

**Welcome** to the first edition of the Knowledge Translation for Technology Transfer (KT4TT) e-newsletter. It is produced by the Center on Knowledge Translation for Technology Transfer. The e-newsletter will keep you abreast of tools and techniques for improving communication between the producers and consumers of new knowledge (knowledge translation), for the purpose of applying that knowledge within new products or services (technology transfer). This work is focused on technology-oriented research for improving the quality of life for persons with disabilities.

The University at Buffalo won a competitive grant to establish this new center. Our proposal drew heavily from our prior fifteen years experience in product development and commercialization of Assistive Technology devices for people with disabilities. That work occurred through the Rehabilitation Engineering Research Center on Technology Transfer.



The Center on KT4TT is now linking the models, methods and measures of technology transfer to those in the emerging field of knowledge translation. Within our frame of reference, knowledge translation is applied to ensure that research-based innovations are tailored for effective communication to various user groups. These groups are other researchers, clinicians, policy makers, manufacturers, consumers and knowledge brokers. We expect improved communication to increase evidence of awareness and use of these innovations among the knowledge users. Their adoption and application of these innovations, in turn, should increase the beneficial impacts for the sponsor's target population of people with disabilities.

The KT4TT program will contribute to three key outcomes:

- **Improved understanding** of the barriers preventing successful knowledge translation for technology transfer and promulgate the carriers available to overcome them.
- **Advanced knowledge** of best models, methods and measures for achieving outcomes.
- **Increased utilization** of these validated best practices by technology-oriented grantees.

The KT4TT team at the Center for Assistive Technology ([cat.buffalo.edu](http://cat.buffalo.edu)) is operating in partnership with Western New York Independent Living Inc., Southwest Educational Development Laboratory (SEDL) in Austin, Texas, and an international team of knowledge translation scholars.

This first e-newsletter introduces the full suite of projects underway while future issues will update their progress. You are also invited to visit our website: <http://kt4tt.buffalo.edu/>. ■

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# Demonstrating Knowledge Translation for Technology Transfer Outcomes to Grantees

The purpose of Development Project 1 (D1) is to accomplish product outcomes from research and development while demonstrating Knowledge Translation for Technology Transfer (KT4TT) practices to the National Institute on Disability and Rehabilitation Research (NIDRR) technology grantees. We will involve NIDRR technology grantees as participant/observers in our development projects and track the grantee's uptake and use of demonstrated knowledge translation and technology transfer best practices.

D1 will conduct six discrete development projects in specific response to NIDRR's direction of further developing and testing models, methods or measures of KT4TT in the three technology areas (Sensory, Environmental Access and Wheeled Mobility), and will establish best technology transfer practices that can be used to effectively implement and evaluate the success of technology transfer activities in the three technology areas.

D1's outputs are tangible prototypes rather than conceptual knowledge. D1's objective is transfer and application (utilization) of these prototypes by collaborating manufacturers, so facilitating use by these target members of the Knowledge Utilization System (KUS) is part of the process. Beyond direct use by manufacturers, D1 expects to facilitate knowledge utilization by the knowledge production system (KPS) - specifically the participating NIDRR grantees and eventually all grantees as well as NIDRR itself. The participating grantees will follow along through the application of the Knowledge to Action (KTA) Model. By observing how the full KT4TT process works in action, the NIDRR grantees can see the steps involved. By participating in these demonstration projects, the NIDRR grantees will recognize the time and effort required to fully implement each step.

Since D1 expects that each new TT demonstration project will complete the KTA action cycle in 18 to 36 month intervals, there will be ample time to compute the costs and benefits associated with the KTA action cycle. The participating NIDRR grantees will then have evidence of the input, process and output requirements within the local norms and setting of their technology area. This information is critical for their decision to apply end of grant KT or to integrate KT into their future projects and proposals.

