Webinars, Advisory Boards, T2 Implementation Plans and other Examples of University Technical Transfer Best Practices

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ABSTRACT

Technical transfer encompasses many activities but often connotes commercialization and patents. On the other end of the spectrum, university researchers may feel that disseminating their results through a journal paper or at a conference or even just briefly describing their projects in a newsletter means that they have filled their tech transfer duties. Tech transfer may be related to specific projects, a group of projects, or independent of specific projects. Project-related tech transfer often is considered at the end of the project but some activities can and should occur at the beginning or middle of the project. Existing tech transfer literature seems to be limited in value for university research centers trying to share the results of several smaller projects or provide overview knowledge of new topics. The paper draws on a survey from other universities of which tech transfer methods they deploy. The respondents were asked whether their technology transfer efforts are for specific projects, groups of projects or independent of projects and when they deploy project-specific technical transfer (at the beginning, middle, or end of project). In this paper, several technology transfer best practices are shared including tech transfer (T2) implementation plans, use of an advisory board, symposiums, and webinars.

Keywords: Technical transfer, technical transfer implementation plans, webinars

INTRODUCTION

Technical transfer encompasses many activities but often connotes commercialization and patents. On the other end of the spectrum, university researchers may feel that disseminating their results through a journal paper or at a conference or even some newsletter articles about projects or general symposiums means that they have filled their tech transfer duties. Technology transfer can be defined as the activity leading to the adoption of a new-to-the-user product or procedure by any user or group of users *(1)*. Another source explains that technology transfer is the process of transferring skills, knowledge, technologies, methods...among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new processes, applications, materials or services*(2)*.

Many universities have tech transfer offices that will aid their researchers with intellectual property issues and the commercialization of their research (three examples are University of Michigan, University of Arizona, and Ohio University *(3–5)*). But what about research that is designed for public agencies to implement such as most transportation research? What about basic research that is just one step towards something that can be deployed in the field? Some argue that the ideas and work is not transferred until an agency or organization adopts it, but there are intermediate steps that can be taken to better disseminate our efforts as a university conducting transportation research.

Several universities have Transportation Tech Transfer or T2 Centers (examples include University of Delaware*(6)* and University of Florida *(7)*). These often include the FHWA-funded Local Transportation Assistance Program and they generally offer training courses to transportation professionals. Many of these provide technical assistance (such as a safety expert) to local and state agencies and they are charged with helping to disseminate new federal government programs and projects such as the FHWA Every Day Counts Initiatives *(8)* but not all disseminate the results of research at that university. However such training programs play an important role in hosting workshops related to specific projects or groups of projects as described further below.

The literature review section below describes recent transportation technology transfer efforts by NCHRP and others. But it may be difficult to adapt all of these to university research. This paper fits a needed niche by describing several university technology transfer practices that apply to transportation research conducted by university researchers.

What is Transferred

The activities described in this paper can be used to disseminate information about specific projects, groups of projects or also general information about topics independent of specific projects. Transportation research centers and university transportation researchers spend efforts conducting research and sharing results but also general training and transfer of knowledge

related to groups of projects or specific topics. Both information about specific projects and more general information can be considered tech transfer.

Timing

Many report that tech transfer occurs at the end of a project. One point to this paper is that tech transfer can and should happen at the end of the project but also at the beginning and middle of the project. Engaging researchers early and often about the need for tech transfer and potential activities should lead to a better dissemination of results as well as the ability to engage potential adopters as the work progresses rather than only after at the end after a technology is developed or a new process is designed.

Paper Structure

The paper is structured as follows. The next section provides a literature review. Then the results of an informal survey of transportation university representatives and transportation research center administrators are provided and discussed. The rest of the paper describes several technical transfer best practices including report, journal and conference paper dissemination; technical transfer implementation plans; project briefs and other outreach; symposiums and workshops; use of an advisory board; additional state and local agency interactions; field testing; and webinars. The paper follows with a discussion of how these practices lead to deployment/implementation of the research and additional conclusions.

