DEVELOPING KNOWLEDGE TRANSFER AND MOBILIZATION STRATEGIES

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Introduction

Research is the foundation to increase understanding of social problems, to develop, and to identify policies and interventions that create measurable benefits for society. Yet benefits are only achieved when research is translated and used in the real world to effectively manage and reduce social problems. Hence, research must be accessible, meaningful, understandable and relevant to practitioners, but also usable according to their context, environment or system.

For this reason, the science of knowledge transfer (KT), knowledge mobilization (KMb), and knowledge utilization (KU) are a growing source of interest across disciplines, particularly in light of economic challenges and increasing demands for improvements and efficiencies in social life. There is a body of research on KT and the utilization of knowledge that spans more than fifty years and cuts across at least fourteen different disciplines (Kramer and Wells 2005).

In the past decade, knowledge transfer and mobilization have been recognized as critical elements of the research process, often in health, social work and education fields (Graham and Logan 2004; Straus et al. 2011; Levin 2011). Knowledge transfer has also become a science, and research to develop theoretical models and study the effectiveness of strategies is underway worldwide, but the development of an evidence-base is still in its infancy (Lyons and Warner 2005).

Knowledge transfer and mobilization remain relatively new fields of inquiry in road safety. This issue is perhaps more challenging to address because of its inherent complexity. Not only is it multidisciplinary, involving diverse research methods and researchers representing the distinct domains of transportation, public health, criminal justice, psychology, addictions and neuroscience to name a few, but it is further embedded within broader systems involving different communities of practice and interest.

However, this challenge cannot be ignored in light of data clearly illustrating that road crashes are a leading cause of fatalities and injuries worldwide, and that this problem will become progressively worse without concerted action (WHO 2007; Mathers and Loncar 2005). The social and economic costs of road traffic injuries are equally profound with the global cost estimated to be US$ 518 billion per year (Jacobs et al. 2000).

As such, there is an immediate and pressing need for road safety researchers to coalesce around this issue. Vast knowledge has been accrued in more than five decades of research. The onus is now on both researchers and practitioners to collaborate and ensure it is readily available to inform decisions, to guide the

implementation of evidence-based programs, policies and interventions, and, ultimately, to save lives – from break-through to follow-through. "While important questions about injuries and their prevention and control remain, as scientists we need to ensure that the knowledge about effective strategies for reducing the injury burden is translated and used" (Frattaroli et al. 2008; p.412).

Understanding knowledge transfer

Knowledge transfer refers to the process of ensuring that rigorous and sound research results are effectively communicated to an appropriate audience in order to inspire and motivate them to alter their behaviour in the real world to produce better outcomes. The overarching goals of knowledge transfer models are somewhat consistent and emphasize the importance of selecting and focusing on a specific audience, taking appropriate steps to make new knowledge created by one group meaningful, usable, and available to a different group, and establishing relationships and engaging with others to create new knowledge that is context-specific (Kramer and Wells 2005).

A range of terms are used in the literature to describe the knowledge transfer process, including knowledge exchange, knowledge mobilization, knowledge management, knowledge utilization and knowledge diffusion. While these terms are sometimes used interchangeably, in many cases they often refer to different things (Lyons and Warner 2005).

In Canada, the most recognized definition of knowledge transfer is "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge". This definition was developed by the Canadian Institutes for Health Research (CIHR) and underscores that KT is a complex process that reflects a continuum of activities beginning with the creation of new knowledge and ending with the application of it in the real world with tangible benefits for society. According to this definition, researchers and end users collaborate to inform the entire research process (Tetroe 2007). The World Health Organization (WHO) has also adapted CIHR's definition with an emphasis on accelerating the benefits of global and local innovation (Sudsawad 2007).