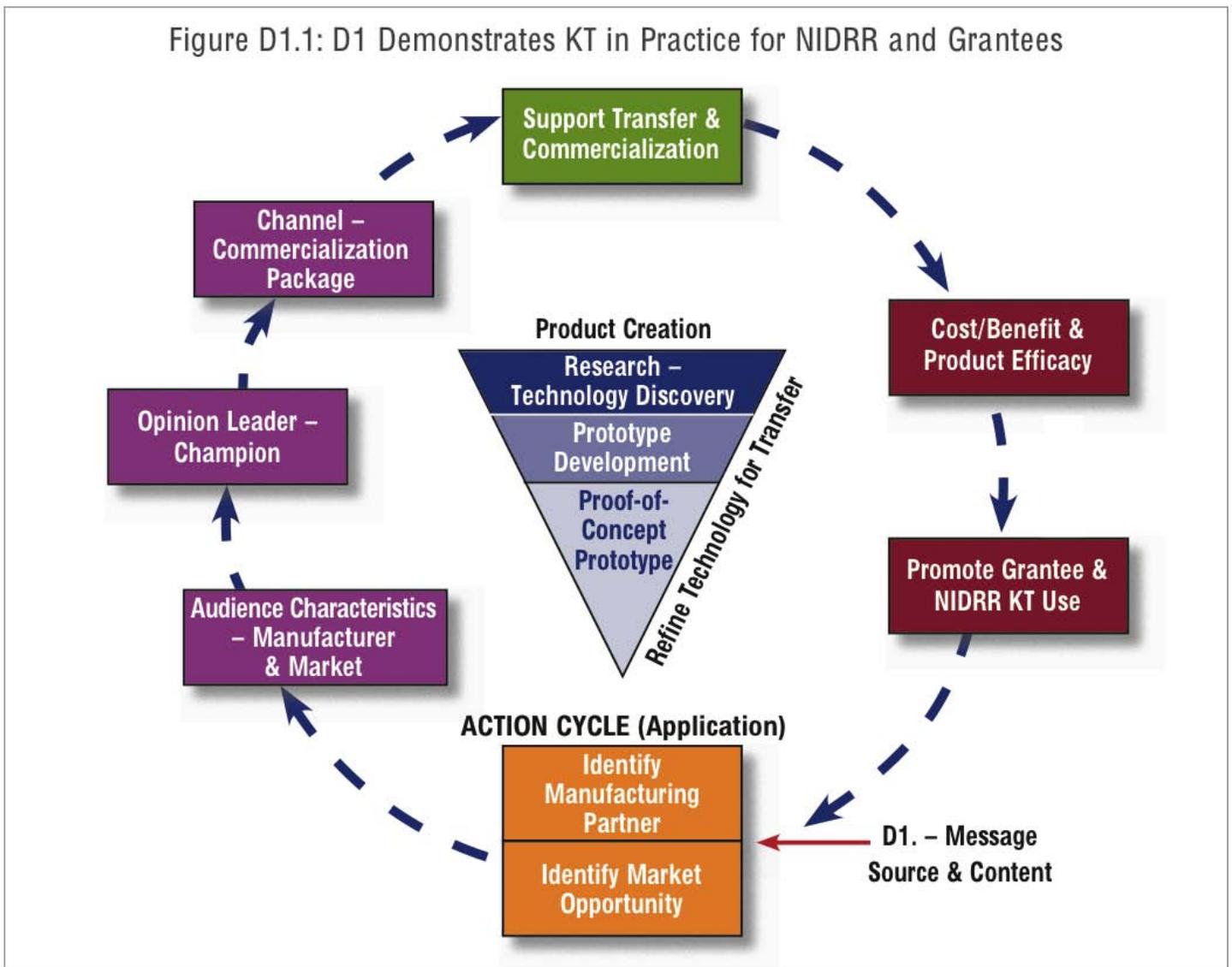
## Technology Transfer Approaches

The individual technology transfer projects conducted under D1 may apply any one of three established approaches to technology transfer:

- 1) **Supply Push (SP) Model** – a process by which the technology transfer process is initiated through an effort to apply a technology's utility within a new product - the technology supplied is pushing toward the marketplace to address an assumed unsatisfied demand.
- 2) **Demand Pull (DP) Model** – the technology transfer process is initiated in response to a validated market demand for a product feature or function. Companies may seek a solution to a problem articulated by their customers.
- 3) **Corporate Collaboration (CC) Model** – a company's internal new product development process incorporates the perspectives and efforts of people with functional limitations. We apply KT practices to communicate the principles of universal or transgenerational design, but do so within the terms of corporate values (e.g., market broadening).