LITERATURE REVIEW

This paper is motivated by the fact that not much of existing technical transfer literature seems to address the needs of a typical university transportation research center. The existing literature can be separated into guidance for university tech transfer and NCHRP/federal DOT tech transfer guidance. Reviewing the literature can lead to frustration. For example, the intriguing title of a recent book, *The Change Book: A Blueprint for Technology Transfer (9)* is about addiction treatment centers and not research. Three books*(10–12)* on university tech transfer are available but they emphasize making money from the commercialization of university research and refer to entrepreneurship and universities' "intellectual property portfolios as lucrative sources of potential revenue"*(10)*.

Recent NCHRP reports should be more promising *(13, 14)* and these build on another NCHRP report from 10 years ago *(1)*. The NCHRP Synthesis 355 report from 2005*(1)* provides an overview and the successes, challenges and next steps for tech transfer. In addition to a tech transfer implementation plan adapted from Minnesota, the report includes the evaluation of tech transfer efforts. NCHRP Synthesis 461 *Accelerating Implementation of Transportation Research Results(14)* introduces factors affecting the use, timing and ease of implementation, several case examples, a discussion of transferability of the strategies and conclusions. Factors include that no one activity is the solution, contexts vary, more strategies are better,

implementation practice maturity is important, implementation resources, culture that fosters innovation, complex process, boundary spanning, incentives, effectiveness measures, and best practices. Most of these factors apply to university non-commercial tech transfer. However the case examples such as the National Network of Implementation Experts probably need to be translated to university context such as the advisory boards described below.

NCHRP Report 768 *(13)* describes a Guided T2 phase as part of an Innovation Adoption Process. Guided T2 has ten steps: address societal and legal issues, have an effective champion, engage decision makers, develop a T2 plan, identify, inform and engage stakeholders, identify and secure resources, conduct demonstrations/showcases, educate, inform, and provide technical assistance, evaluate progress, and reach deployment decision. The NCHRP Report is a good guide and reference and we should all consider the factors listed in NCHRP Synthesis 461 and the ten steps listed in NCHRP Report 768, but the specific examples do not guide a university researcher.

An example of USDOT tech transfer guidance is the 2011 *Key Findings and Recommendations for Technology Transfer at the ITS JPO(15)*. This includes nuggets like "basic and applied research both involve technology transfer but at different stages of development" but there is too much of an emphasis on commercialization and licensing as well as ITS JPO (Intelligent Transportation Systems Joint Program Office) specifics such as ITS JPO Partners, Expansion of R&D Partnerships and Establish Research Park Hubs for the report to resonate.

INFORMAL SURVEY OF WHAT OTHER UNIVERSITIES DO

As a way to better understand the current state of the practice of university transportation tech transfer, a brief informal survey was developed and distributed for this paper. The two-minute survey link was distributed via the TRB University Representatives forum and the Council of University Transportation Centers email list[1]. Thirty-two responses were received in a five day period in July 2015. The survey includes a question about whether tech transfer is only provided for individual projects, for a group of projects, or independent of specific projects (results in Table 1). The table tells us that 90% of the respondents to this question (three respondents skipped the question) conduct tech transfer activities specific to individual projects. Almost half of the respondents conduct tech transfer efforts that are not tied to specific projects like an overview symposium or workshop. Analysis of the individual responses reveals that two of the respondents only do tech transfer independent of projects.

