

International Encyclopedia of Rehabilitation

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Knowledge Translation

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Knowledge translation (KT) encompasses not only dissemination and uptake of information, but also the targeted production, vetting and synthesis of scientific knowledge, with users' direct involvement and ultimate benefit through the use of evidence-based applications. People engaged in KT—whether researchers, product developers, or consumers—seek to close the gap between what people know and what they do. KT efforts improve return on research investment because the public can rely on resources informed by analysis of available evidence. As a process, KT is focused on producing change-based outcomes with specific target systems and/or groups.

The process of KT was conceptualized and advanced by the medical community. Its genesis was in response to the growing perception of a gap between what was known to work through rigorous research and what medical professionals and practitioners continued to do in daily practice. KT has been defined in various ways, generally and within the field of disability. This article will provide an overview of the KT process, key characteristics and the relationship of KT and research dissemination, and the Canadian Institutes of Health Research Knowledge to Action model as a prime theoretical example. Information will be provided about case studies of KT in disability research, challenges in doing KT and in measuring KT impact, and various directions the KT field is likely to take.

Terms related to Knowledge Translation

KT and similar processes go by many names. Graham et al. (2006) researched the number of terms related to KT that 33 applied health research funding agencies used and found 27 labels:

Figure 1: KT terms used by 33 applied health research funding agencies

- applied health research
- capacity building
- co-optation - cooperation - competing
- diffusion
- dissemination
- getting knowledge into practice
- impact
- implementation
- knowledge communication

- knowledge cycle
- knowledge exchange
- knowledge management
- knowledge translation
- knowledge mobilization
- knowledge transfer
- linkage and exchange
- popularization of research
- research into practice
- research mediation
- research transfer
- research translation
- science communication
- teaching
- "third mission"
- translational research
- transmission
- utilization (Source: Graham et al. 2006).

Source: Tetroe JM, Graham ID, Foy R, Robinson N, Eccles MP, Wensing M, . . . Grimshaw JM. 2008. Health research funding agencies' support and promotion of knowledge translation: An international study. *The Milbank Quarterly* 86(1):125-155. Reprinted with permission of Milbank Memorial Fund.

McKibbin et al. (2010) have built on this work, extending the list of terms to 100 and conducting statistical analyses to determine which ones, when used as search terms, provide information regarding particular aspects of KT. Their search was much broader conceptually, with 'use' the most common term appearing in articles treating KT themes. McKibbin and her team also point out that in nursing, 'research utilization' is often employed; The National Rehabilitation Information Center (2007) notes that this term is also very prevalent in disability and rehabilitation research.

The World Health Organization (WHO) uses the term "knowledge translation" in conjunction with citing the 'know-do gap' (WHO 2005). In 2006 it published a bulletin on knowledge translation in global health that included several articles pertinent to theorizing KT and to disability topics, such as HIV/AIDS, mental health and alcoholism (WHO 2006). The WHO emphasizes that KT is a "strategic process" that should promote "the best available evidence" to inform policy and practice in ways that benefit the public (Pablos-Mendez et al. nd; WHO 2006). The bulletin also notes that issues central to KT have been a priority for several international organizations engaged in disability and health-related initiatives since the 1990s, including the:

- Commission on Health Research for Development, WHO;
- UNESCO [United Nations Educational, Scientific and Cultural Organization];
- UNDP [United Nations Development Programme];
- World Bank;

- International Health Policy Program;
- International Clinical Epidemiology Network;
- Alliance for Health Policy and Systems Research; and the
- Agency for Healthcare Research and Quality. (Nuyens and Lansang 2006)

Internationally, given urgent health and related disability concerns in non-Western nations, engaging in KT activity has been a priority for these entities. Defining KT concepts and articulating these into theories and models for action, however, has been primarily a North American and European activity, with particular prominence among Canadian scholars.

KT Scholarship

Scholarly work on KT has focused on defining it, theorizing components of related processes, synthesizing these parts into models, and thinking through how best to evaluate the impact of KT initiatives.

