Knowledge Management for Development Journal
Vol. 6, No. 1, May 2010, 53–69

Routledge
Taylor & Francis Group

From research to policy and practice: a logic model to measure the impact of knowledge management for health programs

Tara M. Sullivan[a*], Saori Ohkubo[a], Ward Rinehart[b] and J. Douglas Storey[a]

[a]*Center for Communication Programs, John Hopkins Bloomberg School of Public Health;* [b]*Jura Editorial Services*

To date, few monitoring and evaluation guidelines exist for knowledge management products and services. One initiative undertaken by the Health Information and Publications Network (HIPNet) (www.hipnet.org), a network of health technical assistance organizations culminated in development of a guide to monitoring and evaluating health information products and services. The guide provides an approach to measuring the function and outcomes of health information programs, suggesting indicators and a logic model linking inputs, processes, and outputs to multiple levels of outcomes. The logic model depicts a way to strategically structure the design, implementation, and evaluation of such programs. This guide represents one of the few efforts to collect, develop, organize, and define indicators related to reach, usefulness and use of knowledge management products and services. It presents a unique logic model and list of indicators that can be used across different knowledge management products and services (e.g. manuals, guidelines, websites, networks, e-learning) to measure reach, usefulness and use. Since its development, the indicators and logic model have been used to guide the monitoring and evaluating (M&E) work of HIPNet member organizations and others. For example, the logic model has formed the foundation of M&E plans and many of the indicators and questions included in the guide have been used as the basis for measuring the reach, usefulness, and use of knowledge management for health programs. This paper discusses the theoretical basis of the logic model in this guide, the components of the logic model, and recommendations for its further development. It concludes that while this logic model based on diffusion of innovations theory fills a gap, knowledge management program designers, implementers, and evaluators will benefit from further testing the logic model and related indicators, better understanding audiences and the role of their networks, expanding the logic model to address multiple levels, further exploring relevant theory, and developing stronger needs assessment, monitoring, and evaluation approaches.

Background

Knowledge management for health programs play an important support role in public health. By providing access to a variety of knowledge management products and services for health professionals, these programs aim to improve the quality of health services and ultimately contribute to improved health outcomes such as increased service utilization and decreased morbidity and mortality. Such programs often serve as brokers or consolidators, collecting, organizing, and analyzing research and program evidence for use by health professionals, who, in turn, influence professional processes in which they are involved.

*Corresponding author. Email: tsulliva@jhsph.edu

ISSN 1947-4199 print/ISSN 1871-6342 online

DOI: 10.1080/19474199.2010.498964
http://www.informaworld.com

These programs clearly communicate and widely disseminate new findings and program innovations so that health professionals can become aware of new evidence and more readily understand its implications for practice. Products include policy briefs, guidelines, manuals, job aides, project reports and the like. Services include searchable databases, e-learning courses and more. With the introduction and use of Internet technologies, services have expanded to facilitate communication and knowledge exchange through online forums and networks.

While the ubiquity of and funding for such programs testify to widespread appreciation of their role, skepticism persists that such programs in and of themselves can shape policy and change the practices of health professionals. This skepticism persists partly because there has been no consensus on how knowledge management activities might influence professional practices and ultimately improve health behaviors at the population level. This paper offers a logic model based on diffusion of innovations theory that will help to inform the design and evaluation of effective knowledge management programs. To do this, we adopt the language of behavior change communication theories and consider the 'target audience' for knowledge management products and services to be health professionals. We frame our discussion in the context of professional practices as behaviors that are learned and can be modified in order to improve professional and programmatic outcomes. Note that in framing our discussion in these terms, our audience focus is only on health professionals and not members of the general public who are generally considered to be the target audience of health communication programs.

Roles and objectives of knowledge management programs

Among the most important functions of knowledge management programs for health professionals are raising awareness of relevant research evidence, increasing knowledge, shaping attitudes, and persuading them to adapt and use new guidance to improve the quality and reach of health services. Often, knowledge management products and services deliberately complement other technical assistance focused on, for example, logistics and supply, service delivery, management, training, advocacy, or other elements of program services. For example, clinical guidelines outlining evidenced-based practice are used in the training of health care providers to improve service delivery. At the same time, knowledge management products and services also reach health professionals who do not receive other direct technical assistance but nonetheless can benefit from up-to-date information. For those who do not have the time or resources to search extensively and synthesize the latest research, these products and services organize and format information in readily accessible and useful ways, such as job aides. Without these resources, the average health professional cannot easily keep pace with the advances in relevant scientific research.

A comprehensive knowledge management program can employ both 'push' and 'pull' strategies. That is – using the terminology of communication campaigns – programs can both 'push' resources out to audiences and respond to the demand or 'pull' by audiences for resources. Knowledge management products and services are pushed out through mass mailings, for example, but are also pulled by health professionals when they proactively request or seek information from websites or searchable databases or subscribe to a journal or online newsfeed. The push and pull of knowledge management programs are two complementary sides of the same coin. In an effort to get important research findings applied to practice expeditiously, knowledge management programs may initiate information dissemination to intended audiences rather than wait for demand to happen. For

example, the latest evidence on the role of male circumcision in curbing the transmission of HIV/AIDS may be pushed out to target audiences based on the strength of the research and the urgency of the problem, alternatively a health care provider might seek information on current therapies for a patient's unusual skin condition by querying a searchable database. After a long history of using mainly top–down push dissemination strategies, knowledge management programs are increasingly aware of the importance of better gauging and responding to the 'pull' of audience needs (Godlee *et al*. 2004). Internet technology makes it easier both for audience members to express their needs and for programs to inquire about and satisfy them.

