that will lead to improved road transportation systems,

# 5. WHAT IS A TECHNOLOGY TRANSFER CENTER?

A Technology Transfer Center can be many things to many people. It is natural that Technology Transfer Centers themselves change and evolve over time, just like the change process they foster. A center can only come to exist when a community of practitioners or their leaders recognize that needs exist that are not being met, and they make a commitment to addressing such needs.

The following descriptors are common for a Technology Transfer Center.

- 1 - a Technology Transfer Center is a **repository** for information about technologies and resources - from cutting edge, or appropriate technology, to good practice;
- 2 - a center can be a local, national, regional and international **conduit** between developers and users of technology and policy;
- 3 - a **focal point for advancing better practice** through a variety of media and activities (e.g., training);
- 4 - a **platform** for systematic technology transfer activities that address and meet unique local transportation requirements;
- 5 - a **catalyst** for improvements and enhancements of local practices;
- 6 - CATALYST: one who advocates the use of improved products and methods by practitioners, and convinces key decision-makers to support such use.

These roles serve to increase awareness of the technology and practices within local agencies and by individuals responsible for road and infrastructure construction and maintenance.

From PIARC unique perspective, in countries where there are PIARC National Committees, a Technology Transfer Center can also serve as the executive agency or secretariat for the National Committee. Where there is no National Committee, the stakeholders of a Technology Transfer Center can be educated about the benefits of PIARC involvement and eventually become the nucleus of a PIARC National Committee. [See the PIARC publication "Why and How Do You Create a PIARC National Committee?"]

In the beginning, a Technology Transfer Center needs to be a "**technology informer**" – identifying, collecting, and **making available** local resources for practitioners; and then accessing and joining networks of knowledge resources from the region and other parts of the world (the first two types of centers). As a center matures, it will move to become **active seekers, translators, adapters, and promoters** of beneficial innovations (the last three types of centers). The natural movement is to move from responders to initiators of the change process.

# 6. BLUEPRINT FOR SUCCESSFUL TECHNOLOGY TRANSFER CENTERS

Effective Technology Transfer Centers and networks of centers operate in the United States (Local Technical Assistance Centers—LTAP), Latin America and the Caribbean (Pan American Institute of Highways—PIH), the Baltic Centers (Finland and its Baltic neighbours Estonia, Lithuania, and Latvia), South Africa, and East Asia. New Technology Transfer Centers are taking shape in Sub-Saharan Africa, Central Europe and Russia.

Each Technology Transfer Center acquires and disseminates technology transfer resources for technologies appropriate to local needs and conditions while maintaining ongoing communication and collaboration with those who will apply the technologies.

The achievements of these centers are founded on the awareness that productive technology transfer relies as much on understanding the local state-of-the-practice and circumstances, as it does on the array of available state-of-the-art technology from elsewhere. Although organizational structures and methods vary depending on local conditions, effective Technology Transfer Centers generally share some basic operating characteristics that allow them to successfully perform their functions.

## 6.1 The basic elements of success

1. Provide systematic technology and information transfer that targets local needs and expertise.
2. Integration into an existing transportation-related institution (government ministry, local authority, academic institution, research laboratory, or professional or trade association) that houses the center as part of its ongoing operation. This relationship saves resources and provides the credibility and contacts necessary to launch new initiatives and programmes.
3. Function independently of host institution to maintain objectivity in its activities, and meet the specific needs of its broader range of stakeholders.
4. Have a visionary “champion” for the Technology Transfer Center who can advance its goals and objectives within the local road transportation professional and institutional community. Such a person could be from the leadership of a road administration, active association, respected researcher, academic, or practitioner.
5. Involve public and private (partner/stakeholder) participation to develop and deliver programmes and projects.
6. Coordinate activities and share information and resources with other regional, national, and international transportation-related organizations and associations.



## 6.2 Building the foundation

Every new and operating Technology Transfer Center needs to take into account a number of factors that underlie the successful development of the institution itself, the process of technology transfer, and the delivery of relevant programmes. The following sections briefly, and generally, raise key issues in question form followed by the most conducive conditions that are instrumental to the development and success of Technology Transfer Centers. Not all issues must be addressed to start a Technology Transfer Center. As the center evolves, the managers must consider the range of issues noted below in order to remain effective.