Definitions

Given the sprawling nature of the KT concept, scholars and policymakers have sought to synthesize and bind the related terms into more precise yet still comprehensive definitions. For example, the Canadian Institutes for Health Research (CIHR) states:

KT is a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system. This process takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user. <http://www.cihr-irsc.gc.ca/e/29418.html>

In 2009, the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR) published its proposed [Long-Range Plan](#) for the years 2010 through 2014. The document outlines how NIDRR fulfills its legal mandate through supporting research and development, capacity building and KT. It defines KT as a:

Process of ensuring that new knowledge and products gained through research and development will ultimately be used to improve the lives of individuals with disabilities and further their participation in society. Knowledge translation is built upon and sustained by ongoing interactions, partnerships, and collaborations among various stakeholders, including researchers, practitioners, policy-makers, persons with disabilities, and others, in the production and use of such knowledge and products (NIDRR 2009).

Developing KT Theories

KT researchers also build theories regarding the determinants of knowledge use and effective methods of promoting this uptake of knowledge.

KT vs. "diffusion", "dissemination" and "research utilization"

Early work on the concept of research utilization considered processes of knowledge diffusion generally, with Rogers' work on the diffusion of innovation leading the way in the early 1960s (Rogers 1995). He described the characteristics of innovations that catalyzed users' adoption: relative advantage, compatibility with "existing values, past experience and needs of potential adopters," degree of complexity (with less favoring greater degree of adoption), "trialability" (or the ability of users to experiment with the innovation while considering its adoption) and observability of benefits post-adoption (Rogers 1995). His work influenced later theories of social marketing, foreshadowing concepts like audience segmentation, market research, branding, price-setting and use of communication channels over which advertisers have control.

This kind of scholarship on diffusion, dissemination and utilization (D&U) and research utilization tended not to critique the content of whatever innovation was proposed but rather to analyze the processes of its diffusion and uptake. "Diffusion" among communities of researchers typically meant letting it happen, publishing in journals primarily focused at the academic community and other researchers. Diffusion theory realized the strong connection between personal involvement and uptake. Adoption of innovations occurred most predictably when a person was available to answer questions and provide technical assistance. Another early term, "dissemination," implied involvement in activities and included tailoring the message sometimes derived from research findings for specific target audiences. "Application" refers to moving research into practice or policy once the strength of evidence is sufficient to ground training and widespread dissemination and or targeted consultation. This approach to getting research findings out into the hands of the public is still common. In KT scholarship, it is known as "end of grant KT," a term that researchers in the KT field typically apply to research result dissemination efforts at the end of the grant funding cycle (Westbrook and Gagnon 2009).

"Integrated" KT

More often, contemporary KT scholarship promotes "integrated KT" (Kitson and Bisby 2008). This way of doing research, consistent with the CIHR and NIDRR definitions above, is collaborative and participatory. It involves engaging and integrating knowledge users into the research process. Within this process knowledge users can include a variety of people who have specific needs that can beneficially be advanced through research, are in need of the answers to specific voiced research questions and want to use those results. Knowledge users and researchers work together to shape the research questions, decide on the methodology, help with data collection and tools development, interpret the findings, craft messages around them, and suggest strategies to move the research results into practice, through widespread dissemination and application.