[1] The survey link: https://www.surveymonkey.com/r/FD2VWMM

Table 1 Types of Tech Transfer Conducted by Respondents, N=29

Does your research center conduct tech transfer efforts specific to individual projects or combined efforts?	% Responding to This Question
Efforts specific to individual projects	90
T2 efforts with multiple projects (a webinar of several projects, for example)	41
T2 efforts that are not tied to specific projects (an overview symposium or workshop, for example)	48

The respondents were provided with a number of technical transfer activities and they were asked to indicate whether their organization performs the activities at the beginning of the project, middle of the project and the end of the project (Table 2). The responses are not provided to imply that this was a comprehensive, scientific survey but to show the gamut of activities and responses by a number of other universities. Some of the responses will be elucidated in the text describing each of these activities below. Highlights include that close to all respondents provide conference presentations or journal articles of their projects, 60% conduct field testing, and almost half are involved in patents or commercialization of their technologies/research. Additional activities described in respondents' comments include technical reports, policy briefs, and industry technology days.

Table 2 Tech Transfer Activities Conducted with Number of Respondents and Within Row Percentages

What kinds of tech transfer do you and your researchers engage in? When do you do it?	Beginning of Project	Middle of Project	End of Project	Total Number of Responses
	Percentage	Percentage	Percentage	
Webinars	23	36	86	22
Project briefs	35	42	69	26
Journal article	7	35	97	29
Conference presentations	23	63	97	30
Field testing	25	85	50	20
Agency champions	77	77	77	17
Advisory board	76	71	71	21
Technical reviews	30	60	75	20
Symposiums/ workshops	30	63	93	27
Tech transfer implementation plans	57	38	67	21
Commercialization /patents	0	33	100	15
Other	33	33	100	3

TYPICAL DISSEMINATION: REPORTS, JOURNAL ARTICLES, CONFERENCE PRESENTATIONS

As shown by the survey results in Table 2, most universities engage in the "typical" technical transfer activities of reports, journal articles, and conference presentations. These are all important to document the research and start to share results.

Reports, journal articles, and conference presentations are attractive but they also have drawbacks as technical transfer activities. Generally reports and journal articles are prepared at the end of the research project. So months and years after the work has started and appealing results have started to be generated, the report or paper comes out. Potential agency adopters

may not know that the research is being conducted and they have no ability to comment on the process and make it more meaningful to their needs. Adoption through citations may take years after release. Conference presentations may be more timely, but they rarely result in documentation that can be cited. Consumers of the ideas and results may be limited to the room where the information was presented and to the limited number of researchers attending a specialty conference or reading a specific journal. Reports may have a wider distribution to practitioners as well as researchers but it's not clear what number are willing to read and adopt a research report beyond a limited number of project champions or reviewers.

We can argue that any citation of a report, article or presentation is technical transfer and means that the research was useful to others, related to others, and/or provided a stepping stone for further research. Citations are an important measure to academics and are used in tenure and promotion decisions and they may be used in identifying successful researchers as they apply for additional funding. Current websites like Google Scholar *(16)* make it easy to track the current number of citations and it seems to be reasonably comprehensive and timely in finding citations. But Google Scholar is only articles--it doesn't include reports or conference presentations. Another website called ResearchGate *(17)* allows researchers to upload conference papers and reports. And others are encouraged to download and use the reports which is then tracked by the site. Like Facebook, Research Gate provides a live feed of uploads from Research Gate researchers that you are following (you are encouraged to follow colleagues and others who have cited your work). The researcher can find out the country of others who download and in some cases the organization and/or information of the individual researchers that download. Such sites may become great enablers of tech transfer as they are used by a wider number of people and populated with more information.

T2 IMPLEMENTATION PLAN

A T2 Implementation Plan can be used at the beginning or middle of a project to engage researchers in the tech transfer project. A large motivation for preparing this paper is to provide a sample T2 Implementation Plan because the author was not able to find an example plan to distribute to researchers in our University Transportation Center in Spring 2015. One survey respondent calls this a Project Communications Plan and describes that it is prepared at the end of the project*(18)*. An example T2 Implementation Plan culled from three other examples is presented in Figure 1.

Ideally each project has a unique plan and the researchers have put some thought into stakeholders and how their ideas will be disseminated. Preparing this plan or a similar version may help make tech transfer more systematic.