Although specific definitions may vary across disciplines, some of the key features of definitions are generally similar and incorporate the following concepts. First, both individuals and organizations are inherently resistant to change, and perhaps nowhere is this fact more abundantly clear than in the field of road safety. To illustrate, despite clear and convincing evidence that drinking and driving is an unsafe behaviour that can exponentially increase a driver's crash risk, a minority of drivers persist in this behaviour. They continue to be responsible for approximately 30% of road deaths in many Western countries. Similarly, there is a significant body of research demonstrating the benefits of specific features of graduated driver licensing programs, yet many licensing agencies have been slow to adopt nighttime and passenger restrictions.

Second, knowledge transfer requires more than a one-way push. It is unlikely that new knowledge will be spontaneously implemented or widely adopted without intensive efforts (Ward et al. 2010). Traditional, passive approaches to the dissemination of research findings have had little success and often do not produce much sought-after changes in behaviour (Lyons and Warner 2005; Ward et al. 2010). Perhaps the most poignant example of this is the case of alcohol ignition interlocks. A wealth of research clearly demonstrating the effectiveness of this device in reducing re-offending among repeat and first-time drunk drivers while it is installed has been amassed in the past two decades. Yet jurisdictions still struggle to convince policymakers that all offenders should be subject to interlock supervision. Of greater concern, they fail to ensure that these devices are even installed with regularity. In reality, knowledge transfer requires a two-way process involving extensive dialogue, and exchange of information and understanding (Ruth 2006).

Third, knowledge must be filtered and distilled to make it usable for a particular audience or within a specific context. There is no doubt that knowledge is more readily used if it is relevant, compelling, tailored to the audience, and visually interesting (Kramer and Wells 2005). In today's environment, professionals are increasingly tasked with ever-growing responsibilities and required to accomplish more with shrinking resources. This creates an untenable situation for practitioners who frequently lack the capacity, the access, and the ability to identify and gather relevant research and apply it to day-to-day operations in a meaningful way. As a consequence, ineffective practices are continued, the delivery of programs and services is sub-optimal, and precious resources are poorly spent.

As in every field, reaching a common consensus on one specific definition of a relatively broad and encompassing concept is extremely challenging due to disciplinary divides. For example, in road safety, there has been considerable debate regarding the definitions of distracted and fatigued driving, not only as knowledge grows but also as disciplines seek to clarify important nuances that are unique to their field. So it is quite likely that the definition of knowledge transfer will also continue to evolve as more organizations become invested in this issue.

Knowledge transfer models and key features

To date, despite growing interest in the field of knowledge transfer, the fact remains that many existing theories are either unknown or not well understood among researchers, much less a broader audience. This may be due, in part, to the tendency of disciplines to function as "silos", resulting in isolation and the failure to recognize the cross-cutting nature of issues. Moreover, although a variety of disciplines have undertaken to develop theories and models, in fact few have been empirically tested, much less with any degree of rigor (Tetroe 2006). As such, there is much work that remains in this field.

While there is a substantial breadth of theories and models that are relevant to this science, there are a few key models that are relevant to the Traffic Injury Research Foundation's (TIRF's) knowledge transfer activities. These are described briefly below to provide context for TIRF's approach.

Planned change or planned action model. These theories are highly relevant to knowledge transfer efforts, and commonly provide a foundation, to varying extents, for knowledge transfer models. Planned change theories provide a set of rationally organized and inter-connected concepts that methodically describe the processes by which planned change takes place, anticipates how different elements in the environment will respond under specified conditions, and assists change agents in managing and controlling factors that may either enhance or detract from the potential to achieve the desired outcomes (Tetroe 2006). Common features associated with these models include: a clear problem statement, specified knowledge, innovation or evidence to be applied, a target audience and environment, the actual intervention or implementation of the knowledge, the adoption or use of the knowledge, and measurement of outcomes (Mitton et al. 2007).

Generally speaking, the main objective of these models is to deliberately engineer change. Although the model may appear to focus on the individual or groups of individuals, in fact it generally seeks to ultimately change the way that tasks are completed on a much larger scale within social systems. Unfortunately, while clear descriptions of features are provided, often lacking are substantive explanations of how to achieve them (Avolio and Bass 1993; Patton and McCalman 2008).

