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What We Know: Managing the Knowledge Content

This chapter presents a unified framework for applying knowledge management and translation (KMT) in public health areas, such as tobacco control. The approach integrates KMT in a system that considers purpose, people, process, and product. This framework then is used to examine two current examples of KMT methodology in tobacco control:

- *Review of KMT in the tobacco control efforts of the National Cancer Institute (NCI) through a formal review of knowledge management based on data gathering and personal interviews*
- *A private-sector project that used concept mapping to help a diverse group of tobacco control stakeholders to collaboratively design a knowledge-base taxonomy for tobacco control*

Knowledge is of two kinds: we know a subject ourselves, or we know where we can find information upon it.

—Samuel Johnson (1709–84)

Introduction

This chapter examines issues in the development and maintenance of KMT infrastructure for tobacco control based on previous work applying KMT to public health, related work in other areas, and a summary of two research projects. These projects include a knowledge infrastructure review of current tobacco control efforts at NCI and the use of concept mapping to help tobacco control stakeholders develop a taxonomy for a tobacco control knowledge base.

More than two centuries ago, Samuel Johnson summarized the fundamental case for knowledge management in the quotation cited here. Today, knowing where to find knowledge and sharing the knowledge that resides within ourselves form the linchpin of the ability to link the efforts of tobacco control stakeholders in a systems environment. Formal KMT methodologies represent a process by which access to this knowledge can be designed and developed both locally and globally.

To disseminate new knowledge, tobacco control researchers, like researchers in virtually every scientific field, rely on publication in peer-reviewed journals. This dissemination tactic is necessary for two reasons: (1) it ensures that the research methods and results have been reviewed by knowledgeable experts, providing some safeguard that the information is credible; and (2) publishing in refereed journals still is an integral part of the academic promotion and tenure process and so is an important part of the culture of most academic organizations. Unfortunately, journals represent an ineffective dissemination strategy at best, because in virtually every scientific field, it often is impractical to keep abreast of a growing mass of published information.

In tobacco control, because researchers come to the field from the perspectives of

so many different disciplines, the literature is particularly fragmented. For example, a search for recent tobacco control citations in *New Citations*¹ yields articles in publications specializing in medicine, pharmacology, cancer, psychology, addiction, and public health, as well as a growing number of journals devoted to tobacco control. *Current Citations* is a citation resource of the Centers for Disease Control and Prevention (CDC). Resources such as this are helpful for identifying the available literature because the citations are written in the language of the discipline in which they reside. However, accessibility of these resources to all frontline practitioners is limited. Similarly, resources that are excellent first steps in translating and synthesizing evidence from the extensive literature on KMT include the Tobacco Technical Assistance Consortium;² CDC's *Guide to Community Preventive Services*;³ and NCI's Cancer Control Plan, Link, Act, Network with Evidence-based Tools (PLANET).⁴

However, practitioners often need knowledge refinement, tailored programmatic tools, and information, which are not necessarily available in "prepackaged" databases. There is a need for enhancement of these existing services and of mechanisms that reward researchers for publishing in refereed journals and for disseminating research output and other knowledge to sources more available to practitioners. Similar mechanisms must be made available for researchers to tap into the experiential knowledge of frontline practitioners and the tacit knowledge of experts in other disciplines.

Today, organizations grapple with the ever-increasing and complex web of health knowledge that influences many facets of life. The first step in this effort is to differentiate between knowledge and information. Information is data such as the pattern of adult smokers in the United States. Knowledge involves interpretation

of information within some context. Knowledge also includes experiences, expertise, and routines that sometimes can be expressed only through action. Therefore, understanding the significance of the pattern of adult smokers in the United States in terms of its economic and societal impacts constitutes a source of knowledge about tobacco control that can have a profound influence on the health of the nation. Knowledge is a fundamental component of how organizations function. Increasingly, organizations in pursuit of success are looking for effective ways to manage what they know.