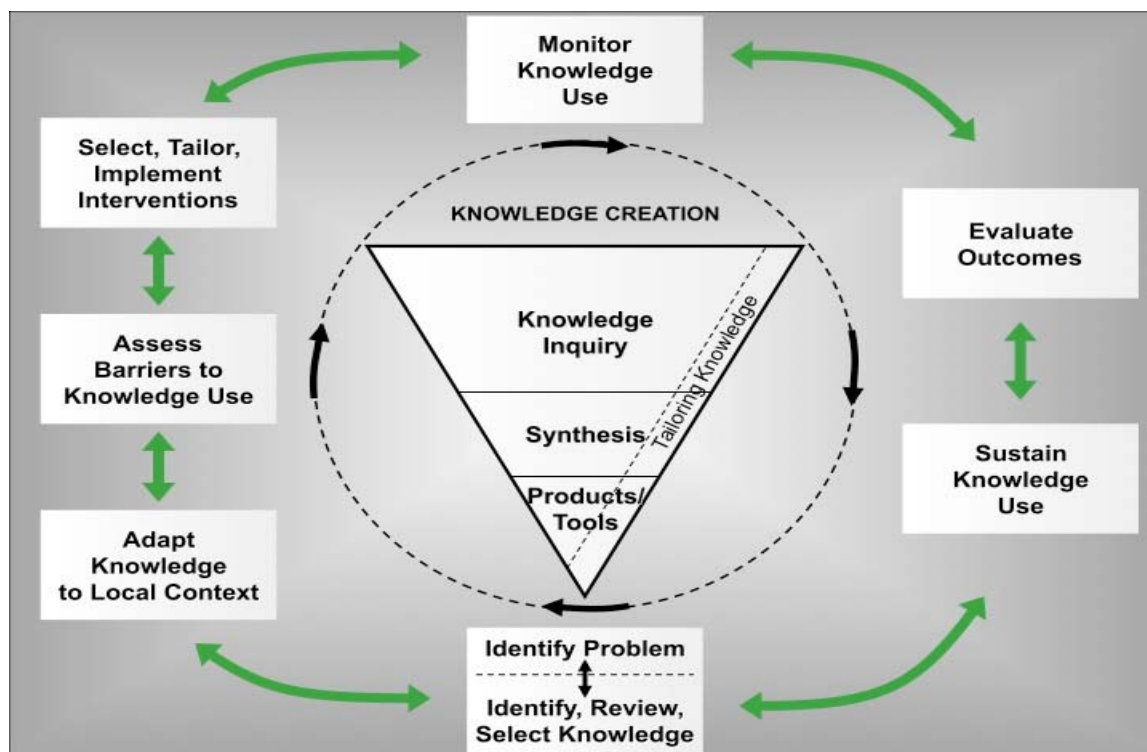
Integrated KT has a number of benefits. Through partnerships, the research is strengthened. The research can be more solutions-based because there is an end-user involved in developing the research question. The findings can have more impact because the end-users are engaged and interested, ready for results and willing to use the results because they are of direct relevance to their day-to-day lives.

Models of KT in Action

Sudsawad (2007) offers a helpful overview of several theoretical models, including the KTA model described below; the other models she points out "can be used to augment an understanding of the specific components, chronological stages and contextual factors that must be taken into consideration to facilitate successful communications, interactions, partnerships, and desired outcomes." A related initiative was that of the "KT Theories Group" led by Graham and Tetroe (2009). They reviewed 31 planned action theories, including those that focus on KT, and came up with a model that synthesizes them. Called the "Knowledge to Action Model," it has been used as a fundamental part of its framework by the NIDRR-funded project Center for Knowledge Translation for Technology Transfer at the University of Buffalo (see <http://kt4tt.buffalo.edu/development/D2/index.php>). While KT has heavily incorporated research into its process design, it is the case that professionals in the Development arena are also initiating efforts to combine KT and other concepts such as Technology Transfer to maximize outcomes.

The KTA model is represented in Figure 2 below. The diagram contains two parts: the Knowledge Creation Cycle that illustrates the process of knowledge creation, and the Action Cycle, which illustrates the process of knowledge application. The Knowledge Creation Cycle is in the center of the diagram with the Action Cycle in a circle around the outside.

Figure 2. "Knowledge to Action Model" (CIHR)



Source: Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, Robinson N. 2006, Winter. Lost in translation: Time for a map? The Journal of Continuing Education in the

Health Professions 26(1):13-24. Reprinted with permission of *The Journal of Continuing Education in the Health Professions*.

The triangle or cone shape in the middle symbolizes knowledge creation. The process has three components: knowledge inquiry, synthesis, and products and tools. Knowledge inquiry pertains to primary research, which should be relevant to a pre-identified gap in the knowledge base before it is applied to address that need. Ideally, researchers investigate questions that knowledge users want to ask and problems that they are facing, so that their findings will contribute to solutions. The next component of this cone shape is knowledge synthesis, the contextualization and integration of research findings of individual studies from a larger body of knowledge on a topic. It represents a family of methodologies for determining what is known in a given area, and what the knowledge gaps are. This process is discussed in more detail in the systematic review section below. Moving down through the funnel, knowledge is distilled and refined and presumably becomes more useful to those who develop and use the resulting research-based products and tools.

Getting into the cycle itself, the first step is to identify the problem and review and select knowledge that would help address it. There is an interactive process between those who produce knowledge and those who aim to use it through which they come to consensus about what knowledge is needed in a particular area.