Knowledge management program audiences

Knowledge management products and services support health professionals in a variety of roles. Some programs provide health information for a wide range of audiences, while others focus only on one or two key audiences. For the purposes of the present discussion, the types of audiences knowledge management programs serve might be collapsed into five main categories each with distinct professional needs. Those categories are: policy makers, program managers, health care providers, trainers and educators, and researchers. Each of these audiences has a specific professional role, or action focus, that can benefit from knowledge management products and services (see Table 1). For example, policy makers are concerned with prioritizing issues, allocating resources, and coordinating programs, whereas health care providers involved in one-to-one interactions with clients aim to accurately communicate information, provide appropriate care and advice, and motivate clients to adopt healthy behaviors.

Evaluation challenges for knowledge management for health programs

Donors and implementers are interested in achieving the maximum return on investment in knowledge management programs in the field of global public health, yet little research addresses the links among these types of programs, the use of content, and health outcomes. Organizations providing knowledge management and related services have sought to better understand and explore this linkage to improve the design of activities and the ability to monitor and evaluate them.

To date, few monitoring and evaluation (M&E) guidelines exist for knowledge management products and services. For example the LEAP-IMPACT community (a joint initiative of the Technical Centre for Agriculture and Rural Cooperation (CTA), the Royal Tropic Institute (KIT), and International Institute for Communication and Development

Table 1. Key audiences and action focus.

Audience	Action focus
Policy makers	Prioritization of issues, advocacy, resource allocation, coordination
Program managers	Selection of program strategies, program planning and implementation, resource allocation, coordination
Health care providers	Care & treatment, patient communication and counseling, client motivation
Trainers and educators	Health education, health communication, instruction, motivation of practitioners
Researchers	Literature review, design of studies, data analysis and interpretation, data utilization and dissemination, translating research into practice

(IICD)), has developed a toolkit for evaluating information projects, products and services (2009). It provides information about evaluation context, process, tools and guidelines. It also presents indicators for specific knowledge management products and services (e.g. training course, newsletter, website), and offers tools for planning and evaluation. Similarly, the UK Department for International Development (DFID) has developed M&E guidelines for information and communication for development (ICD) programs (Myers 2005). These guidelines present a range of M&E approaches to choose from, depending on the stage of the program. The guidelines do not introduce original frameworks or indicators, but rather point to useful resources for those who seek further information.

Another initiative undertaken by the Health Information and Publications Network (HIPNet) (www.hipnet.org), a network of health technical assistance organizations – most of them funded by the United States Agency for International Development – culminated in development of the *Guide to monitoring and evaluating health information products and services* (Sullivan *et al*. 2007). The guide provides an approach to measuring the function and outcomes of health information programs, suggesting indicators and a logic model linking inputs, processes, and outputs to multiple levels of outcomes. The logic model depicts a way to strategically structure the design, implementation, and evaluation of such programs.

This guide represents one of the few efforts to collect, develop, organize, and define indicators related to reach, usefulness and use of knowledge management products and services. It presents a unique logic model and list of indicators that can be used across different knowledge management products and services (e.g., manuals, guidelines, websites, networks, e-learning) to measure reach, usefulness and use. The logic model presented in the guide draws on diffusion of innovations theory, however, it does not explicitly address how the theory influences various aspects of the model or how diffusion of innovations key components (in combination with the logic model) can be used to plan and evaluate knowledge management for health programs.

Since its development, the indicators and logic model have been used to guide the M&E work of HIPNet member organizations and others. For example, the logic model has formed the foundation of M&E plans and many of the indicators and questions included in the guide have been used as the basis for measuring the reach, usefulness, and use of knowledge management for health programs.

The remainder of this paper will discuss the theoretical basis of the logic model in this guide, the components of the logic model, and recommendations for its further development.

Applying diffusion of innovations theory to knowledge management programs

Theory from social and behavioral sciences is an indispensable tool in guiding knowledge management program design, implementation, and research and evaluation. Theory helps such programs to design strategies, products, and services that influence health outcomes and to monitor their results. For that reason, in developing a logic model, the initial task is to select appropriate theoretical constructs. As Walker *et al*. (2003) notes, there is ample evidence that understanding why health professionals do or do not act on research findings is similar to finding out why people do or do not adopt a healthy lifestyle. In keeping with this notion, we focus on theories of behavior change and communication. Specifically, we focus on diffusion of innovations, a robust theory that offers several constructs relevant to designing and evaluating knowledge management programs.

Diffusion of innovations theory explains how an *innovation*, defined as an idea perceived as new within a given social system, is *communicated* through certain *channels*

over *time* among members (e.g. individuals, informal groups, organizations) of the *social system* (National Cancer Institute 2003, Rogers 2003). According to the theory, the characteristics of both the *innovation* and its *adopters* determine the rate of adoption of an innovation (Rogers 2003). In the context of knowledge management programs and for the purposes of this paper, we focus on this specific type of innovation: 'evidence-based information and guidance' on best practice presented in action-oriented and usable formats (e.g. instructions, guidelines, and regulations) and disseminated through knowledge management products and services (e.g. publications, distance learning courses, websites). One may argue that the evidence itself, gained from scientific research, may qualify as an innovation in a broader context. However we must emphasize that in order to translate such scientific evidence into policy and practice, health professionals must have access to 'evidence-based information and guidance' which we defined as a specific type of innovation. Furthermore, we focus on adopters as 'intended audiences in various health professional areas' (e.g. program managers, health care providers, trainers, and educators).[1]

The innovation – characteristics of readily adopted practice

Five characteristics of an innovation as perceived by potential adopters influence the rate of adoption: relative advantage, compatibility, complexity, observability, and trialability. Table 2 defines these characteristics and illustrates how they might be applied to knowledge management programs in order to strategically maximize their effectiveness.