The KT4TT's research projects may identify other approaches to technology transfer and D1 will, as they are identified, add them as options. ■

Figure D1.1: D1 Demonstrates KT in Practice for NIDRR and Grantees



In an effort to demonstrate best practices in working with a corporate partner on a development project, D1 initially will focus on the CC Model and the collaborative research approach developed by the Rehabilitation Engineering Research Centers on Technology Transfer (T<sup>2</sup>RERC) in its last cycle for its first three development/demonstration projects. This collaborative research approach involves identifying a corporate partner to jointly research and develop a product to fill a known product gap in the consumer marketplace thus fulfilling an unmet consumer need.

### Design of Development/Demonstration Program

The objective of this project is to involve relevant technology grantees directly in the KT4TT Center's process of conducting original research and development (R&D) within the KTA model, to achieve TT product outcomes.

NIDRR RERC grantees that join our demonstration projects as participant/observers will participate with us in the demonstration project through video conference meetings, teleconferencing with the corporate partner, project deliverables and weekly - if not daily - project status emails. Working in partnership with a corporation, the grantee will experience applying TT best practices and applying them within a KT context. The demonstration process provides adequate time for reflection, when the grantee can compare and contrast the KT4TT's approach to their own. The KT4TT's target grantees include both the RERC and Small Business Innovation Research (SBIR) program grantees.

The RERC technology grantees operate primarily in the academic sector and have longer time frames for their projects - five-year cycles, while SBIR grantees operate within the business sector and are constrained by shorter

timeframes and smaller budgets. This means the development/demonstration projects require two different approaches, one for the RERCs and another for the SBIRs.

The development/demonstration projects for RERCs will involve them as participant/observers in one of our transfer projects. The participant/observer experience is expected to help RERC grantees improve their own understanding of proper practices. Through this Corporate Collaboration development/demonstration project, the participant/observer RERC will be exposed to the details and the form in which research knowledge must be presented to a corporate manufacturer.

The development/demonstration projects with SBIR grantees will be limited to their own funded projects. The KT4TT project team will interject our own expertise into the SBIR project so the SBIR will participate/observe how our approach reflects or differs from their plan. As we will be providing free resources including focus groups we anticipate that the SBIR grantee will participate.

The RERC and SBIR development/demonstration projects are necessary to enable the KT4TT to engage NIDRR's technology

grantees on a one-to-one basis and to collaborate at a level of detail that immerses these NIDRR grantees in industry-standard practices.

## Project D1 Methodology

Each development project will follow a standard framework or set of best practices as outlined by the Product Development and Management Association (PDMA) and refined through the 15 years of TT experience of the applicant. This framework includes: project definition and commencement; consumer oriented product requirements definition; project designers solution selection; project designers materials and component selection; consumer beta testing of prototype; and in depth consumer environment appropriate testing.

The manufacturer must be able to commit to an 18-36 month development window for any new product. In addition to our own consumer testing, the KT4TT will rely on the internal facilities, testing protocols and quality control procedures of these companies. The KT4TT Center will then proceed to initiate collaboration, address intellectual property issues, and set project timelines and deliverables. ■

### Development Project 2

## Knowledge Base and Toolkit for Knowledge Translation and Technology Transfer

Project Lead: Joseph P. Lane

### Knowledge Base and Toolkit for KT and TT

Development Project 2 (D2) is establishing a "Knowledge Base" consisting of all of the information, references, data and documents compiled and generated by the Center on Knowledge Translation for Technology Transfer (KT4TT). The purpose is to have one repository of information from the various research and development projects to facilitate uptake and use among the knowledge users. The knowledge base will include a fully and publicly accessible database and website to organize and link all the data-level knowledge. It will also contain copies of all of the KT4TT output materials.

D2 must account for: 1) the diversity of knowledge recipients along with their contexts and values and 2) the unavoidable complexity of KT4TT knowledge. Generation of an effective knowledge base is dependent upon a good understanding of the knowledge recipients and their social contexts.

The knowledge database website will be the hub and structuring element for all other knowledge base items. A deep and multifaceted knowledge base portfolio enables effective knowledge translation. The full complement of knowledge base components expected to be produced by the KT4TT includes:

- 1) Eight core knowledge base items under D2:
  - a. Knowledge database website;
  - b. Executive-summaries;
  - c. E-Newsletters;
  - d. Project reports;
  - e. Training modules;
  - f. Workshops;
  - g. DVDs;
  - h. Webinars.
- 2) Technical assistance - a dissemination and implementation knowledge base.
- 3) Demonstration under Development Project 1 (D1) - an implementation knowledge base.
- 4) Peer reviewed publications - a dissemination knowledge base when in conjunction with an E-Newsletter that summarizes the publication and notifies target groups.
- 5) Other non-peer reviewed publications.