Example T2 Implementation Plan

Project Name_____
Investigators (Schools)_____

Select as many as apply from the following technical transfer outcomes:

- ❑ I anticipate this project will result in a traditional or online training program for professionals
- ❑ I anticipate this project will result in a guidebook or similar publication in addition to a final technical report
- ❑ I anticipate this project will result in at least one peer-reviewed journal article
- ❑ I anticipate this project will result in at least one technical presentation at a conference or to practitioners
- ❑ I anticipate this project will result in a potential patent or otherwise marketable product
- ❑ I anticipate this project will be a viable subject for a webinar
- ❑ Other

List primary stakeholders (end-users)/target audiences of this project:

List potential agency champions:

Describe stakeholder engagement activities (use the following list as potential examples):

- Media relations and social media
- Events and conferences (national and local) for PIs to participate in
- Contact stakeholders and offer report, abstract, PIs
- Work with advocacy organizations to utilize news stories
- Field implementations
- Professional development (training workshop, webinars)

Describe intellectual property plan if technology will be commercialized:

What is the tech transfer timeline?

List potential T2 metrics (examples include: number of media placements, web views, Facebook comments and re-tweets, workshop attendance):

List next steps:

Figure 1 Example Tech Transfer (T2) Implementation Plan

Two-thirds of respondents state that they utilize tech transfer implementation plans; 57% of these use them at the beginning of the project and two-thirds at the end of the project. Engaging researchers at the beginning or middle of a project has many positive impacts including:

- Researchers can help identify potential agency champions or early adopters of their efforts. As described below, communicating regularly with these adopters should result in work that better fits agency needs.

- Researchers can help identify appropriate venues for disseminating the results of their research.
- Researchers better understand the value of sharing descriptions of their projects and intermediate results like methodology design.
- Researchers may be able to share when results are expected and appropriate timing for dissemination.

BRIEFS AND OUTREACH

Different universities have different processes for releasing information like project briefs and other outreach like press reports, newsletters and association magazines. For the reasons listed above, short project descriptions that can be absorbed by a variety of practitioners and laypeople should be released as the project starts and also in the middle of projects, not just at the end of projects. Twenty-six of the 32 respondents to the survey distribute project briefs, one-third of these at the beginning of the project, 42% in the middle of the project and two-thirds (69%) at the end of the project. This information dissemination should expose wider audiences to both specific research projects and more-encompassing topical coverage than reports, journal articles and conference presentations. Information can be distilled to sound bites or policy briefs that enable the reader to understand the expected and actual benefits of the research efforts.

Items released to local newspapers are exciting but there are also many digital options that can be pursued. Centers maintain mailing lists and can send specific emails about projects or activities. newsletters with a variety of messages, and links to reports. One survey respondent explained that the list that they use to send out links to final reports includes 10,000 email addresses*(19)*.

SYMPOSIUMS AND WORKSHOPS

Symposiums and workshops have the potential to offer additional information compared to a news article but also at a level that can be appreciated by a wider audience. There is the further benefit of in-person information exchange and the potential for teaching and interactions between the facilitators, instructors, audience members, and participants. Symposiums and workshops are activities utilized by most of the survey respondents (27/32).

Nomenclature may vary from university to university, but often a symposium covers a variety of topics and utilizes several presenters. Workshops are often related to a specific project and they're often suggested by researchers as a tech transfer activity either in the original project proposal or as part of an add-on tech transfer effort. A symposium may be organized for larger audiences (generally a number that fits in one room) and workshops are often limited to 30 or fewer participants to encourage interactions.

Both symposiums and workshops benefit from popular, appealing hot topic themes and advertising. The audiences of both can be expanded by including presentations (PDFs of PowerPoints for example) on a website. Audio or visual recordings can be made and included

on the website. Visual recordings can be uploaded onto YouTube. Presentations can be broadcast concurrent with the live event as a webinar with remote participants.