Table 2. Characteristics of innovations applied to knowledge management programs.

Characteristic of innovation (Rogers 2003)	Definition of characteristic (Rogers 2003)	Application to knowledge management programs
Relative advantage	The degree to which an innovation is perceived as being better than the idea or practice it supersedes.	Demonstrate the benefits of certain practices or approaches over others, particularly of new practices over those of current practices. Cite research about relative effectiveness. Compare alternatives.
Compatibility	The degree to which an innovation is perceived as consistent with existing values, past experience, current practices and needs.	Relate/link emerging policies, programs and research practices to current practices. Explain how to build on existing systems.
Complexity	The degree to which an innovation is perceived as relatively easy to understand and use.	Simplify or summarize information about practices or programs; provide clear steps or stages for use and application.
Observability	The degree to which the use and results of an innovation are visible.	Provide examples, model programs, professional role models; facilitate the exchange of experiences among health professionals.
Trialability	The degree to which an innovation may be experimented with or tested on a limited basis or with limited risk before committing to its adoption.	Provide/suggest easy ways to try the innovation, describe implementation in stages (related to complexity), or provide both pilot and scaled-up versions.

Research indicates peoples' perceptions of these five characteristics of the innovation account for 50 to 90 percent of the variance in the rate of adoption of innovations (Rogers 2003). Ensuring that evidence-based information and guidance address these attributes speeds the adoption of new behaviors, products, or technologies.

Time – the innovation-decision process, characteristics of adaptors, rate of adoption

According to diffusion of innovations theory, individuals generally move through an 'innovation–decision process' from initial awareness of the innovation to confirmed or committed practice of the innovation. The innovation–decision process consists of five stages (Rogers 2003):

(1) *Knowledge* occurs when an individual (or other decision-making unit) is exposed to an innovation's existence and gains an understanding of how it functions.
(2) *Persuasion* occurs when an individual (or other decision-making unit) forms a favorable or an unfavorable attitude toward the innovation.
(3) *Decision* takes place when an individual (or other decision making unit) engages in activities that lead to a choice to adopt or reject the innovation.
(4) *Implementation* occurs when an individual (or other decision-making unit) puts a new idea into use.
(5) *Confirmation* takes place when an individual seeks reinforcement of an innovation–decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

This is not a strictly linear progression. Different audiences may start at different levels of familiarity with an innovation and move along the continuum at different rates. Audiences may also be categorized according to their willingness to adopt new behaviors relative to others in a social system. This willingness is typically associated with past success in adopting and benefiting from new practices or with better access to the resources needed to obtain, try and sustain use of an innovation.

A curve showing cumulative percentage of a population adopting an innovation over time typically has an S-shape (see Figure 1). This shape implies that a successful innovation

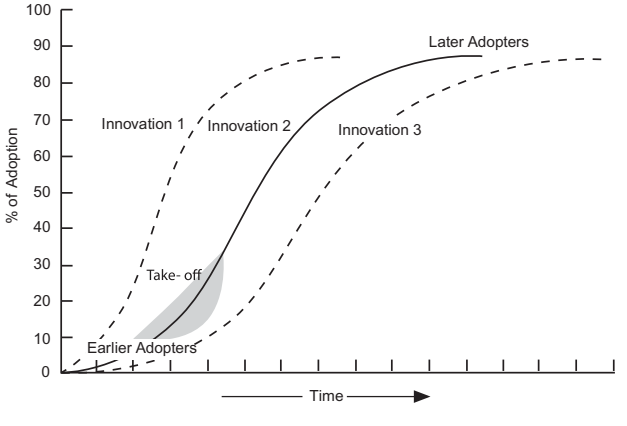

Figure 1. The diffusion process.
Source: Rogers (2003).

gradually spreads from a few earlier adopters to the larger population. Some innovations have a rapid rate of adoption (Innovation 1), while others are adopted more slowly (Innovation 3) depending on the perceived characteristics of the innovation and the nature of the 'community' or network of users. Once enough individuals – the 'critical mass' – have adopted an innovation, the further spread of the innovation becomes self-sustaining. Some innovations may only ever reach and saturate a subset of a larger community or population, depending on the extent of its utility for different groups. Regardless of the eventual extent of the reach of an innovation in the population as a whole, innovations that fail to attain a critical mass within at least a relevant subset of the population may well die out and never achieve sustained practice.

Those people who are earlier adopters of an innovation can play a key role as opinion leaders and change agents. These tend to be motivated and committed individuals who champion the new practice (sometimes because they seek validation of their own decision) and in so doing, effectively inform, advise, and convince others to adopt an innovation (Moulding *et al*. 1999, Rogers 2003). In their role as ambassadors for new ideas in their community of professionals, these people tend to accelerate the diffusion process and so help to determine when the critical mass is reached (Valente and Davis 1999, Rogers 2003, Berwick 2003).

Knowledge management programs can help to facilitate the diffusion process by publicizing desirable or beneficial characteristics of both the innovation and spreading news of adopter success. As the innovation decision process unfolds, program activities will change their approach, from introducing an innovation and its features to a new audience, describing early results of adoption as they materialize, encouraging emulation of earlier adopters and addressing barriers to adoption that emerge as the diffusion process progresses. To get the timing right, it is important to know just where different user groups stand with regard to the innovation (still at an early stage of learning how to use it? dealing with difficulties encountered during early attempts to use it? becoming confident users and champions of the innovation?) and to keep tabs on the overall spread of the innovation over time. Depending on the diversity of user groups and the capacity of a program to serve multiple audiences, an information program may implement the strategy of 'something for everyone'. Even while focusing on one or two primary user groups, a program might simultaneously offer a variety of products, services, and implementation activities tailored to subgroups at different stages of readiness or need, thus capitalizing on audience diversity and allowing user groups to exercise their own varying demands rather than providing narrower 'lowest common denominator' services and products.