The knowledge database is being constructed on an Oracle version 10g database platform, normalized for optimal search performance. The knowledge database website will include many functions and elements to increase utility such as navi-

gation, searching, querying, filtering and report generation. A draft data input structure is being created to ensure it functions as an input form for all types of KT4TT outputs. That way, all data, documents and related entries can be formatted within the same reporting structure, as well as being searched and accessed the same way.

## Facilitating Knowledge Utilization

The knowledge base will be designed to facilitate utilization by the knowledge production system (KPS) at the individual, organization and sector levels. It will integrate the formats, structures and language that generate a shared understanding of the utility and value of Knowledge to Action (KTA) Model tools and products. The contents will include the evidence of the KTA model's utility - generated by Research Project 3 (R3), the KT intervention and by D1's TT Demonstration outputs. It will also include the cost/benefits calculated for generating these outputs, so that KPS members can consider its feasibility within their own context.

The knowledge base will also be designed to promote full access and ease of use to members of the knowledge user system (KUS). An entry screen will identify the user's category and then orient the material to the priority interests of that user category. ■

### Research Project 1

# Knowledge Synthesis on Knowledge Translation Reconciled with Technology Transfer

Project Leads: Jennifer Flagg and Vathsala Stone

Researchers and small business owners often encounter barriers on their paths to delivering successful innovative outputs, regardless of whether they are products, services or concepts. The goal of Research Project 1(R1) of the Center on Knowledge Translation for Technology Transfer (KT4TT) is to identify effective carriers, such as tools, resources, and processes that can be used to help researchers and small business owners to overcome these barriers to technology transfer (TT) and knowledge translation (KT). To do so, the project team is working to develop a roadmap to KT4TT that will offer customized guidance for progressing through the technology transfer process towards a variety of outputs including knowledge outputs (i.e. published papers), prototypes and complete products. Specific steps and tasks will be explained by relevant, evidence-based literature. Effective carriers will be identified for overcoming barriers that might be encountered throughout the process. Further, tools and resources such as guidebooks, knowledge bases, and manuals will be made available via web links.

Construction of the roadmap will require the center to gather relevant literature by systematically performing a scoping review. In addition to outlining steps and tasks, the review will enable the team to identify and document barriers and carriers to KT4TT. This documented information will ultimately populate a user friendly, searchable database that new product developers can utilize as a resource for finding information related to best practices and overcoming or preventing barriers to KT4TT.

The information produced by the scoping review must be categorized and organized in a meaningful way, which can be easily understood and applied by all target audiences. For this purpose, the team is developing an integrated model of knowledge translation for technology transfer. The integrated KT4TT model combines the traditional research process with the development and production processes as articulated by the Product Development and Management Association (PDMA). The model also pairs relevant components of Ian Graham's Knowledge to Action (KTA) model with related steps from the research and PDMA processes such that the integrated model and the KTA model can inform each other with effective techniques. The combination of these models produces one complete model inclusive of research,

development, and production, which is also mindful of the target audiences' differing needs.

The integrated model employs a stage-gate framework, which has proven to be highly successful in facilitating the development of new products. A series of go/no-go checkpoints (gates) act as quality control measures throughout the process, ensuring that only high quality outputs move on to future stages. This type of check is critical in the private sector, where escalating company resources are required to further development, but is also applicable to organizations using public funds in an effort to successfully introduce products into the marketplace.