### 6.2.1 Identify user needs

- A. Who is the target audience? They could be specific, or general, and could include engineers, skilled or unskilled labour, community leaders, decision-makers, public or private sector entities, or researchers.
- B. Does the user recognize the need for technical assistance? The target audience is cognizant of the need for new solutions to existing problems.
- C. What, specifically, does the user need to know in order to improve current procedures or practices? New technology, techniques, materials, and processes.

### 6.2.2 Evaluate transportation environment and identify potential successful partners/stakeholders

- A. What are government policies relating to advancing road construction, maintenance and innovative techniques or materials? The government encourages (or does not) innovative solutions through funding, training and research.
- B. Are the necessary private sector organizations or transportation associations committed to operating a successful Technology Transfer Center? Trade associations, professional organizations, universities, chambers of commerce, etc.
- C. Is the relationship between the public and the private transportation sectors a cooperative one, conducive to collaborative work? The two sectors appreciate the resources, knowledge and skills each possess to improve road transportation. Both understand that their combined experience is greater than the sum of the parts.

- D. What type(s) of resources—monetary and physical—are required and available to support these need(s)? Centers require sustainable or committed sources of funding, space, personnel and equipment to operate effectively.
- E. Is the road agency receptive to innovative or foreign technology application? New solutions are regularly sought and applied when possible.
- F. What is the role of the private sector and other transportation organizations or academia in regional/national road development practices? These organizations regularly, and often on their own initiative, provide solutions to existing problems through the development or introduction of new technologies.

### 6.2.3 Describe local conditions that affect the types of technology and levels of technical expertise that can be transferred

- A. Is there a local individual or organization who is much aware of both technology and local conditions who can adapt promising technologies to local road characteristics? Practicing engineer, economist, trainer, applied researcher.
- B. What types of appropriate technology are available for adoption or adaptation to meet local user needs? Labour intensive, high-tech, or other appropriate technologies.

## 6.3 Specify Programme Activities

The heart and soul of any Technology Transfer Center are the basic programme activities and special projects that are developed and delivered to its audiences or users. They usually include, but are not limited to:

### 1. Communication options

- print media: regular newsletters, research reports, implementation reports, manuals and brochures, and material from other members of the Technology Transfer Center network;
- face-to-face presentations such as training courses and workshops, demonstrations, networking sessions and circuit rider or road show programmes;
- electronic media, including computer programmes, electronic bulletin boards, teleconferences, and Internet sites;
- cooperative agreements or membership in national and international road associations which give access to information, expertise and opportunities for training;
- peer interaction through staff exchanges or structured professional development programmes;
- reinforce technology transfer by disseminating information through more than one medium;

## 2. Training options

- self-study guides and interactive computer-based training,
- short courses,
- in-depth training institute,
- on-the-job training or demonstrations,
- videotapes or CD-ROM;

## 3. Technical assistance options

- call-in or hotline services,
- information network, World Interchange Network (WIN), or other technical resource system,
- mobile technical assistance team,
- twinning relationships with other organizations or Technology Transfer Centers that have the necessary expertise and experience.

The Local Technical Assistance Project (LTAP) Centers in the United States and the Certified Centers of the Pan American Institute of Highways maintain five basic mandatory activities:

- 1 - Compile and maintain a mailing list
  - identification of users and stakeholders
- 2 - Publish a quarterly newsletter
  - communication of successes and available resources
- 3 - Conduct or arrange seminars and training sessions
  - delivery of the benefits
- 4 - Provide material and information
  - delivery of the benefits and marketing of information
- 5 - Evaluate effectiveness of programme
  - feedback for continuous improvement.

## 6.4 Organize the Center

Every center requires a certain amount of basic institutional infrastructure and development to become and remain a viable technology transfer agent.

1. Identify an organization that will agree to house the Technology Transfer Center as part of its ongoing operation, however, the center must have its own identity and space within that structure.
2. Establish a working relationship with the national public agency responsible for roads.
3. Draft mission statement that defines purpose and operation of the center.
4. Establish basic funding needs.