Communication channels

Diffusion of innovations theory defines communication as the process of creating and sharing information toward the end of mutual understanding. Channels refer to the means through which information is shared or exchanged (Rogers 2003). Channels are either mediated (requiring some form of technology to link communicators) or unmediated (relying on direct interpersonal or face-to-face contact between communicators). Modern interactive technologies, especially Internet-based technology and software, are notable for their ability to mimic certain aspects of face-to-face communication over great distances, creating a virtual interpersonal experience. Thus, successful knowledge management programs mobilize multiple channels to combine the reach of media technologies with the personal tailoring of interpersonal communication. Combinations may range from mass mailing of print publications to mass dissemination of audiovisual material

through Web portals to online forums that facilitate networking among remote and highly dispersed users. The signature advantage of mass communication technologies – reach – is critical to the rate of diffusion. Mass distribution of high quality information about new practices can rapidly catalyze the knowledge acquisition stage of the innovation–decision process, while opportunities for networking can rapidly expand interaction between those who have already adopted an innovation and those who have not, accelerating opportunities for observability and learning from experience.

The social system

The final crucial element of the innovation–decision process is the social system itself, within which information flows (Rogers 2003). A social system is a set of interrelated units (individuals, organizations, communities, etc.), linked by their communication with each other and engaged in joint problem solving to accomplish common goals. The social system has attributes important to the uptake of evidence-based research into practice. Some of these attributes are physical (e.g. proximity, density of the social system, interconnection with other systems), some are structural (e.g. access to the means of communication, presence of active change agents or champions of new practices, credibility of available information sources) and some are socio-cultural (e.g. valence (positive or negative)) and strength of norms related to information seeking, openness to change, degree of similarity or diversity among members of the social system). Social systems or networks of highly similar individuals tend to communicate with each other frequently recirculating the same information within their relatively closed system, and therefore are less likely to innovate. In contrast, networks whose members are more diverse or have more links to other networks are more likely to have access to more and different sources of information and therefore tend to be more innovative.

Considered together and applied to the design, implementation and evaluation of knowledge management programs, all of the key elements of diffusion of innovations can have a powerful effect on the uptake of evidence-based research into practice settings. Below we propose a logic model for knowledge management activities and describe how diffusion of innovations theory can be applied throughout, from program inputs to outcomes.

A logic model for knowledge management programs[2]

Logic models play an important role in the design and evaluation of programs by visually showing how program components logically link to one another to achieve the desired outcomes (Frankel and Gage 2007). Also, a logic model shows what resources are required to conduct activities (also referred to as processes) and produce outputs and what processes and outputs are needed to achieve outcomes at multiple levels (Cooksy *et al*. 2001). Logic models are informed by relevant social and behavioral theories such as diffusion of innovations. The logic model here codifies *inputs*, *processes*, *outputs* (Bertrand and Escudero 2002), *initial outcomes*, *intermediate outcomes*, and *intended long-term outcomes* (United Way of America 1996). It also maps areas of importance to those who provide knowledge management products and services (reach, usefulness, and use) to logic model components. These categories are defined below (see Figure 2) and then each is discussed further in reference to the second figure (see Figure 3).

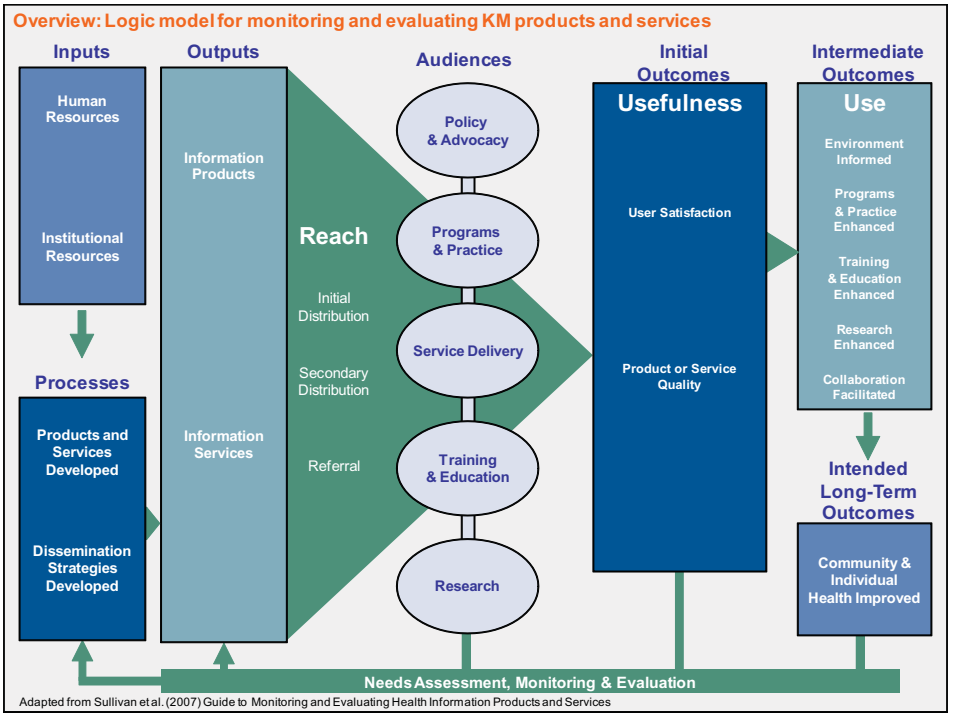

Figure 2. Overview of logic model.