The KT4TT team believes that the National Institute on Disability and Rehabilitation Research (NIDRR) grantees will significantly benefit from the introduction of such a model, which can be used as a roadmap not only for project implementation, but also for planning and grant proposal development. Interested individuals can check the KT4TT website for project updates, and will find the complete roadmap and database available in late 2009. ■

## Research Project 2

# Establishing the Context of Knowledge Production and Knowledge Utilization

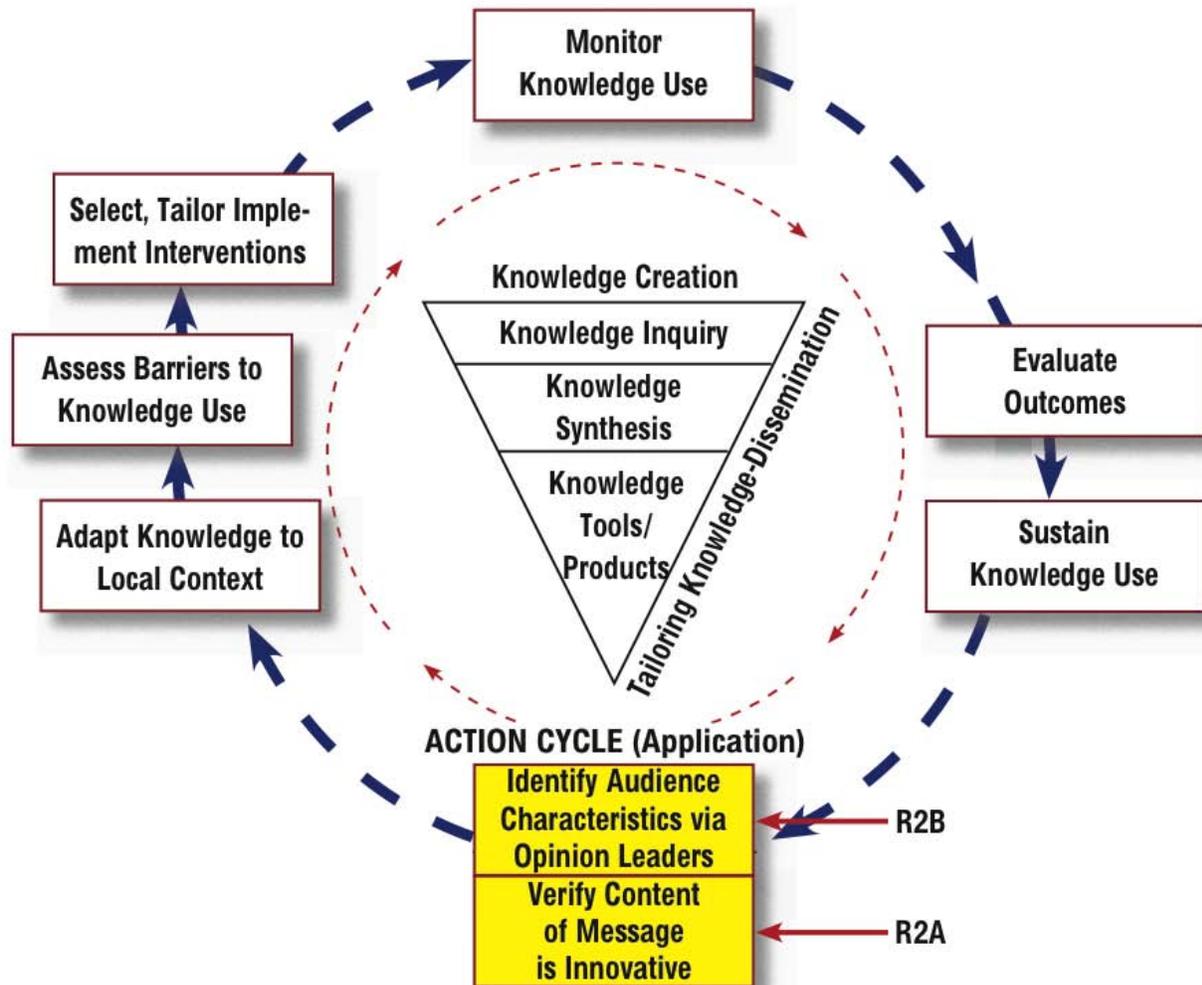
Project Lead: Joseph P. Lane

Research Project 2 (R2) is conducting qualitative research on the knowledge producers and on knowledge users to identify the barriers and carriers to knowledge utilization within three technology focus areas: 1) wheeled mobility; 2) sensory/AAC; 3) environmental access. To ensure the focus is on the barriers and carriers, the project will attempt to control for the quality of knowledge translated for use by others. That is, the project will identify and work with only those knowledge outputs deemed to be innovative. For technology-related knowledge, innovativeness is defined by three attributes: 1) novelty - the planned application is unlike anything else in the marketplace; 2) feasibility - the proposed technology platform can be replicated under reasonable constraints; 3) utility - the envisioned product or service will be valued by one or more target user groups.