Once the knowledge is synthesized and relevant to a problem, it needs to be adapted to the local context. One must consider which key message and format would be usable to knowledge users and help them in their local context. Crucial to full expression of this step is working very closely with those who will be using the knowledge to understand the variables in their environment that may affect how knowledge should be adapted to that context. Understanding that context means assessing organizational and team barriers to knowledge use, the incentives to participate in the process of using that knowledge, and identifying the most appropriate mechanisms or strategies to using the knowledge within that context.

In the KTA schema, knowledge use must be monitored iteratively. Key questions are: How is the knowledge being used? Have the potential barriers to it been overcome? The assessment process continues through the cycle. More formal evaluation of the outcomes of the cycle is also important to understand how to assess the impact of the application and use of knowledge and to draw upon valid evaluation tools and select appropriate outcomes to measure in that particular context.

Finally, one considers sustainability and considers how long the skills and knowledge are maintained. Has a need and appreciation for using the knowledge been created and maintained? Is it sustainable? That is the last stage in the cycle, which then begins again.

KT Evaluation

As is apparent from the inclusion of "monitor knowledge use," "evaluate outcomes" and "sustain knowledge use" in the KTA cycle, an important part of the KT field is evaluating implementation processes and assessing outcomes. Researchers engaged in the KT field study the determinants of knowledge use and effective methods of promoting the uptake of knowledge.

The goal of this type of research is to understand what makes KT processes work and why and what are their active ingredients.

Research projects about KT investigate functions that can be measured, such as changes in awareness or attitudes, learning outcomes, behavior, policy or opportunities for people with disabilities to enjoy improved products or services. Pre/post measures are often used to assess an individual's change in awareness or attitude. Behavioral changes can be assessed from observation and information collection. Environmental changes may relate to many different types of sectors and values and are much more difficult to assess.

A review of KT evaluation projects is beyond the scope of this article, but some good overviews are:

- The KT Casebook (CIHR 2009). It brings together the groups of researchers and knowledge users whom the CIHR funds to learn more about their experiences with the KT process—successful and less than successful—to understand what the ingredients are that make it work.
- The research utilization demonstration projects of the NIDRR-funded Research Utilization Support and Help (RUSH) project (<http://www.researchutilization.org>)
- The University of Texas Health Science Center's Web site KTEExchange.org: <https://ktexchange.sph.uth.tmc.edu/>
- The journal *Implementation Science* (www.implementationscience.com) frequently publishes articles of relevance to KT projects.

Systematic Review

"Synthesis" is included in the KTA model's central triangle. Another major branch of work related to KT highlights the difference between previous understandings of moving research to practice and KT: in the concept of KT there is a need to identify what is "known" in answer to a specific question. From the KT perspective, analysis of the best available relevant rigorous research results produces knowledge that is ready to be utilized. Evidence results from the aggregation of similar relevant and rigorous research results bearing on answering a single question. The intervention, drug, or practice studied is as close to being proven effective or ineffective as contemporary science can deem it to be, given the current body of relevant research. Consequently, research findings may help individuals and organizations to make decisions and develop policies grounded in evidence. The process makes sense of what might be competing research results or different types of research designs that may have otherwise led into conflicting applications to practice.

Two organizations support the production, collection, and access to systematic reviews, The [Campbell Collaboration](#) and [The Cochrane Collaboration](#). The Campbell Collaboration is an international group of researchers oriented around issues of behavioral and social research, including education, which recently initiated a new [subgroup in the area of disability](#). The Cochrane Collaboration focuses on health care research areas and issues. Within [The Cochrane Collaboration](#), there is a [Rehabilitation and Related Therapies Field](#) group.

Other organizations have related missions in that they promote the production and use of evidence syntheses. Examples are the University of London's [EPPI-Centre](#), (Evidence for Policy and Practice Information and Co-ordinating Centre). It assists legislators to identify research bases related to proposed and existing policy. The Joanna Briggs Institute (www.joannabriggs.edu.au) in Australia focuses on incorporating quantitative and qualitative research into evidence syntheses. Most others are located in the U.S. and Canada.

Challenges to KT as applied to Disability and Rehabilitation

KT processes are ambitious, complex and long term. Unsurprisingly, they confront numerous challenges.

Johnston et al. (2009) identify several issues that inhibit the inclusion of disability research results into systematic review evidence pools. Among them are the frequency of small sample sizes due to low prevalence of many conditions; frequent lack of randomization; difficulties in complete blinding or placebo control; and the nature of research questions in the field that are inherently broad, complex and engage social, physical and economic environments in order to address disability in a theoretically sophisticated way.