The website for an example Symposium offered in May 2015 by the Mid-Atlantic Transportation Sustainability University Transportation Center is: Blue and Green Highways Symposium. The Symposium featured eight presenters that each presented on topics related to transportation sustainability including an overview, sustainability rating systems, sustainable materials, asset management, stormwater, and climate impacts and resiliency. The website provided above includes links to PDFs of the presentations and the archived recordings of three webinars that were offered concurrent with the event. Limited numbers attended the event in person and attended the webinars but 45 have viewed the videos on YouTube over two months and we expect this number to grow.

Partnering on hosting symposiums and workshops provides several useful benefits:

- Audience is potentially expanded as the advertising mechanisms and membership of partners are utilized and reached.
- Partners may have additional experience in hosting and conducting in-person training.
- Events with multiple topics may draw wider audiences and have broader lasting impact.
- Partners may provide resources like facilities or refreshments or related materials to share with participants.

WEBINARS

Webinars are increasing in popularity and they are an increasingly important tech transfer tool. 22 survey respondents report using webinars (23% at the beginning of projects, 36% in the middle of projects, and 86% at the end of projects). As described above, webinars can be conducted concurrently with in-person tech transfer information dissemination events. They can be conducted as a series. They can also be conducted as stand-alone ways to broadcast information to remote participants.

Webinars are generally 60-90 minutes but participants seem willing to sign up for and listen to longer webinars that are concurrent with symposiums and other events. Webinars can feature one presenter or presentations from multiple presenters/projects. Ways to engage webinar participants during the webinar include regular polling and utilizing a chat box to solicit questions of the presenters but also for participants to share information related to the presenters.

Several companies offer webinar platforms and they vary in usage fees, accompanying email and webinar management systems, audio options, and ease of use. Some webinars are easy to use by participants (requiring only a click on a link). Others may require software to be downloaded, but these are increasingly rare. The University of Virginia Center for Transportation Studies has used a webinar system for over a year which was purchased from a third party reseller that provided an email management system and arranges for technical support and linked us to a third party audio provider.

The webinar system was purchased to support a six-part, two university webinar series to disseminate information from several regional University Transportation Center projects. Since then, the webinar system has been used to support a webinar of a visitor speaking with students in the room and remotely, concurrent webinars during a symposium, a preview for a training course, a stand alone webinar for a TRB committee, and concurrent webinars during a different regional UTC's Annual Meeting.

There are many webinar best practices that can be adopted including:

- Reminders sent one week before, one day before, and one hour before the webinar, ideally with a link to a website that includes the speakers' presentations, an elongated description of the webinar and presentations, and speaker biographies.
- Polls asking for responses at the beginning of the webinar, during presentations, and in-between presentations.
- Making the presentations, chat discussion, responses to poll questions, and a YouTube recording of the webinar available on a website after the webinar.
- Considering webinar participants to be not just the webinar attendees, but the webinar registrants (showing interest in the subject even if they were not able to attend) and visitors to the webinar website that includes items from the following: archived webinar recording, speakers' presentations, chat transcript, responses to poll questions, Q and A transcripts, and details from the webinar such as description and speaker biographies.

ADVISORY BOARD/TECHNICAL REVIEW PANEL/EXTERNAL REVIEWS

Getting the attention of an advisory board, utilizing agency champions, utilizing project technical review panels, and conducting external reviews are all tech transfer activities. Advisory boards can be considered the Implementation experts mentioned in *(14)* and project champions are emphasized as one of the ten steps in *(13)*. These external collaborators can be enlisted at the beginning of the project, in the middle and the end. As shown in Table 2, 21 of the 32 survey respondents utilize these external folks. Such two-way exchanges can improve the research by enabling others to help direct the research, ideally to make the research more responsive to the board member's or reviewer's needs. By enlisting the support of these external collaborators early in the project, the board member, panelist, or reviewer is alerted about the project and they can watch out for the release of more information and tell others about the project.