R2 is focused on the first stage of the Knowledge to Action (KTA) Action Cycle, following the "end of grant" creation of new knowledge as shown in the figure (**R2 Activity is Limited to the First Step in KTA Action Cycle**). This is because the project is working with existing National Institute on Disabil-

ity and Rehabilitation Research (NIDRR) grantees that have already completed a prior cycle of funding as Rehabilitation Engineering Research Centers (RERC) or Small Business Innovation Researchers (SBIR), and therefore have already generated new knowledge through research activity.

## R2 Activity is Limited to the First Step in the KTA Action Cycle



R2A Grantee Innovation Profiles (GIP) will apply a case study methodology to identify innovations among the “end of grant” knowledge produced by participating RERC and SBIR grantees in the three selected technology areas. The RERC’s on AAC, Wheeled Mobility and Recreational Technologies are already engaged. The grantees are identifying knowledge outputs they nominate as innovative. The project is controlling for the quality of research by only considering studies published in the peer-reviewed literature or presented at juried conferences. Once the innovation is clearly defined to the satisfaction of the grantee, the project will enlist an external panel of experts to independently validate the innovativeness of the discoveries, and establish evidence-based benchmarks of the grantee’s prior dissemination and utilization outcomes for those innovations.

### R2A Case Study Research Questions:

1. What new knowledge has NIDRR technology grantees

produced through research projects that can be defined as innovative?

2. What barriers and carriers arise in identifying and meeting user needs through the application of research-based knowledge?
3. What knowledge innovations have potential value and utility to which categories of knowledge users?
4. What efforts have NIDRR technology grantees made to communicate these innovative knowledge outputs to potential knowledge users?
5. What barriers and carriers impact the depth and breadth of the diffusion of these knowledge outputs among the knowledge users?

R2B Knowledge Value Profiles (KVP) is extracting evidence of barriers and carriers to the knowledge utilization process for the six categories of knowledge users, across the three technology areas. It will establish knowledge values in the con-

text of each of the six categories of knowledge users, at the organization level of analysis. The project is creating a survey instrument that reflects the national organizations representing each of the six groups that will participate in identifying how they identify and validate new knowledge from research, and how they communicate such knowledge to their membership. This project is applying basic marketing practices to help NIDRR technology grantees define the culture, language and interests of their customers. In the prior RERC on Technology Transfer (T<sup>2</sup>RERC), the project team created product market profiles, to accurately and succinctly communicate the potential value of a prototype invention to potential licensing partners. This project will create something similar called Knowledge Value Profiles (KVP) - one for each category of target knowledge users. In a very real sense, the user's capacity to value new knowledge is analogous to a market's capacity to value a new product. The KVPs will map value structures for research-based knowledge and document evidence of recent knowledge utilization practices - all to effectively communicate the utility of a knowledge discovery to the various target audiences who are expected to acquire and apply these discoveries.

#### R2B Value Mapping Research Questions:

1. To what extent do national professional organizations and their memberships, value knowledge outputs from research centers?
2. What barriers and carriers arise in the valuation assessment of research by knowledge users within national organizations and technology sectors?
3. What capabilities do organizations and their members currently possess to successfully adapt and apply new research-based knowledge?
4. How and in what ways do knowledge users apply research knowledge (e.g., instrumental, conceptual or strategic forms of use)?
5. What evidence do organizations provide for recent use of research knowledge?

#### R2 Outputs

By the end of Year One of the Center on Knowledge Translation for Technology Transfer, the R2 Project will generate:

Twenty-four Pre-Intervention Measures of Knowledge Translation (KT) Attitudes and Behaviors – R2 will conduct pre-intervention measures of attitudes and behaviors about KT. R2A

will do so for the six NIDRR grantee's Project Investigators (PI) and R2B will do so for the eighteen organizations (six per technology area). The plan is to conduct a post-intervention measure of KT attitudes and behaviors, with the same individuals during the fifth grant year, to chart changes related to participation.

Six sets of Grantee Innovation Profiles – One set each for the validated innovation outputs from the three RERCs and three SBIRs. The total number of innovations within each set cannot be determined a priori, but the inclusion criteria for both groups ensure an adequate inventory of knowledge outputs from each grantee.