How to include consumers

Consistent with emphasis of Participatory Action Research, or "PAR" (Oregon Health and Science University, 2010), many researchers in the field of disability and rehabilitation include people with disabilities in active roles on their projects when selecting research topics, formulating questions and designing the research and related instrumentation. Level of involvement varies from full colleague to occasional reviewer. Challenges to this aspect of knowledge translation (from researchers' perspective) are finding people who are interested and available. Other challenges are ensuring such participants receive appropriate remuneration and are fully included rather than being shut out by technical and scientific lexicons and concepts.

Ensuring consumers' timely access to quality research

Once a particular study is completed, it may not be clear if its results should be publicized. Vetting research related to specific consumer needs requires an infrastructure that facilitates access to relevant evidence when it is needed. The "integrated KT" approach implies direct involvement of both researchers and users. Others involved in NIDRR's U.S. disability research portfolios have suggested the value of a "knowledge broker" model (Blasiotti 1992). This approach includes personal technical assistance to facilitate decision-making and adoption/adaptation.

Consumer literacy

Literacy barriers are of special pertinence to those with cognitive disabilities. Nearly half of Americans have medium to low levels of health literacy (Davis et al. 2002, cited in Len-Rios 2009). Over 300 studies demonstrate that most health materials are beyond the comprehension skills of most Americans (Rudd, Joeykens, and Colton 2000, cited in Zarcadollas and Pleasant 2009). KT recognizes and provides relevant information in a user-friendly, accessible manner. The Cochrane and Campbell Collaborations produce 1-2 page user abstracts or plain language summaries of systematic reviews designed for general readers.

Cultural competency

Other aspects of identity, in addition to the disability status, can contribute to disparate access to research and the pertinence of those findings to the user. For example, membership in an underserved racial/ethnic group may hamper access to research (Len-Ríos 2009) due to the fact that most research is published in English text, so consumers who do not read English are hindered. Stone (2005) offers suggestions tailored for rehabilitation professionals who work with specific ethnic and cultural groups.

Future Directions

As the field of KT matures, some current trends may intensify:

- Increasing research about KT processes is occurring so as to increase effectiveness and understanding.
- Developing methods of synthesizing and integrating qualitative studies in evidence-based analyses.
- KT is becoming more international and requires an infrastructure to support its informational components. The Open Access movement promoting no-cost online access to journal articles, communities of practice, and social networking platforms are being applied in the scientific realm more frequently and allows more people to reach better informed decisions.
- KT as a process is moving out of healthcare into psycho-social and behavioral areas.
- KT effectiveness is being measured in terms of the changes it produces.
- KT is increasingly being included in research project designs to plan for measurable use and resulting change.

There will be a growing emphasis on "how research methods can answer the questions that practitioners are asking," so that there is not only more evidence-based practice, but more "practice-based evidence and practice-based theory" (Crosby, DiClemente and Salazar 2006). Accomplishing this goal may be contingent upon the creation of new specialized roles and infrastructures.

For Further Reading

Included in the list of references below are several reviews of literature for those readers interested in more detail such as Harrington et al. (2009) and Sudsawad (2007). Below is a list of links that provide additional resources related to KT concepts, theories, tools and case studies:

- KT Clearinghouse: <http://ktclearinghouse.ca/>
- KT Canada Seminar Series (March 12, 2009, Ethical Challenges in KT Research): <http://ktclearinghouse.ca/ktcanada>
- KT Casebook: http://www.cihr-irsc.gc.ca/e/documents/kt_casebook_e.pdf
- CIHR website: <http://www.cihr-irsc.gc.ca/e/29418.html>

- What is Knowledge Translation? (NCDDR, FOCUS #10)
<http://www.ncddr.org/kt/products/focus/focus10/>
- Overview of International Literature on Knowledge Translation (NCDDR, FOCUS #14)
<http://www.ncddr.org/kt/products/focus/focus14/>
- Knowledge Translation at the Canadian Institutes of Health Research: A Primer
<http://www.ncddr.org/kt/products/focus/focus18/>
- Library of KT Resources: <http://www.ncddr.org/ktinfocenter>
- What is Knowledge Translation?
- http://www.idrc.ca/research-matters/ev-125530-201-1-DO_TOPIC.html

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