Social interaction model. The social interaction model posits that personal relationships and interactions between the source of the knowledge and the target audience are critical elements to ensure that research is applied and used by practitioners (Landry et al. 1998; Kramer and Wells 2005). Two main objectives of this type of model are to build relationships with end users to strengthen the utility and implementation of the research (Kramer and Wells 2005) and to make research available and understandable to decision-makers such that it can be applied in practice. This model suggests that more intensive and sustained interactions between researchers and the target audience increase utilization. Some of the key factors highlighted in this model that explain utilization include the types of research products, interest of the audience, efforts to disseminate the products and linkage mechanisms (Landry et al. 1998).

It warrants mentioning that there are some differences across models. Some of them propose that sustained and intense collaboration between researchers and end users involves systematic and structured interactions that are initiated with a precise need and continued throughout the entire process to ensure the knowledge is adapted to meet the needs of the target audience (Lee and Garvin 2003). Conversely, others argue that the use of knowledge is a function of somewhat chaotic interactions between researchers and the audience and the strength of these may vary at different stages in the process (Landry et al. 1999).

Knowledge utilization model. These models, which are more prevalent across disciplines, seek to explain the process by which knowledge is used and applied in practice. One particular goal of some models that are most relevant to road safety is to explain the interaction and negotiation that occurs between the two fundamentally different systems of science and policy

and the factors that mediate this process (Wingens 1990). In addition, some models also distinguish between the different ways that knowledge can be used (e.g., conceptual use, instrumental use and symbolic use) (Sudsawad 2007).

Such models emphasize some key principles that knowledge transfer activities must incorporate to ensure that knowledge is utilized and applied in the real world. These include the quality of the knowledge to be transferred and the level of credibility associated with its source, the context and environment of the end users, the quality of the partnership between the knowledge broker and the end users, and the way in which the use of the knowledge is evaluated (Kramer and Cole 2003).

One important finding emerging from this field is that the extent to which knowledge is utilized may be more of a function of factors pertaining to the behaviour of the researchers and specific context of the end users rather than the actual qualities or characteristics of the knowledge products that are created (Landry et al. 2001).

Network models. These models examine the movement of knowledge, resources, activities, and learning between different entities to understand how the creation of information networks changes the behaviour of individuals and organizations. One of the fundamental concepts associated with network models is the idea that the relationships or connections between individuals and groups can be fragile or strong, and this can vary according to how closely and how often people interact, and the level of exchange that occurs between them. Of interest, each of these types of relationships can be beneficial depending on the intended objectives (Kramer and Wells 2005).

There are some important lessons that stem from these models. First, networks are developed and sustained by making possible the movement of information, services, resources and products from one audience to another. They are also dynamic and require attention and care, and can be enhanced by the continued presence of individuals who can connect researchers and end users. Each entity or group in the network also requires a leader who can establish solid linkages with leaders from other groups to enable knowledge exchange and the strengthening of linkages across groups (Kramer and Wells 2005).

Knowledge broker models. Knowledge transfer can be greatly facilitated by introducing a human element into the process using a knowledge broker. Brokers are credible individuals who are capable of selecting persons who are interested in an issue and bringing them together such that they can exchange ideas and collaborate to develop evidence-based solutions. The role of brokers is to build and facilitate relationships and networks to enable the sharing of research and ideas to inspire and motivate new work. Knowledge brokers are the foundation to make evidence-based decision-making possible because they encourage the relationships and linkages that facilitate knowledge transfer (CHSRF 2003; Kramer and Wells 2005).

Barriers to knowledge transfer

Any model of knowledge transfer must account for a number of important barriers that practitioners may encounter when searching for and attempting to access and apply relevant research. It must also be flexible enough to accommodate the fluency of barriers which may be more or less pronounced depending not only on the professional group but also the system in which it is applied.