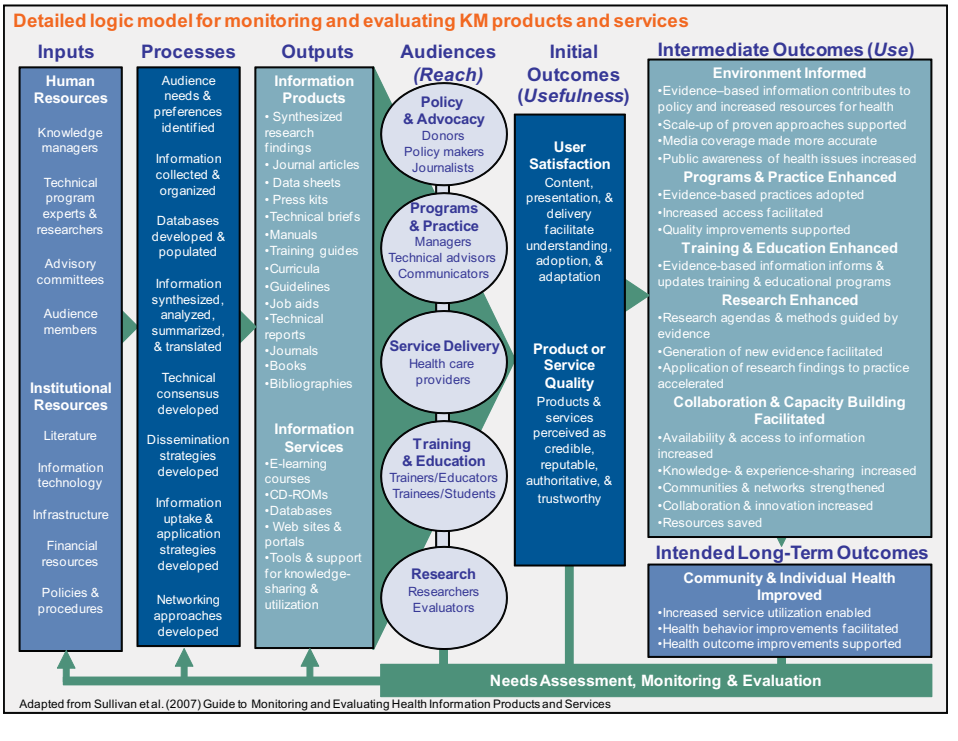

Figure 3. Detailed logic model.

Inputs – leveraged to carry out activities

Inputs constitute all resources invested into a project, such as human and financial capital, equipment, and facilities that enable a program activity to occur (Bertrand and Escudero 2002). Inputs for knowledge management programs can be divided into two main categories: human resources and institutional resources. Human resources are particularly important for producing knowledge management products and services. As shown in Figure 2, knowledge managers, such as writers, research analysts, and librarians, work with technical experts, researchers, advisory committees, and audience members to create knowledge management products and services. Web developers, graphic designers, and printers provide a complementary set of expertise, creating formats that are relevant and useful. Institutional resources are also a crucial input. They range from financial resources to management and administration to policy and procedures that influence how knowledge management programs can conduct their work.

Processes – undertaken to develop products and services

Processes apply inputs to achieve a specific goal. They refer to how and how well an activity is carried out (Bertrand and Escudero 2002). Key processes in the development of knowledge management products and services include: audience members' needs and preferences are identified; information is generated, collected, and organized; information is synthesized, analyzed, and summarized; and information is translated, adapted, and transformed to suite audience needs. Knowledge management products and services are designed to facilitate adoption. Publications provide guidance on how evidence-based program approaches can be tailored to local contexts. Applying characteristics of a readily adoptable practice as outlined in diffusion of innovations theory (see Table 2) further supports use and application of information products and services.

A key process of some information programs is to collaborate to develop and disseminate technical consensus on a specific topic. This process involves convening technical experts with the goal of developing guidance that is endorsed and applied by the group and its partners. Networking approaches offer an opportunity to facilitate collaboration and information sharing. Finally, information programs develop processes to disseminate information products and services to audiences using a variety of channels, including mailing, Internet and CD-ROM.

Outputs – reach audience groups

Outputs are the products or services resulting from processes. These outputs *reach* audience members through various and complementary communication channels and formats. The outputs are information products and services that may range from print and electronic publications to various types of information services such as searchable online databases.

Audiences are individuals and groups who are the potential adopters of the contents of knowledge management products or services. *Reach* measures strategic dissemination efforts to the audiences outlined in the logic model.

Ideally, outputs correspond to the intended audience's stage in the innovation–decision process. Research has shown that earlier adoption results from greater access to or use of mass and other targeted media that provide information relevant to the behavior (Valente and Fosados 2006), indicating the importance of external sources of information. Health professionals with ties beyond their immediate local professional networks – ties

provided by a Web-based information program, for example – would be more likely to adopt new practices than their colleagues without such ties. Furthermore, these innovators should be of particular interest to knowledge management programs because they in turn may influence the other members of their local network with regard to the innovation. Thus, identifying, investing in and cultivating the support of early adopters should be one of the core strategies for knowledge management programs seeking to disseminate evidence-based information and guidance. It is useful to learn through formative research, if possible, who are the potential early adopters, what their position in their local network is and how they use information resources, in order to maximize their access to useful types and formats of information products and services so that they can become enthusiastic users and champions of new practices.

Outcomes – may relate to knowledge, skills, attitudes, behavior, health condition, or health status (United Way of America 1996). Outcomes are expected at different levels, depending on the program. This logic model uses three outcome levels: *initial*, *intermediate*, and *intended long-term outcomes*.