5. Designate funding sources that can provide seed money that can be used to attract the support of other public and private partners.
  - Combination of public and private funds. Local? International or bilateral donors?
  - Define level of any ongoing public funding.
  - Identify membership dues categories, if dues are planned; or service fees (e.g. for training)
6. Identify donors or contributions-in-kind to supplement operating funds.
7. Establish advisory or twinning relationship with an experienced center of comparable operation and size and geographical similarity.
8. Establish a local advisory board of active transportation professionals representing various sectors who can help guide and advance the goals and programmes of the center.
9. Determine if initial organizational links to other Technology Transfer Centers will be formal or informal.
10. Undergo Strategic Planning exercise to define long-term goals and objectives and serve as a map for programme development and delivery
11. Develop Annual Work plans to define scope of actual tasks, and resources/budgets required to deliver programmes.
12. Institute method to track activities, inquiries, and feedback from activities to enhance future programmes.

## **6.5 Personnel and logistical requirements**

1. Select center director who is a recognized leader in road transportation industry, who can enlist champions of the technology. The director should also have the following qualities:
  - strong management skills,
  - technical expertise and professional credibility and contacts,
  - good interpersonal communication,
  - negotiating and bargaining skills,
  - marketing abilities,
  - broad based knowledge of transportation issues.
2. Other positions for staffing the center could include, over time:
  - engineer (specify required engineering specialties),
  - information specialist/trainer,
  - administrative/support staff.

These positions can be full-time or part-time depending on arrangements, available funding, etc. Identify opportunities to share administrative or support duties with sponsoring organization.

### 3. Define space and equipment needs and sources

- space: size and location,
- furniture,
- office equipment and computer(s),
- telecommunications equipment,
- equipment required for training,
- vehicle.

## 6.6 Measure Performance and Success

The technology transfer process promotes continuous improvement. By the same token, a Technology Transfer Center or activity needs to include objective mechanisms for measuring progress, performance, and plan for improvement. Therefore each center should regularly establish, measure, interpret and base future activities on performance criteria. This process generally should allow a center to:

- assign output indicators to all activities of the center (e.g. number of courses, participants, regularity of newsletters or other outreach communication);
- develop and implement measurement and evaluation methods to determine results and outcomes from the outputs. Generally speaking they should be able to identify the extent to which skills are improved and level of knowledge are increased, and how they impact the state-of-the-practice, and ultimately the road system. The results should be tied to the objectives of a programme or project objective, for example: longer lasting pavements, reduced speeds in neighbourhood streets, lower accident rates, or faster road construction, etc.;
- use measurement evaluations as means to continuously improve programmes and to gain new and continued support and collaboration. This process is vital for the continued relevance and success of a Technology Transfer Center and to help ensure support for the center in the future.

# 7. CONCLUSIONS

In an age of world markets and global economies, nations can no longer stand alone and hope to advance. Similarly, road and road transport technology is abundantly available all over the world. Where existing associations and forums exist for practitioners to meet and exchange experiences, technology transfer is already occurring to improve practices and reduce costs. Where such meetings are less frequent, or where it needs to be enhanced and boosted, Technology Transfer Centers are a proven mechanism that is locally driven, and locally managed.

In a continuation of the World Road Association (PIARC) long history of fostering technology transfer, PIARC is supporting the establishment of Technology Transfer Centers in developing countries and countries in transition. This guide has been developed to inform decision-makers of the benefits of Technology Transfer Centers; and to assist managers to plan and start a center.

# 8. TECHNOLOGY TRANSFER CENTERS AND NETWORKS REFERENCES

Centres de transfert de technologie	Téléphone/Fax/E-mail/Site web
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<b>Références réseau / Network References</b>	
<p><b>Institut Panaméricain des Routes (IPR)</b> Siège IPR c/o Federal Highway Administration – HPIP 400 Seventh Street, S.W. Washington, DC 20590 <b>AMÉRIQUE LATINE</b></p>	<p><b>Tél. :</b> (202) 366-0220 <b>Fax :</b> (202) 366-3619 <b>E-mail :</b> <a href="mailto:pih-ipc@fhwa.dot.gov">pih-ipc@fhwa.dot.gov</a> <b>Site web :</b> <a href="http://www.pih-ipc.org">www.pih-ipc.org</a></p>
<p><b>Russian Association of Territorial Bodies of Highway Administration (RADOR)</b> 9 Rota Street, 16, 3 Moscou, 107061 Russie <b>RUSSIE</b></p>	<p><b>Tél. :</b> 7095-963-2518 7095-963-2033 7095-963-2722 <b>Fax :</b> 7095-964-3720 7095-964-4581 <b>E-mail :</b> <a href="mailto:RADOR@CITYLINE.RU">RADOR@CITYLINE.RU</a></p>
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# 9. BIBLIOGRAPHY AND INTERNET RESOURCES