A review of the literature on barriers to knowledge transfer by Glasgow and Emmons (2007) identified more than 30 impediments to sharing knowledge about evidence-based interventions. The authors reported that there are several different types of barriers pertaining to the features of the interventions derived from the knowledge, the environment or context of the intended audience, limitations of the research, or interactions between these barriers (Green et al. 2009; Schillinger 2010).

Some barriers are more common than others, including:

- Technical language or jargon that is specific to the field of research and/or another discipline with which the practitioner is unfamiliar. This can impede the ability of practitioners to recognize or appreciate relevant research.
- The breadth of databases which can be accessed and searched has the unintended consequence of fragmenting relevant research literature, particularly in relation to multi-disciplinary fields like road safety. Of note, academic publications are a fundamental source of scientific knowledge and during the 20th and 21st centuries, there has been

a 3% to 6% compounded annual growth in the number of scholarly journal articles overall. In light of such a tremendous increase in the sheer number of journals and journal articles it has become an onerous undertaking to remain abreast of current articles, to say nothing of gaining a complete understanding of historical works (Lawrence 2009).

- The rapid advancement of research and increasingly available international research makes it challenging for practitioners to keep pace with new knowledge.
- The cost and accessibility of research may result in it being unavailable to practitioners (Lawrence 2009).
- The gap that exists between theories and concepts on one hand and explanations of their practical applications or implications in the real world are significant barriers to the use of research.
- Research happens slowly and rarely in time to inform policy.
- Policy decision-making includes forms of evidence that are outside of the research context, including contingencies, preferences, values, habits, traditions, and influence from lobbyists and pressure groups (Davies 2004).

The implication of overlooking barriers to knowledge transfer that are encountered by the intended audience is that the success of activities may be undermined. As such, there is a need to be cognizant that such barriers exist, and to undertake to manage and minimize them in cooperation with practitioners.

Gaps in existing models

A broader examination of the knowledge transfer field reveals that there are at least three important gaps that a majority of models fail to address, and researchers are only recently beginning to examine these gaps. First, in many instances, the target audience for knowledge transfer initiatives is rarely queried or consulted in relation to the knowledge to be transferred. More often, researchers undertaking these initiatives determine, with little or no input from practitioners, what information is most relevant and, from their perspective, would be most useful. As such, knowledge transfer initiatives and their associated end products are developed and vigorously pursued, however, critical thinking about target audiences, their accessibility, the usability or applicability of the products produced to the audience, and their ability to use or interest in them are secondary and rarely explored in detail until it is time to undertake dissemination. The end result of this is limited uptake at best on the part of practitioners. Unfortunately, many knowledge transfer initiatives have culminated in this outcome.

Second, models are generally linear, sequential or circular and fail to account for the ongoing iterative nature of knowledge transfer as a process. Negotiation is a critical element of knowledge transfer as researchers and practitioners seek to find common ground and identify strategies that are reasonable, practical, and most importantly, achievable. This is particularly true in light of the length of time it can take to complete a knowledge transfer initiative, and the changing environments and priorities to which the decision-making of practitioners is subject. To date, only a handful of models explicitly acknowledge the importance of a multi-directional or dynamic process that evolves over time according the stage of the process (see Ottawa Model of Research Use, Leeds Knowledge Brokering Model, PARIHS Model).

Third, the vast majority of models are discipline-specific and most useful within a particular professional group or targeted towards a single group of end users. This may be due, in part, to the inherent nature of researchers and practitioners to operate in silos and overlook the relevance or connectedness of their work to other disciplines or systems. As a consequence, these models may be beneficial to address rudimentary or clear-cut problems but have limited applicability to broader and more complex social issues such as road safety.