Three sets of Knowledge Value Profiles – one set consisting of six categories for each of the three selected technology areas. Each category will include at least one organization representing the individual users in that category. In some cases, the project may elect to contact more than one organization within a particular category, should they discover cause to create sub-categories of knowledge users.

Six Barrier and Carrier Matrices – one set for each of the three technology areas, each containing one matrix for the knowledge production system, and a second for the knowledge utilization system. These matrices will be assembled from the barriers and their related carriers, stratified by system level (individual, organization, sector) where they appear. The matrices will provide a case-based and category-based reference template for planning, implementing and managing the KT process to accomplish innovative knowledge outputs and knowledge utilization for technology transfer outcomes.

The information on carriers and barriers collected in year one, will be fed back into the Research Project 1 (R1), knowledge synthesis and integration process, and fed forward for use in Research Project 3 (R3), KT intervention study. The same information will be supplied to the Development Project 1 (D1), technology transfer demonstration project, and integrated into the Development Project 2 (D2), knowledge base. The utilization project will also apply this information to the dissemination, training and technical assistance activities. R3 will apply the findings from R2 in the context of its KT interventions, as described in the next study. The year five post-intervention surveys of producers and users will occur as part of R3. ■

# Knowledge Translation Intervention in Grantee Knowledge Innovations

Project Leads: Vathsala Stone and Machiko Tomita

Research Project 3 (R3) will develop and implement knowledge translation (KT) interventions in National Institute on Disability and Rehabilitation Research (NIDRR) technology grantee knowledge (K) outputs classified as “innovations” in order to study their effects on potential users. The study will include six interventions and cover the three technology areas addressed by the Center on Knowledge Translation for Technology Transfer (KT4TT). It will be conducted during years 2, 3 and 4 of the project cycle, implementing two KT interventions per year. One will be focused on RERC (Rehabilitation Engineering Research Center) innovations and the other on SBIR (Small Business Industry Research) innovations.

R3 will focus the study on K outputs from participating NIDRR grantees. Further, it will limit them only to outputs occurring at the “end of their grant”, as opposed to the K outputs generated at the start of the grant (i.e., implement “integrated KT”). Thus each innovation will be an “end-of-grant” output selected in a previous step in Research Project 2 (R2). It will be randomly selected from a pool of innovations generated by the grantee, classified by an expert panel as truly innovative and useful to multiple user categories.

The project will target six categories of knowledge users (KUs) for the study of intervention effects: other researchers (other than researchers on the chosen innovation), clinicians/practitioners, manufacturers, policy makers, brokers and consumers. It will apply the intervention at the end of grant stage and follow the steps of the Know Knowledge to Action Model’s Action Cycle to implement it and track its effects on users.

The KT intervention strategy will involve:

- (a) Development of six Contextualized Knowledge Packages (CKP) which will consist of the selected innovation K tailored to the specific user contexts as well as information and support material needed for its effective use; and
- (b) Delivery of the CKP to the six specific user samples through multiple channels.

The CKP will be used as a facilitating vehicle (Carrier) to accomplish the uptake and utilization of the NIDRR grantee knowledge by specific KU groups. Thus the overall implementation approach of R3 will follow the KTA Model, with the project team playing a facilitator role to promote knowledge use.

The procedures of R3 represent a “Scientifically Based Systematic Evaluation” of a KT intervention. It follows the steps of the action cycle of the KTA model, which are implicitly the steps for a “systematic evaluation” proposed by the context, input, process, and product (CIPP) evaluation framework (Stufflebeam et al., 1971; Stufflebeam & Shinkfield, 2007). Utilizing this evaluation framework, R3 will employ a randomized controlled trial (RCT) for its intervention study design, to study the differential effects of the KT strategy, the traditional knowledge dissemination utilization (KDU) strategy and no strategy (control group) on targeted users from each of six KU categories. The KDU strategy will consist of the dissemination of innovation in its original form while the KT strategy will involve disseminating translated formats of the innovation followed by training and technical assistance as needed. The project will track the depth and breadth of innovation diffusion and utilization among treatment and control groups using an instrument based on the framework for Levels of Use Scale proposed by Hall, Loucks, Rutherford and Newlove (1975). ■

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