Initial outcomes – attitudes toward knowledge management outputs

Initial outcomes measure audiences' attitudes toward publications and services. Audiences determine *usefulness* based on their satisfaction with content, presentation, and delivery mechanisms and the perceived quality of a product or services. Do content, presentation, and delivery facilitate understanding, adaptation, adoption, or use? Do users feel that products and services are credible, authoritative, trustworthy, and reputable and thus considered high quality? Indicators to measure 'usefulness' can help to determine if knowledge management products and services are produced keeping in mind the five characteristics of an easily adoptable innovation. That is to say, have they been developed considering relative advantage, compatibility, complexity, observability, and trialability? When measurement takes place soon after audiences receive information products or use services, initial outcomes are comparatively easy to assess.

Intermediate outcomes – use of knowledge management products and services

Intermediate outcomes relate to *use* or adaptation of information products and services to inform policy, improve programs, enhance training and education, and promote research efforts. Improvements yielded from use of information products and services could include improving quality of care, increasing access to services, supporting the scale-up of proven approaches, helping to speed the application of research findings to practice, and contributing to efficiency. Hypothetically, the perceived *usefulness* of information products or services, under initial outcomes, influences these intermediate outcomes.

While most knowledge management programs capture information on usefulness, many have stopped short of measuring health information and product use – in large part due to the difficulty in accurately capturing 'use' information and/or the difficulty of defining what constitutes 'use'. Methods for measuring use are in the early development stages and at the same time, those producing knowledge management products and services may have felt that responsibility for the use of their products and services lay in someone else's hands – perhaps the hands of those working closer to the point of use (e.g. service delivery). Today, however, knowledge management programs are encouraged and motivated

to move further along this continuum to influence application of health products and services and capture data to measure its impact.

Intermediate outcomes are more difficult to evaluate than initial outcomes because users seldom adapt or use information to change the way that they do things (behavior change) unless there are other sources that add to, confirm, or endorse the knowledge presented. Such change in practice is usually the result of multiple factors, and, thus, it is often difficult to attribute change to a specific information product or service. That said measurement of intermediate outcomes can learn from the evaluation of communication programs that address the public or health care consumers. Today, many such programs measure 'use' as a simple yes/no answer that may be further contextualized with qualitative data to create an 'evidence-based narrative' (Sullivan *et al*. 2007). To further understand and refine measurement of use, knowledge management programs need to consider measuring a 'hierarchy of effects' that has been widely used to measure the effectiveness of communication programs. This hierarchy of effects relates to the five stages of the innovation–decision outlined by Rogers (2003, p. 5) and has been further elaborated to include up to 16 effects (Piotrow *et al*. 1997, Valente 2002, Rogers 2003).

Intended long-term outcomes – changes in health status

Intended long-term outcomes relate to improvements in health condition or status of the public or of health care consumers that may be related to the exposure of health care providers and allied professionals to health information or products (United Way of America 1996). Programs develop knowledge management products and services bearing in mind how they will contribute to *intended long-term outcomes* such as improvements in the health behavior and health status of the population. The model includes this level of outcomes to show that information products and services can contribute to health outcomes. In fact, measuring intended long-term outcomes generally is not feasible given the high resource investment required. Furthermore, it would be extremely difficult to attribute such outcomes to the intended audience's exposure to specific information products and services, since information products and services are just one contributor to health interventions, the impacts of which are, in turn, subject to numerous internal and environmental influences.

To ensure that data informs program design and implementation, information collected from *needs assessment*, *monitoring*, and *evaluation* efforts are fed back into inputs, processes, and outputs, improving the development and provision of information products and services. Formative research, including *needs assessment* helps to guide program design by assessing audience needs and preferences along with other aspects of the environment that pose barriers and opportunities for knowledge management programs. *Monitoring* of inputs, processes, outputs, and initial outcomes help knowledge management programs quantify what the program has done and who has been reached. Data from *monitoring* also helps to identify areas of program strength and weakness and can be used for mid-term adjustments to program design and implementation. *Monitoring* can also be used to explain why an expected change (in use of evidence-based guidelines, for example) did or did not occur. *Evaluation* measures changes in intermediate outcomes, such as adoption of evidence-based practice (see lower edge of graphics in Figure 2 and Figure 3, respectively).

Recommendations for future practice and research

While this logic model based on diffusion of innovations theory fills a gap, knowledge management program designers, implementers, and evaluators will benefit from further

testing the logic model and related indicators, better understanding audiences and the role of their networks, expanding the logic model to address multiple levels, further exploring relevant theory, and developing stronger needs assessment, monitoring, and evaluation approaches. Each of these areas is discussed below.

Test the logic model and related indicators

The logic model is this paper forms part of larger work undertaken by members of HIPNet to improve design and evaluation of health information/knowledge management programs. This logic model is the cornerstone of the *Guide to Monitoring and Evaluating Health Information Products and Services* (Sullivan *et al.* 2007). The guide also includes a set of indicators to monitor and evaluate health information programs. Indicators cover three key areas (reach, usefulness, and use), which map to key components of the logic model (outputs, initial outcomes, and intermediate outcomes). Moving forward, it will be important to further test the logic model and related indicators to assess the validity of these measures and to look for gaps in measurement through the lens of social and behavioral theory and research.

Better understand intended audiences and the role of their networks

While one of the strengths of the logic model is its comprehensiveness, it could better address audiences and the role of social networks. A more detailed version of the logic model could look closer at the specific needs and action focus of each of the intended audience groups both in terms of their job function (e.g. policy maker, program manager) and their willingness to innovate, could provide guidance on identifying and leveraging change agents and opinion leaders, and could explore the role of social networks on the rate of adoption. For example, diffusion of innovations theory points to sources of influence on the adoption decision, including information exchange about the innovation among individuals in a social network (Rogers 2004, Valente and Fosados 2006).