Moreover, there are also generally different target audiences, even within a single discipline (e.g., legislative, management, frontline, industry) and they are each searching for and must be able to identify specific parts of available knowledge that are tailored and most relevant to their needs. Such audiences are also more comfortable with receiving knowledge using different strategies, materials, and delivery mechanisms. Yet rarely are such differences recognized, much less accounted for, and researchers frequently adopt a "one-size-fits-all" approach to knowledge transfer activities. They frequently do not consider that what is useful in one forum may not be widely applicable to all intended audiences, and they often fail to appreciate distinctive features within broader categories of end users (e.g., decision-makers) (Lomas 1997).

Finally, the models frequently articulate what is supposed to happen at each of the identified stages, yet are often absent of explanations regarding how to make it happen. In this respect, models are analogous to a "black box" which constrains the ability of users to either test them or reap promised benefits in substantive ways, making such models of limited value in the real world. In essence, these models represent "half a solution" and require considerable work on the part of those attempting to apply them.

TIRF's model of knowledge transfer

The knowledge transfer model that has been developed over the last decade by TIRF has evolved as a result of its extensive experience working with governments, policymakers and frontline practitioners across issues and systems to inform the development and support the delivery of research projects, and to further the application of key findings in practice. The model consists of four distinct and independent yet inter-connected streams of activities that are integral components of its knowledge transfer initiatives. These four streams include: 1) maintenance of a systems perspective; 2) rigorous evidence review; 3) adapted implementation; and, 4) regular and ongoing feedback.

Unique features. There are some unique features of TIRF's knowledge transfer model that are considered essential to its success. Of greatest importance, topics and issues that are much-needed to inform practice, but that are also amenable to knowledge transfer efforts, are determined in consultation with practitioners (representing frontline and administrators) and policymakers, professional associations, governments, researchers and, in some cases, industry. This is in sharp contrast to many other models wherein typically it is independently determined what is needed. Moreover, TIRF's ability to view and understand the issue and its implications from multiple viewpoints makes it possible to more precisely focus knowledge transfer activities.

Another unique feature is careful consideration of the context, environment and systems in which practitioners operate. Knowledge cannot be transferred in a vacuum and failure to appreciate or acknowledge practical barriers or constraints that are imposed by broader systems can limit the success of any knowledge transfer initiative. For this reason, the maintenance of a systems perspective and the monitoring and anticipation of important changes is invaluable. In this regard, TIRF's model is neither linear nor cyclic, and instead represents a complex adaptive systems view of road safety.

TIRF's model also incorporates a multi-disciplinary approach to knowledge transfer initiatives in recognition of the complex nature of road safety issues. While this approach undoubtedly makes it more challenging to undertake knowledge transfer because it requires careful attention to diverse practices, system constraints, terminologies, competing priorities and delivery systems, if done well, it is possible to maximize the reach and penetration of initiatives. A close examination of the ways that knowledge gaps effect outcomes across systems, and the identification of consensus and commonalities that exist among professions, creates a powerful source of leverage to build larger communities of concern that are more effective in stimulating action and driving change on a broader scale. In this regard, the payoff makes the investment highly worthwhile.

Finally, TIRF's model is not prescriptive and its methods do not assume a pre-determined or singular application for the knowledge that is transferred. A core objective of TIRF's initiatives is to provide options and alternatives in conjunction with their respective implications that practitioners can consider, discuss, explore and evaluate. Researchers should not lose sight of the fact that the goal of research is to provide evidence to inform decision-making and reduce social problems. How it is applied is often beyond the purview of researchers, and, as such, their role is to make evidence available with appropriate caveats and considerations.

The ways that reductions can be achieved often take many forms and must be pursued using strategies that may not be optimal but are achievable. The reality is that the application of research findings in the real world involves careful negotiation and much broader considerations. In this regard, a researcher's credibility in relation to knowledge transfer is based, in large part, on their understanding of the environment and context of practitioners, and the systems in which they operate, but also their ability to separate their perspectives and opinions from their knowledge. Decision-making is ultimately left in the hands of practitioners and policymakers and must be tailored to their environment. Lobbying or advocating for particular outcomes, while desirable, detracts from that credibility.