Advisory board best practices include:

- Providing updates on multiple projects through in-person meetings and electronically.
- Soliciting research needs.
- Enlisting their help to deploy project results. They can be early adopters of new results.
- Encouraging members to tell others about the projects and disseminate information about the project.
- Asking members to share how project results can be used by themselves, at their organizations, and by their peers.

Project champions are one form of external support and more than half of the survey respondents (17) state they use these. The definition and roles of project champions may vary but generally they help identify a research need, they are consulted and kept informed throughout the project, and they commit to helping deploy the research results and disseminate information about the project. Champions may be formally involved as project sponsors or as part of each project's Technical Advisory Committee. Potential champions can learn about projects at the project's inception and through the life of the project through the activities described in this paper. Encouraging investigators to share mid-project and final-project results in smaller project-specific or in larger regional meetings can engage champions.

ADDITIONAL STATE AND LOCAL AGENCY INTERACTIONS

The more state and local agency representatives learn about a university's research projects the better. State and local representatives are likely responsible for implementing project results. More interactions can be facilitated by participating in organization events at the national, regional, state and local level. Participation can be as an attendee or as a speaker. Principal investigator and center representative participation on technical committees is another form of tech transfer. One survey respondent mentioned participation in technical committees (e.g. ASTM, AASHTO, regional user-producer groups, ad-hoc committees formed by DOTs)*(20)*.

FIELD TESTING

A natural part of many research projects may be field testing because researchers are eager to see how their ideas work when exposed to users, weather, and existing facilities and conditions. Ideally, field testing requires the cooperation of government officials who are then made aware of the project and can become engaged to influence how the work applies to their needs. Example field testing projects at the University of Virginia Center for Transportation Studies conducted for two different UTCs are the inclusion of new materials in a stormwater bioretention facility built by the City of Charlottesville adjacent to a school parking lot and demonstration to traffic management center operators of a virtual dynamic messaging system. Sometimes testbeds are maintained by agencies to facilitate demonstration deployments of research ideas. But not all research requires an official testbed and interacting with agencies and arranging a test independent of a testbed may have several advantages over utilizing a testbed that doesn't incorporate all real world conditions and is managed by a non-government entity.

IMPLEMENTATION/ADOPTION

Field testing and other demonstrations may be the first steps towards implementation and adoption of research. Virginia DOT has stated this year that none of their research projects are finished until they have been implemented*(21)*. The USDOT Office of the Secretary of Transportation-Research (OST-R) Tech Transfer Manager has explained that tech transfer has not occurred until the research has been deployed or implemented by an agency*(22)*.

As the examples in this paper imply, there are many tech transfer activities in addition to actual implementation or deployment. One can argue that all of these activities and venues for disseminating project information (from reports and journal articles to newsletter articles and webinars to agency champions) may support this ultimate goal of deployment.

ADDITIONAL CONCLUSIONS

This paper has provided several examples of tech transfer activities conducted by universities. The paper is intended to provide discussions of several tech transfer methods and to document that tech transfer can and should occur at the beginning and middle of projects as well as at the end of projects. Also, many of these activities are described in the context of disseminating the results from a single project but they also apply to groups of projects or even general information exchange tech transfer efforts like symposiums and webinars. The paper is supported by the results of a university tech transfer examples electronic survey disseminated in July 2015.

Future research may follow two avenues. First, more research is needed to assess whether earlier technical transfer efforts lead to more successful research implementation. Second, studying state DOT technical transfer may help universities understand what DOTs are doing and how to better work with DOTs to make university research more implementable.

Following NCHRP Synthesis 461 *(14)* we should use multiple tech transfer activities. There is not an ideal set of strategies or a best practice to always follow, but hopefully the examples described here will be thought provoking and may apply to disseminating results of the next project.

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