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Transportation Research Board  
National Research Council  
2101 Constitution Avenue, NW  
Washington, DC 20418  
[www.nas.edu](http://www.nas.edu)

## Sélection d'adresses Internet

Banque africaine de Développement  
[www.africandevbank.com](http://www.africandevbank.com)

Coopération économique dans la zone de l'Asie-Pacifique (APEC) – Transports  
[www.apecsec.org.sg/workgroup/transportation.html](http://www.apecsec.org.sg/workgroup/transportation.html)

Banque asiatique de Développement  
[www.asiandevbank.org](http://www.asiandevbank.org)

Department for International Development (Département pour le Développement International –DFID – Royaume Uni)  
[www.dfid.gov.uk](http://www.dfid.gov.uk)

Union européenne  
[www.cordis.lu/transport/](http://www.cordis.lu/transport/)

**Federal Highway Administration (Administration Fédérale des Routes – FHWA - États-Unis)**  
[www.fhwa.dot.gov](http://www.fhwa.dot.gov)

**Banque Interaméricaine de Développement**  
[www.iadb.org](http://www.iadb.org)

**Organisation Internationale du Travail – Advisory Support Information Services and Training (ILO-ASIST)**  
<http://iloasist.csir.co.za/index.htm>

**Fédération Routière Internationale (IRF)**  
[www.irfnet.org](http://www.irfnet.org)

**Documentation Internationale de Recherche Routière (IRRD/OCDE)**  
[www.oecd.org/dsti/sti/transport/road/stats/IRRD/irrd.htm](http://www.oecd.org/dsti/sti/transport/road/stats/IRRD/irrd.htm)

**Institut des sciences et des techniques de l'équipement et de l'environnement pour le développement (ISTED)**  
[www.isted.com](http://www.isted.com) avec liens sur les sites Internet : [www.enpc.fr](http://www.enpc.fr), [www.entpe.fr](http://www.entpe.fr), [www.lcpc.fr](http://www.lcpc.fr), [www.inrets.fr](http://www.inrets.fr)

**Japan Highway Public Corporations (Entreprises Publiques des Routes du Japon)**  
[www.japan-highway.go.jp](http://www.japan-highway.go.jp)

**Local Technical Assistance Programme (Programme pour l'assistance technique au niveau local – LTAP – États-Unis)**  
[www.ltapt2.org](http://www.ltapt2.org)

**McTrans Center for Microcomputers in Transportation (McTrans - Centre pour le micro-ordinateur dans les transports – États-Unis)**  
<http://mctrans.ce.ufl.edu>

**Organisation pour le Développement et la Coopération économiques**  
[www.oecd.org/transport/](http://www.oecd.org/transport/)

**Institut Panaméricain des Routes**  
[www.pih-ipc.org](http://www.pih-ipc.org)

**Reform of Road Maintenance (IRF-UNECLAC-ECLAC)**  
[www.zietlow.com](http://www.zietlow.com)

**Road Engineering Association of Asia and Australasia (Association Technique des Routes pour l'Asie et l'Australie - REAAA)**  
[www.jaring.my/reaaa/](http://www.jaring.my/reaaa/)

**Transportation Research Information Service (TRIS/TRB USA)**  
<http://tris.amti.com/search.cfm>

**Programme des Nations Unies pour le Développement**  
[www.undp.org](http://www.undp.org)

**Commission économique pour l'Afrique (ONU)**  
[www.un.org/depts/eca](http://www.un.org/depts/eca)

**Commission économique et Sociale pour l'Asie et le Pacifique (ONU)**  
[www.unescap.org](http://www.unescap.org)

**Commission économique pour l'Amérique Latine et les Caraïbes (ONU)**  
[www.eclac.cl](http://www.eclac.cl)

**Banque mondiale – Base de connaissances en ligne**  
[www.worldbank.org/html/fpd/transport](http://www.worldbank.org/html/fpd/transport)

**Réseau mondial d'Échange (RME)**  
[www.piarc.org/rme-win.htm](http://www.piarc.org/rme-win.htm)

**Association mondiale de la Route (AIPCR)**  
[www.piarc.org/](http://www.piarc.org/)