Conclusion

The profound consequences of failing to pursue knowledge transfer are evident throughout history. To illustrate, it was 263 years following Lancaster's first demonstration that citrus juice was a preventive for scurvy in 1601 before decision-makers in the British merchant navy began routinely using it (Lomas 1997). This clearly illustrates that the inability to convey knowledge to decision-makers in a meaningful way can result in inaction and, subsequently, the maintenance of the status quo versus a reduction in social harm. To date, the shortcomings associated with knowledge transfer are more a result of a silo mentality that divides researchers and practitioners than the fact that research is unavailable or considered irrelevant to decision-making (Kramer and Wells 2005).

With a decade of experience, TIRF has learned some important lessons that have helped inform the development of its knowledge transfer model. Of utmost importance, it is vital that researchers are regularly present among practitioners and both listen and seek to understand their perspectives, their experiences, and their concerns before drawing conclusions or developing solutions. Concerted efforts are needed to recognize and reconcile competing perspectives and to avoid imposing their own experiences and frame of reference on identified issues. In this way, researchers are most welcome and best able to offer constructive, informative and value-free evidence that is relevant and practical to and can be applied by practitioners.

Knowledge transfer initiatives also require a specific goal and clear focus and this should be reinforced and maintained throughout the process. In the complex world of practitioners, simple is better and more likely to be accepted, implemented, and achieve widespread support. Ongoing dialogue with the target audience and the thought leaders that shape and influence their behaviour is indispensable to inform content, strategy and delivery. It is also necessary that activities are sufficiently flexible so that they can be adapted to respond to changing priorities, leaders, and opportunities. Finally, inclusive leadership and decision-making are fundamental elements and central to the success of any knowledge transfer initiative.

TIRF's engagement in the knowledge transfer field has added a new dimension to its research activities and produced significant benefits for the organization. It has facilitated the collection of data and access to it, it has shaped and underscored the relevance of research to inform practice, and it has added much needed context to inform decision-making in a policy environment. This has contributed to the increasing visibility of its work and attracted new funding sources. As such, TIRF plans to continue to refine its model and undertake to evaluate its effectiveness in order to further develop understanding of this important field. "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge" (Nonaka 2007; p.162).

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About the Traffic Injury Research Foundation (TIRF)

The mission of the Traffic Injury Research Foundation (TIRF) is to reduce traffic-related deaths and injuries. TIRF is a national, independent, charitable road safety research institute. Since its inception in 1964, TIRF has become internationally recognized for its accomplishments in a wide range of subject areas related to identifying the causes of road crashes and developing programs and policies to address them effectively.

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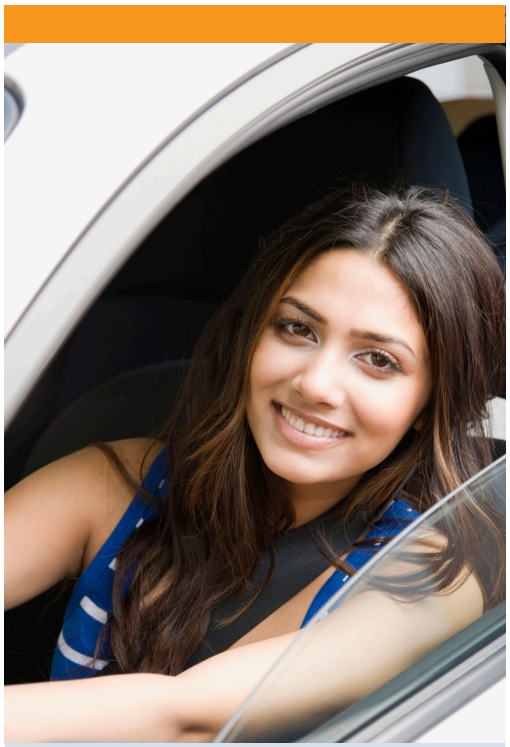

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