Knowledge Management and Translation

Definition

Knowledge management has been formally defined as “the organization, creation, sharing and flow of knowledge within organizations.”⁵ Knowledge translation refers to the process by which knowledge is rendered usable by its end users. The first of these two definitions is quoted from *Wikipedia*, an Internet-based encyclopedia that, in and of itself, represents a good example of the evolution of knowledge management in a systems environment. In first-generation KMT solutions, people would attempt, often unsuccessfully, to create all-encompassing proprietary knowledge “systems” through means such as intranets and databases. Second-generation solutions frequently follow the core systems concepts of chaos and complexity theory. Namely, these include the adoption of simple rules that ultimately gather, maintain, and translate knowledge in forms that can be best used by those who need it. *Wikipedia* itself uses such simple rules, built around interlinked components known as “wikis”

that users can update. A stakeholder-based mechanism for review and acceptance preserves accuracy and integrity. Unlike a traditional top-down effort to create a new encyclopedia, *Wikipedia* harnesses the power of its own readers to create a knowledge base that is truly encyclopedic, but often updated within minutes after new events happen.

Within such a systems environment, knowledge management forms an integral part of a new approach to tobacco control and public health. Previous chapters in this monograph discuss the use of systems models—networks of stakeholders and adaptive organizations—to address increasingly complex issues in this field. KMT forms the “glue” that holds these components together by providing the knowledge needed for these components to function and interact.

At a practical level, KMT involves both the methodologies and infrastructure needed to use knowledge effectively. It comprises strategies, processes, and technologies for identifying, capturing, and leveraging knowledge to advance a field of study. In concert with other integrated systems approaches in tobacco control, KMT strategies can manage and disseminate knowledge ranging from evidence-based tobacco control practices to the needs and experiences of the practitioner community.

Within the cycle of planning, implementation, and evaluation (see chapter 4), KMT is central to implementation strategies as a resource for maintaining explicit knowledge that, in turn, forms an evidence base. In addition, such strategies also are intimately connected to the development of both systems and networks for tobacco control, by drawing on the large body of tacit knowledge in the form of the needs and expertise of tobacco control stakeholders. As has been demonstrated in other fields, such tacit knowledge is critical to optimizing the efforts of a widely diverse range of stakeholders.

Dimensions

Nonaka and colleagues⁶ differentiate the raw data that drive the organizational knowledge infrastructure in terms of *explicit* and *tacit knowledge*. Both kinds of knowledge are created by individuals and amplified as part of the knowledge system in an organization. *Explicit knowledge* constitutes factual information that generally is contained within data. It often is precise and can be formally articulated in organizations. *Tacit knowledge* is formally defined as “knowledge that enters into the production of behaviors and/or the constitution of mental states but is not ordinarily accessible to consciousness.”⁷ Tacit knowledge generally is present in individuals. It is the subjective know-how in individuals and often is more difficult to express than explicit knowledge, except through action and experience.

These two kinds of knowledge frequently converge, as when both the facts of a study and the knowledge of its principal investigator are important to changing outcomes. Leveraging this knowledge is perhaps the most critical issue facing effective implementation of a KMT infrastructure to link research and practice in tobacco control so researchers and practitioners can share needs, experiences, and best practices in support of improved outcomes for tobacco control.

As a formal science, KMT methodologies have become the cornerstone of a revolution in knowledge-intensive organizational behavior. In the context of public health and specifically tobacco control, development of formal knowledge infrastructures holds the potential to integrate systems approaches such as system dynamics and network analysis as part of a broader knowledge-based framework for the linkage between research and practice. The four common types of knowledge management projects are to build knowledge repositories, improve knowledge access and use, enhance the underlying knowledge

environment, and manage knowledge as an asset. In a review of corporate knowledge-management projects across 24 companies, Davenport and colleagues⁸ summarize eight key success factors behind these systems:

1. Linkage to economic performance and industry value
2. Existing technical and organizational infrastructure
3. Standard but flexible form of knowledge structure
4. Knowledge-friendly culture
5. Clear purpose and language among staff
6. Change in motivational practices
7. Multiple channels of knowledge transfer
8. Senior management support

Replicating these success factors from the private sector to public health involves numerous challenges. These include coordination of KMT efforts across multiple organizations with different cultures, the need to develop a consistent and universally accepted knowledge infrastructure, and budgetary constraints. At the same time, such a knowledge infrastructure has the promise to form a cornerstone for evidence-based decision making in public health and for linking research to practice and practice to research. Moreover, the current state of tobacco control, with its multiple stakeholder organizations operating in an environment of declining financial resources, can particularly benefit from a consistent and successful knowledge infrastructure.

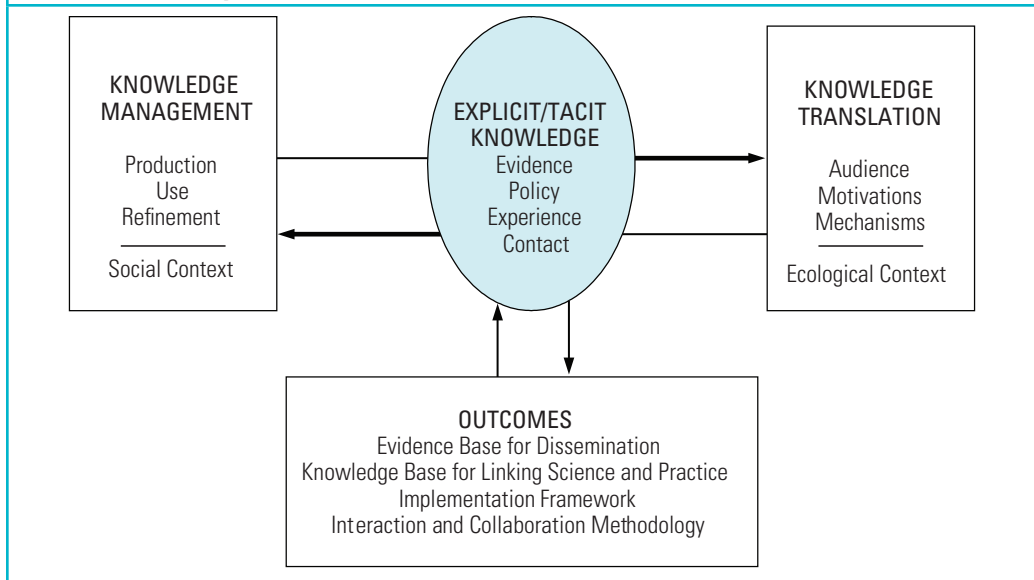
As part of research on the application of managing knowledge content from multiple stakeholders in the public health system, a metalevel framework is envisioned that applies knowledge management and knowledge translation concepts and strategies to the health policy, evidence, experience, and contact base in the field (figure 7.1).

Knowledge Management Concepts

Lau⁹ outlines a conceptual framework for knowledge management that comprises a set of knowledge management concepts for the health setting, revolving around

the production, use, and refinement of both explicit and tacit knowledge in an underlying social context. The types of knowledge addressed include clinical and administrative policy, research evidence, practice experience, and resource contact that are considered critical and relevant to specific settings. An overview of this framework, as shown in figure 7.2,

Figure 7.1 Overview of a Knowledge Management and Translation Framework for the Health System



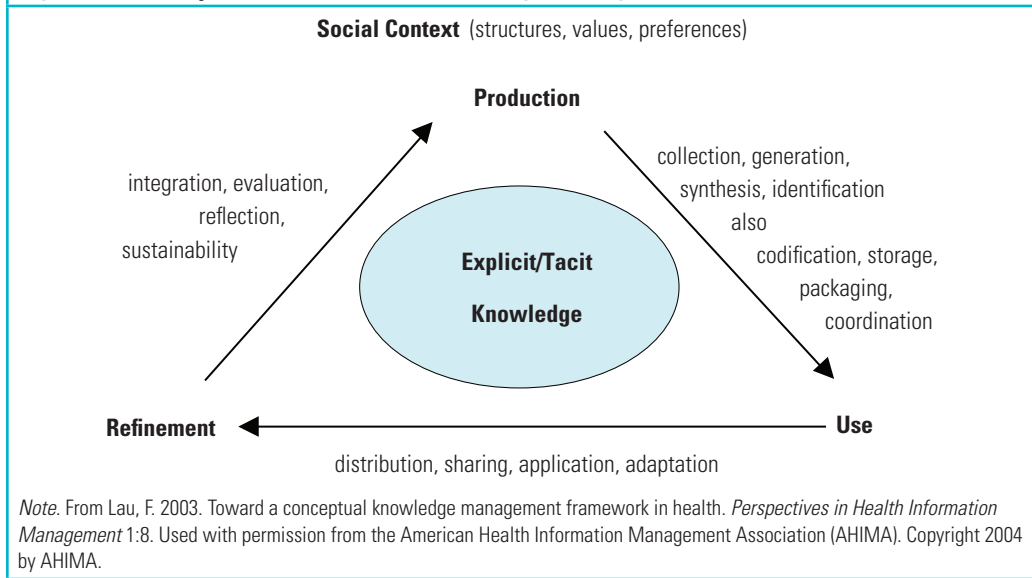
Benefits of Knowledge Infrastructure for Tobacco Control

For tobacco control, potential outcomes of a consistent knowledge infrastructure include

- *Evidence base for effective dissemination*, which serves as a repository for evidence-based practices in tobacco control, potentially in much the same way the Cochrane Collaboration^a provides the medical profession with an accessible meta-analysis of evidence-based medical research
- *Knowledge base for linking science and practice* so stakeholders in both communities can share needs and approaches
- *Implementation framework* for policy changes and consensus practices in tobacco control
- *Interaction and collaboration methodology*, which links large, geographically and politically diverse groups of tobacco control stakeholders in a cycle of planning, implementation, and evaluation for ongoing tobacco control efforts

^aCochrane Library. 2003. <http://www.cochrane.org>.

Figure 7.2 Conceptual Framework for Knowledge Management



involves three key components: knowledge production, use, and refinement.

Knowledge production is the process of creating and organizing policy, evidence, experience, and contacts. In a health care context, sources of this knowledge include policy syntheses, research findings, local practices, and resource contacts. The phase of knowledge production includes collection of local experience, such as organizational practice norms and values, generation of new knowledge from primary research (e.g., randomized trial or case study), synthesis of research findings, policy advice and local experience through a critical review process, and identification of individual or organizational resource contacts willing to share their knowledge.

As knowledge is created, a formal process is needed to organize this knowledge as artifacts or intellectual resources. This process involves codification of knowledge by using the appropriate nomenclature; computer-based storage for later retrieval and maintenance; packaging with appropriate content details and delivery

modalities; and coordination of intellectual resource contacts on such details as expertise, experience, locations, and availability.

Knowledge use refers to the manner in which stakeholders use explicit and tacit knowledge in a local setting. In a tobacco control environment, these stakeholders can span a broad range of roles, including researchers, advocates, practitioners, leaders, and legislators. The types of knowledge they use can range from specific research results to linkage with other stakeholders and their expertise. Factors in knowledge use include distribution to targeted audiences through channels such as print and online media; sharing through interpersonal communication; application in a local setting in policy or practice; and adaptation to the values, cultures, and norms of the local environment.

Knowledge refinement refers to ways knowledge sources are institutionalized within organizations over time as part of routine, accepted practices. Knowledge refinement is an ongoing process of

managing the information that is extant in the knowledge base. Factors in knowledge refinement include integration with existing work processes and practice norms; evaluation by using measures (e.g., quality, use, and impact); reflection on the knowledge source through subjective interpretations by stakeholders; and ongoing sustainability of the knowledge management approach.

All three of these factors exist within a larger *social context* affecting how the overall stakeholder group—including policy makers, practitioners, researchers, and the public—interacts with knowledge. This social context encompasses the social structures (e.g., organizations, rules, and processes) in which these stakeholders operate; values guiding beliefs and actions; and preferences on a wide range of health issues, based on belief systems and needs. This context creates a unique environment for knowledge management that is difficult to replicate outside of it.

Knowledge Translation Concepts

Knowledge management focuses on the systematic process of producing, using, and refining explicit and tacit knowledge in and across organizations. Knowledge translation is concerned with the dynamics necessary to convert explicit knowledge to tacit knowledge and vice versa across individual, group, organizational, and societal levels. The proposed framework for translation comprises members of the audience, their motivations, and the different mechanisms for the ongoing conversion of tacit and explicit knowledge within an underlying ecological context. An overview of this framework, as shown in figure 7.3, involves three key components: an audience, motivations, and mechanisms.

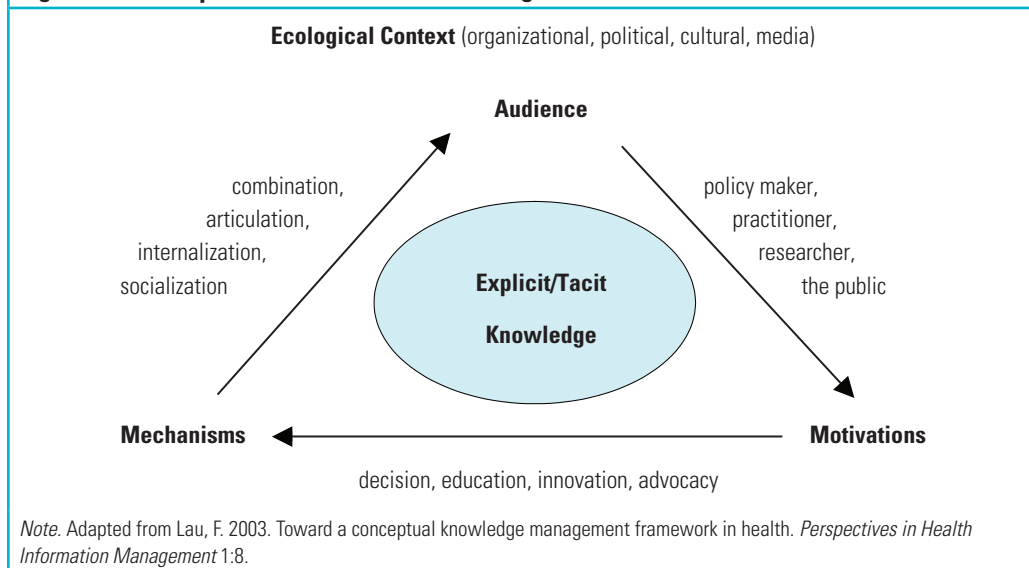
The audience consists of stakeholders, such as policy makers who make legal, financial, or administrative decisions; practitioners

who assist in clinical decisions for clients and families; researchers involved in scientific inquiries to generate new health knowledge; and others ranging from advocates, activists, and legislators to the general public. An important dynamic that determines the success of any effort at knowledge translation is the ability to distinguish among the types of audiences involved. Different audiences have different knowledge needs that must be recognized when translating the policy, evidence, experience, or contact to address a particular issue.

Motivations for knowledge translation depend on the specific audience. Motivations may include decision making for clinical, administrative, or legislative issues; education to improve knowledge and performance; innovation to generate new knowledge; or advocacy to influence the actions of others.

Mechanisms that translate explicit and tacit knowledge into usable forms of health policy, evidence, experience, and/or personal contact include a combination of different forms of explicit knowledge to add value, articulation of tacit knowledge in print or electronic form, internalization of explicit knowledge as intellectual capability, and sharing of tacit knowledge with others through socialization.

This environment for knowledge translation exists in an *ecological context* that views the health system as an ecosystem with interrelated components interacting with each other at different levels over time, in a complex and unpredictable manner.¹⁰ The quality and effect of these interactions are contingent on different situational contexts. These include the organizational context in the health care environment; the cultural context that encompasses values, beliefs, and norms; the political–legal context such as legislation, mandates, and privacy issues; and the surrounding media environment for communication and interaction.

Figure 7.3 Conceptual Framework for Knowledge Translation

Integration of Knowledge Management and Translation

Effective management of the content of explicit and tacit knowledge requires consideration of all of the concepts described in the frameworks for knowledge management and knowledge translation. Although the two frameworks address different aspects of managing and translating knowledge, they are complementary in nature and should be considered in synchrony for maximal effects. Therefore, in producing, using, and refining tobacco control knowledge such as policy, evidence, experience, and contact in and across organizations, one should also take into account members of the intended audience, their respective motivations, and the mechanisms available for translating such knowledge, within the underlying social and ecological contexts. Table 7.1 summarizes specific considerations for each aspect of the integrated KMT concepts.

As table 7.1 implies, the integration of knowledge management and knowledge

translation has specific ramifications for the processes of knowledge production, use, and refinement to address specific audiences and their motivations. *Knowledge production* requires consideration of factors related to generating knowledge for effective translation. These factors include the following:

- Collection of local experience in such a way that stakeholders articulate it from a tacit to explicit form
- Generation of new knowledge by articulating tacit knowledge from research findings into published form
- Synthesis of this knowledge in forms such as systematic reviews
- Identification of intellectual resources as sources of tacit knowledge

Once generated, the knowledge should be organized by methods that facilitate effective translation. This process encompasses the codification of collected experience, evidence, and other resources into explicit knowledge in the following steps:

Table 7.1 Integrated Concepts of Knowledge Management and Translation

Concept	Audience	Motivations	Mechanisms
Production	Who generates and/or organizes the knowledge and whom is it for?	What are the motivations for creating and organizing the knowledge?	What translation mechanisms should be included when creating and organizing the knowledge?
Use	Who uses the knowledge?	What are the motivations for using the knowledge?	What translation mechanisms should be included when using the knowledge?
Refinement	Who refines the knowledge and whom is it for?	What are the motivations for refining the knowledge?	What translation mechanisms should be included when refining the knowledge?

- Use accepted vocabularies such as that of the *International Classification of Diseases* (10th revision)¹¹ and Health Level 7¹² (an exchange standard for clinical data)
- Code this knowledge into online repositories
- Package it in a variety of content, media, and delivery formats
- Coordinate intellectual resource contacts within this knowledge base to enhance their availability as sources of tacit knowledge

Knowledge use through translation should take place in contexts that are relevant to different audiences and their motivations. This context must influence factors such as the distribution of explicit knowledge in appropriate forms and the sharing of tacit knowledge through socialization. The presentation should be tailored to different audiences. The application and/or adaptation of explicit or tacit knowledge must be oriented to local settings.

Knowledge refinement involves formulating a presentation of concepts that is geared to specific audiences and their motivations. This process requires integration of new knowledge with existing knowledge by socializing new knowledge in tacit form; internalizing new explicit knowledge into

tacit knowledge; and conversely, articulating new knowledge from tacit to explicit form. The process also entails evaluation of the impact of this knowledge by articulating tacit experience into a quantifiable explicit form, reflection of the experience of using this knowledge, and assessment of the sustainability of the KMT effort.

The common thread running through each of these issues is the need to develop a consistent approach for KMT that encompasses the unique needs and motivations of each of the stakeholder audiences, such as policy makers, practitioners, and researchers. Moreover, as discussed later in this chapter, these issues point to the need to integrate knowledge management strategies for health care environments within the broader area of systems thinking—for example, the use of systems approaches involving adaptive behavior and feedback to address complex issues. Accomplishment of this integration requires the following procedures:

- Infusing the collection of explicit knowledge into research and practice experience
- Leveraging the use and maintenance of networks as a source of tacit knowledge
- Using this knowledge in a framework of systems-level planning, implementation, and outcomes evaluation

- