

Technology Transfer: A New Model of the Innovation Process¹

Addiction Technology Transfer Center (ATTC) Network Technology Transfer Workgroup²

I. Introduction

As funders of substance abuse treatment increasingly require community treatment providers to use evidence-based practices (EBPs), it is imperative that the lag between development of an innovative treatment and its implementation into practice be shortened. Moreover, community treatment providers need assistance with the change process since implementing complex treatments demands significant personnel, clinical, and financial resources, usually over the course of several years.

The term *technology transfer* broadly describes strategies that promote the transfer of new technologies, practices, or skills, such as EBPs for substance use disorders, from one setting to another (Backer, 1991). Routine use of technology transfer methods in substance abuse treatment, however, lags behind that in fields like agriculture, communications, marketing and management, sociology, and even public health, which have been developing, testing, and refining technology transfer methods to successfully disseminate innovations for decades (Garner, 2008; Gotham, 2004; Rogers, 2003; Stirman, Crits-Christoph, & DeRubeis, 2004).

The Addiction Technology Transfer Center (ATTC) Network, funded by the Substance Abuse and Mental Health Services Administration's (SAMHSA) Center for Substance Abuse Treatment (CSAT) since 1993, is a national network of 14 Regional Centers and a National Office. Technology Transfer is the ATTC Network's mandate and mission. As a nationwide, multidisciplinary resource for professionals in the addictions treatment and recovery services field, the ATTC Network's purpose is to 1) raise awareness of evidence based and promising treatment and recovery service-practices, 2) build skills to prepare the workforce to deliver state-of-the-art addictions treatment and recovery services, and 3) change practice by incorporating these skills into everyday use for the purpose of improving addictions treatment and recovery outcomes. Over the past 17 years, the ATTC Network has amassed considerable experience and expertise in the successful transfer of technology within the substance abuse treatment field.

II. Need for a Conceptual Model of Innovation, including Technology Transfer

The history of technology transfer begins with theory and research on diffusion of innovations, which has its roots in a study of hybrid seed corn (Ryan & Gross, 1943). Although hybrid seed corn had advantages over standard seed corn, Ryan and Gross found that hybrid seed corn took 13 years to diffuse into communities in Iowa. They plotted the rate of adoption ("S-shaped adoption curve") and studied factors affecting diffusion, including individual farmer

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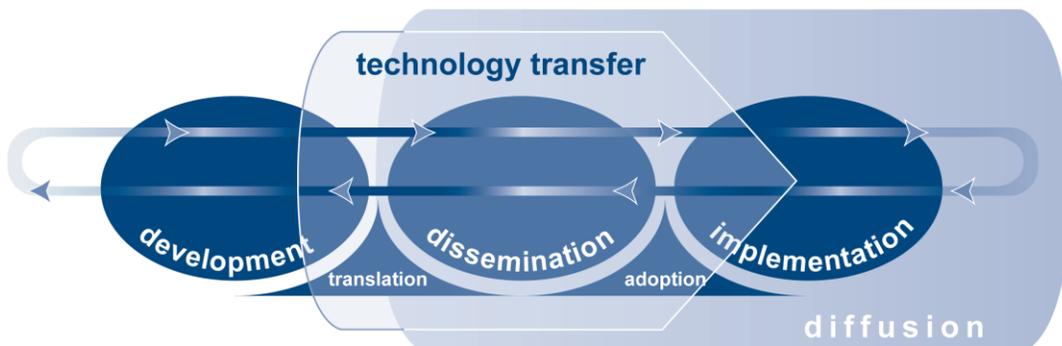
factors such as education, organizational factors such as farm size, and external factors such as the importance of exchanging information with neighboring farmers. This work was extended and popularized by Everett Rogers, whose research and seminal book *Diffusion of Innovations* (5th edition, 2003) led to an explosion in this area of study. By 2003 there were over 5000 publications related to diffusion of innovations (Rogers, 2004). Moreover, this body of work covered the whole lifespan of an innovation, from early development through its long-term application in practice or eventual rejection. Technology transfer represents part of this process.

The rapid ‘diffusion’ of diffusion of innovations theory and research of the past 45 years has led to multiple, overlapping theoretical models, a plethora of terms that are inconsistently and contradictorily used, and a great deal of research on specific aspects of the innovation process that are difficult to integrate into a coherent body. Thus, it is difficult to comprehensively test the validity and reliability of theoretical models related to the innovation process. A more uniform set of terms and definitions would allow for easier grouping of research results and communicating across disciplines. Addressing these issues could serve to better inform and standardize the process through which innovations are understood, investigated, communicated, and transferred to the field.

III. ATTC Network Model of Technology Transfer in the Innovation Process, Key Definitions, and Example

Through a process of research and theory review, consultation with experts in the field, and gathering of experience from members of the ATTC Network, the ATTC Network Technology Transfer Workgroup selected and defined seven key terms related to the innovation process and developed a comprehensive model of the continuum of diffusion of innovation. The ATTC model (Figure 1) illustrates the continuum of diffusion of an innovation from conception through implementation. This model draws on theory and research related to diffusion of innovations, implementation science, etc. It is not meant to supplant or correct other models. Rather, it provides a conceptual framework of the whole innovation process, into which various theories and models that refer to different parts of the process can be contextualized.

Technology Transfer in the Innovation Process



The innovation process begins with the development of a new innovation or technology, including its initial evaluation. Next, the innovation goes through translation where the essential elements and relevance of the innovation are explained and the innovation is packaged to

facilitate its spread. In dissemination, awareness about the innovation is promoted with the goal of encouraging its adoption. Adoption is not a single decision but a process of deciding to use the innovation. The final phase, implementation, is the incorporation of the innovation into routine practice in real-world settings. Technology transfer is a process that incorporates a set of focused, multidimensional strategies designed to intentionally promote and accelerate the movement of innovations through the continuum. Technology transfer is a dynamic, iterative process that spans the stages of later development, dissemination, and early implementation.

To further explain, next are the key terms and definitions, along with examples of how the model can be used to explain the substance abuse treatment innovation of Motivational Interviewing.

- a. Development – Creating and initially evaluating an innovation. An innovation can be an idea, technology, treatment or method.*

Rogers' (2003) suggested that developing a technology includes recognizing a problem/need and inventing a technology through basic and applied research. For evidence-based substance abuse treatments, it includes effectiveness research in the field, such as research conducted by community treatment agencies in the National Institute on Drug Abuse's (NIDA) Clinical Trials Network (CTN).

Example: Motivational interviewing is a counseling practice developed by William Miller and Stephen Rollnick (1991). Research shows that MI has a positive effect on retention in care (Carroll et al., 2006), and the effectiveness of MI in the field has been explored through NIDA's CTN (Carroll et al., 2002).

- b. Translation – Explaining the essential elements and relevance of an innovation, and packaging it to facilitate dissemination.*

As opposed to the National Institutes of Health (NIH) use of translation from basic or "bench" research to applied research (2010), in the ATTC Model, translation refers to the process of adapting knowledge or information from one form to another to promote its application. A prime example of translation is the NIDA/SAMHSA Blending Team products. Blending Teams include ATTC Network staff, NIDA researchers, and treatment providers from NIDA's CTN. The teams develop user-friendly products such as awareness kits and training packages that introduce treatment providers to an evidence-based treatment method. Thus far, Blending Team products have been created for buprenorphine treatment and its use in short-term opioid withdrawal, buprenorphine treatment in young adults, treatment planning, supervisory tools for motivational interviewing, and motivational incentives (see <http://www.ATTCnetwork.org/blendinginitiative>; Martino et al., 2010).

Example: The ATTC Network, in conjunction with NIDA's CTN, developed the *Motivational Interviewing Assessment: Supervisory Tools for Enhancing Proficiency* (MIA:STEP, 2006) product that provides mentoring resources to enhance the MI skills of counselors, as well as supervisory tools to fortify a supervisor's ability to provide structured, focused, and effective clinical supervision. The ATTC Network has also developed newsletters and articles that provide information about MI and the benefits of its use.

- c. Dissemination - Promoting awareness of an innovation with the goal of facilitating adoption and implementation. Dissemination strategies include raising awareness, building knowledge, and distributing materials.*

It is critical to have standard definitions of the key terms *dissemination* and *implementation* to clarify the difference between the two as they are often used interchangeably. The definition proffered here focuses on dissemination as awareness raising, versus implementation as actually using an innovation. Examples include delivering presentations, building knowledge through trainings, distributing informational materials via mail or internet, and utilizing marketing approaches. The ATTC Network frequently disseminates resources about evidence-based treatments by offering them on the ATTC Network website.

Example: ATTC Regional Centers conduct MI awareness and/or skill-building trainings with clinical staff and supervisors (e.g., between January 1, 2006 and March 31, 2010, ATTC Regional Centers conducted 583 events related to the MIA:STEP Blending Product).

- d. Adoption - The process of deciding whether to use an innovation. Adoption may or may not lead to implementation.*

The adoption stage is a decision or series of decisions that may lead to implementation. This stage includes a review of information pertaining to the innovation as well as the pros and cons of adoption. Some researchers suggest that adoption may also include a “trying on” period where the innovation is tried out or applied in a limited way.

Example: During the adoption process, the ATTC Network supports organizations to ensure they have the information necessary about MI so that they can authentically decide whether or not to implement it.

- e. Implementation – Incorporating an innovation into routine practice. Implementation ideally includes a range of strategies designed to address individual, organizational, and systemic characteristics (e.g., skills training, administrative buy-in, and policy changes).*

Implementation is the actual use of the innovation, rather than the earlier stage of dissemination which involves learning about an innovation. The new field of “implementation science” studies the effects of individual, organizational, and systemic characteristics on the process of implementation. Several models of the implementation stage itself have been developed that are applicable to substance abuse treatment (e.g., Fixsen et al., 2005; Simpson & Flynn, 2007). Moreover, Fixsen and colleagues (2005) describe the difference between “paper implementation” where policies or procedures related to an evidence-based practice are put into place, and “performance implementation” where the procedures and processes involved in an evidence-based practice are utilized with positive outcomes for consumers. Studies have shown that the extent to which an evidence based practice is implemented with fidelity to the original practice affects clients’ treatment outcomes (e.g., McHugo et al., 1999).

Example: ATTC Regional Centers support early implementation of MI in several ways: training on the MIA:STEP product with clinical supervisors in order to sustain the use of MI in clinical settings; ongoing technical assistance to program administrators around implementation; periodic coaching sessions with clinical staff to enhance and refresh their MI skills.

- f. Technology transfer - A multidimensional process that intentionally promotes the use of an innovation. Technology transfer begins during the development of an innovation, continues through its dissemination, and extends into its early implementation. This process requires multiple stakeholders and resources, and involves activities related to the translation and adoption of an innovation. Technology transfer is designed to accelerate the diffusion of an innovation.*

Technology transfer, then, spans from the late development of an innovation or technology, through its early implementation. The goal is to speed up the process of diffusion of innovations through active efforts aimed at multiple stakeholders.

Example: The ATTC Network is charged with providing a range of technology transfer services to accelerate the use of EBPs for substance abuse treatment. The Network is involved with activities related to MI from the translation stage (MIA:STEP Blending Product) through its early implementation.

g. Diffusion – The planned or spontaneous spread of an innovation.

This definition follows Rogers' (2003) use of diffusion as including planned and spontaneous spread of innovations. The model shows diffusion as an overarching construct that spans the whole innovation process following its development.

IV. Practical Applications of the Model of Technology Transfer in the Innovation Process

The ATTC Model has a number of practical applications for the substance abuse treatment field:

- Allows federal, state and other funders, program directors, and clinicians to more easily comprehend and appreciate the entire diffusion continuum, including the role of specific technology transfer activities;
- Clarifies the multi-tiered change process needed for successful implementation of evidence-based treatment practices;
- Assists stakeholders in determining how to invest limited resources to increase the utilization and monitoring of those interventions;
- Leads to more satisfaction with the change process and fewer failed attempts to use innovations;
- Helps stakeholders to assess where they are along the diffusion continuum and identify which activities are appropriate to facilitate the long-term implementation of an evidence-based practice.

V. Resources

The Workgroup has developed a number of resources that addiction and recovery professionals can use to improve services. The ATTC Network's comprehensive website (www.ATTCnetwork.org/technologytransfer) provides information to key stakeholders around the process of integrating addiction science into clinical practice through the lens of the ATTC model, including:

- Interactive version of the graphic through which individuals can review the characteristics of each process;
- Matrix outlining roles for policy makers, agency directors and/or clinicians throughout the innovation process;
- Slide presentations describing the ATTC Model and definitions;
- *The Change Book: A Blueprint for Technology Transfer* (ATTC Network, 2000), a technology transfer tool designed to assist agencies and staff in implementing change initiatives to improve treatment outcomes.

VI. Conclusion

For the past 17 years, the ATTC Network has utilized a variety of strategies on multiple levels within the treatment system to increase the sustained implementation of EBPs, and therefore, is in a unique position in the field to synthesize the work of a range of theorists on the diffusion of innovations, incorporate our experiences of diffusing innovations nationally, and propose a uniform theoretical framework. The ATTC Technology Transfer Workgroup believes that the ATTC model and definitions will help federal, state and other funders, program directors, and clinicians to better understand the innovation and technology transfer process; thus accelerating the use of more effective treatments and better serving people with substance use disorders.

VII. References

- Addiction Technology Transfer Centers. (2000). *The change book. A blueprint for technology transfer*. Kansas City, MO: Author.
- Backer, T. E. (1991). *Drug abuse technology transfer*. Rockville, MD: National Institute on Drug Abuse.
- Brown, B.S., & Flynn, P.M. (2002). The federal role in drug abuse technology transfer: A history and perspective. *Journal of Substance Abuse Treatment, 22*, 245-257.
- Carroll, K. M., Farentinos, C., Ball, S. A., Crits-Cristoph, P., Libby, B., Morgenstern, J., Obert, J. L., Polcin, D., & Woody, G. E. (2002). MET meets the real world: Design issues and clinical strategies in the Clinical Trials Network. *Journal of Substance Abuse Treatment, 23*, 73-80.
- Carroll, K. M., et al. (2006). Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: A multisite effectiveness study. *Drug and Alcohol Dependence, 81*, 301-312.
- Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M., & Wallace, F. (2005). *Implementation research: A synthesis of the literature* (FMHI Publication No. 231). Tampa: University of South Florida, Louis de la Parte Florida Mental Health Institute, the National Implementation Research Network.
- Garner, B. R. (2009). Research on the diffusion of evidence-based treatments within substance abuse treatment: A systematic review. *Journal of Substance Abuse Treatment, 36*, 376-399.
- Gotham, H. J. (2004). Diffusion of mental health and substance abuse treatments: Development, dissemination, and implementation. *Clinical Psychology: Science and Practice, 11*, 160-176.
- Martino, S., Brigham, G. S., Higgins, C., Gallon, S., Freese, T. E., Albright, L. M., et al. (2010). Partnerships and pathways of dissemination: The National Institute on Drug Abuse—Substance Abuse And Mental Health Services Administration Blending Initiative in the Clinical Trials Network. *Journal of Substance Abuse Treatment, 38*, S31-S43.
- McHugo, G. J., Drake, R. E., Teague, G. B., & Xie, H. (1999). Fidelity to assertive community treatment and client outcomes in New Hampshire dual disorders study. *Psychiatric Services, 50*, 818-824.
- Miller, W. R. & Rollnick, S. (1991) *Motivational Interviewing: Preparing People to Change Addictive Behavior*. New York: Guilford Press.

- Rogers, E. M. (2003). *Diffusion of Innovations*. (5th ed.). New York: Free Press.
- Rogers, E. M. (2004). A prospective and retrospective look at the diffusion model. *Journal of Health Communication*, 9, 13-19.
- Ryan, B., & Gross, N. C. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology* 8, 15.
- Simpson, D. D., & Flynn, P. M. (2007). Moving innovations into treatment: A stage-based approach to program change. *Journal of Substance Abuse Treatment*, 33, 111-120.
- Stirman, S.W., Crits-Christoph, P., DeRubeis, R.J. (2004). Achieving successful dissemination of empirically supported psychotherapies: a synthesis of dissemination theory. *Clinical Psychology: Science and Practice*, 11, 343-359.