Expand the logic model to account for multiple levels – individual, organization, system

Informed by the diffusion of innovations theory, the logic model proposed here focuses primarily on two major influences on adoption: 1) the perceived characteristics of innovations and 2) the characteristics of the individuals who may adopt the change. In recent years diffusion researchers have expanded upon the traditional diffusion model by proposing an equal focus on the environment (e.g. organization and managerial structure within a system) as another key determinant of rates of adoption (Berwick 2003, De Civita and Dasgupta 2007). In most instances information programs as chartered today have little direct influence over the environmental factors. Where applicable – for example, where there is a well-defined social system in place – incorporating this third theoretical construct into the logic model could guide knowledge management activities in a more comprehensive effort to change practice.

Further explore relevant theory

While much of our work draws on diffusion of innovations theory, other theories are also relevant to designing activities that deliver and promote the use of the latest research findings and program guidance among health professionals. In diffusion of innovations theory,

changes in knowledge and attitudes are the main factors said to lead to changes in practice. The theory does not address, however, the role of other personal factors such as self-efficacy (i.e. confidence in one's ability to organize and execute actions to achieve desired goals) and the need to develop the skills needed to undertake the new behavior (Moulding *et al*. 1999), although self-efficacy is affected by perceived characteristics of the innovation. Is it difficult to do? Can I try it without much risk? Therefore, theories that focus on describing the transition from knowledge to action (in the logic model, from 'usefulness' to 'use') can help to explore further and describe a crucial step in the research-to-practice continuum. Other theories offer insight into the opportunities for knowledge management programs to influence this transition. For example, Fishbein's Theory of Planned Behavior explores cognitive or rational processes around decision-making at the individual level (Fishbein *et al*. 2000, Montaño and Kasprzyk 2002) focusing specifically on anticipated consequences of a new behavior and the behavioural and attitudinal norms within one's personal networks, while Bandura's Social Cognitive Theory focuses on social modeling – learning by observing the actions of others around you and explores interpersonal factors such as peers, colleagues, and other social relationships and social conditions (Baranowski *et al*. 2002). Social cognitive theory identifies perceived self-efficacy as a key predictor of behavior and recognizes social modeling as the dominant vehicle for disseminating new ideas, values, and styles of conduct (Bandura 2006). Both theories can complement diffusion of innovations theory and would enhance the current logic model, offering different ways of predicting or fostering use and adaptation of knowledge management products and services.

Develop stronger research and evaluation approaches

Developing a standard set of data collection instruments to facilitate needs assessment, monitoring, and evaluation would ensure that all relevant indicators are measured and would facilitate consistency across data collection efforts (whether within a particular knowledge management program or across programs). By standardizing the methods and types of data collected, researchers will be better able to compare the effects and effectiveness of different knowledge management program approaches.

Few knowledge management programs put substantial resources into formative research to systematically understand the intended audience and thus guide program design. Knowledge of the audience is crucial, however. It plays an important role, not only by identifying content and format preferences, but also by uncovering norms for seeking health information and potential barriers to information use. Similarly, many knowledge management programs collect process evaluation (monitoring) data. Before development of the *Guide*, however, no group had developed consensus on a core set of indicators and consistently applied them. Finally, outcome evaluations (if conducted at all) have relied largely upon readership surveys using non-probability sampling methods. Today, many knowledge management programs recognize the need to improve measurement on all fronts and are motivated to improve evaluation practice. Knowledge management programs need to use stronger research methods, including probability samples, measurements at multiple points in time, comparisons between groups exposed to knowledge management products and those not exposed, and multiple sources of data to compare the consistency of findings. To do so, knowledge management programs need the resources and expertise required to conduct studies that can better identify and isolate their effects.

Conclusion

To design and assess the effectiveness of knowledge management activities, program planners and evaluators need to be able to identify, define, and measure key program components. To that end, we present an original model that shows how knowledge management inputs, processes, and outputs logically link to one another to attain outcomes at multiple levels. We relate key areas for measurement of information programs (reach, usefulness, use, and outcomes of use) to these standard logic model components. Drawing on communication theory (i.e. diffusion of innovations), we discuss how usefulness can enhance use of evidence-based information and translate into outcomes such as improved programs and practice.

Because the model covers a wide range of information formats (e.g. journals, job aids, training courses) and dissemination media (e.g. print, Internet, CD-ROM), it can readily be tailored to meet specific program needs. One unique aspect of this model is that it includes audiences, emphasizing the desire to focus and tailor information programs to meet specific knowledge management needs of specific groups of health practitioners. Using a logic model such as this, researchers can systematically measure discrete program components, test links between them, and advance an understanding of how to produce knowledge management programs that facilitate the application of evidence to health care practice.

Notes

1. Along with these two major influential factors mentioned above – the perceptions of innovations and the characteristics of the individuals who may adopt the innovation, 'contextual and managerial factors within a social system' constitute the third factor influencing the rate of diffusion of innovations (Berwick 2003). We have not yet attempted to incorporate this variable into the proposed logic model, however.
2. This section draws from Sullivan *et al.* (2007).

Notes on contributors

Tara M. Sullivan, PhD, is a research associate for the USAID-funded Knowledge for Health Project at the Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health. Dr Sullivan has over 15 years experience in monitoring and evaluation of international health and development programs and has lived and worked in Botswana and Thailand. Dr Sullivan's research focuses on strategies to facilitate the use of health information in policy and programs and on improving the quality of family planning and reproductive health services.

Saori Ohkubo, MA, is monitoring and evaluation adviser of the USAID-funded Knowledge for Health project at the Center for Communication Programs (CCP), Johns Hopkins Bloomberg School of Public Health. She has over ten years of experience in project management, research, and monitoring and evaluation for various international development sectors including public health and basic education. At CCP she has provided technical and managerial leadership in the development of project-wide M&E strategies, including assessing and documenting the impact of KM health information products, tools, and services.

Ward Rinehart, MA, is founder and manager of Jura Editorial Services SARL in Gex, France. He has more than 30 years of experience as editor and project director at the Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health, as an editor and as Project Director for the USAID-funded Population Information Program and the INFO Project.

J. Douglas Storey, PhD, is associate director for communication, science and research at the Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health. Dr Storey has

over 30 years of experience in communication, health and education, and has lived and worked in more than 20 countries. Dr Storey studies health competence as a conceptual framework for understanding and measuring the impact of health communication programs, the role of communication in emergency preparedness and response, and community-based strategies for behavior change communication.

References

ACP-EC Technical Centre for Agriculture and Rural Cooperation (CTA), the Royal Tropic Institute (KIT), and International Institute for Communication and Development (IICD) 2009. *Smart toolkit for evaluating information projects, products and services*, 2nd ed. The Netherlands: CTA/KIT/IICD.

Bandura, A. 2006. Going global with social cognitive theory: from prospect to paydirt. *In*: S.I. Donaldson, D.E. Berger and K. Pezdek, eds. *Applied psychology: new frontiers and rewarding careers*. Mahwah, NJ: Lawrence Erlbaum Associates, 53–79.

Baranowski, T., Perry, C.L. and Parcel, G.S. 2002. How individuals, environments, and health behavior interact. *In*: K. Glanz, B.K. Rimer and F.M. Lewis, eds. *Health behavior and health education*, 3rd ed. San Francisco, CA: Jossey-Bass, 165–184.

Bertrand, J.T. and Escudero, G. 2002. *Compendium of indicators for evaluating reproductive health programs*, MEASURE Evaluation. Chapel Hill, NC: University of North Carolina.

Berwick, D.M. 2003. Disseminating innovations in health care, *The Journal of the American Medical Association*, 289 (15), 1969–1975.

Cooksy, L.J., Gill, P. and Kelly, A. 2001. The program logic model as an integrative framework for a multimethod evaluation, *Evaluation and program planning*, 24, 119–128.

De Civita, M. and Dasgupta, K. 2007. Using diffusion of innovations theory to guide diabetes program development: an illustrative example, *Journal of Public Health*, 29 (3), 263–268.

Fishbein, M., Triandis, H.C., Kanfer, F.H., Becker, M., Middlestadt, S.E. and Eichler, A. 2000. Factors influencing behavior and behavior change. *In*: A.S. Baum, T.A. Revenson and J.E. Singer, eds. *Handbook of health psychology*. Mahwah, NJ: Lawrence Erlbaum.

Frankel, N. and Gage, A. 2007. *M&E fundamentals: a self-guided minicourse*, MEASURE evaluation, Chapel Hill, NC: University of North Carolina.

Godlee, F., Pakenham-Walsh, N., Ncayiyana, D., Cohen, B. and Packer, A. 2004. Can we achieve health information for all by 2015?, *Public health*, 364, 295–300.

Montaño, D.E. and Kasprzyk, D. 2002. The theory of reasoned action and the theory of planned behavior. *In*: K. Glanz, B.K. Rimer and F.M. Lewis, eds. *Health behavior and health education*, 3rd ed. San Francisco, CA: Jossey-Bass, 67–98.

Moulding, N.T., Silagy, C.A. and Weller, D.P. 1999. A framework for effective management of change in clinical practice: dissemination and implementation of clinical practice guidelines, *Quality in health care*, 8 (3), 177–183.

Myers, M. 2005. *Monitoring and evaluating information and communication for development (ICD) programmes*, London: Department for International Development (DFID).

National Cancer Institute 2005. *Theory at a glance: a guide for health promotion practice*, US Department of Health and Human Services. Bethesda, MD: National Institute of Health.

Piotrow, P.T., Kincaid, D.L., Rimon, J.G. and Rinehart, W. 1997. *Health communication: lessons from family planning and reproductive health*. Westport, CT: Praeger Publishers.

Rogers, E.M. 2003. *Diffusion of innovations*, 5th ed. New York: Simon & Schuster.

Rogers, E.M. 2004. A prospective and retrospective look at the diffusion model, *Journal of Health communication*, 9 (6), 13–19.

Rogers, E.M. and Scott, K.L. 1997. The diffusions of innovation model and outreach from the National Network of Libraries of Medicine to native American communities. Available: http://nnlm.gov/archive/pnr/eval/rogers.html (accessed 1 September 2007).

Sullivan, T.M., Strachan, M. and Timmons, B.K. 2007. *Guide to monitoring and evaluating health information products and services*. Baltimore, MD: Johns Hopkins Bloomberg School of Public Health, Washington, DC: Constella Futures, and Cambridge, MA: Management Sciences for Health.

United Way of America 1996. *Measuring program outcomes: a practical approach*. Alexandria, VA: United Way of America.

Valente, T.W. 2002. *Evaluating health promotion programs*. New York: Oxford University Press.

Valente, T.W. and Davis, R.L. 1999. Accelerating the diffusion of innovations using opinion leaders, *The annals of the American Academy of Political and Social Science*, 566, 55–67.

Valente, T.W. and Fosados, R. 2006. Diffusion of innovations and network segmentation: the part played by people in promoting health, *Sexually Transmitted Diseases*, 33 (7), S23–S31.

Walker, A.E., Grimshaw, J., Johnston, M., Pitts, N., Steen, N. and Eccles, M. 2003. PRIME – PRocess modelling in ImpleMEntation research: selecting a theoretical basis for interventions to change clinical practice, *BMC Health Services Research*, 3 (1), 22pp.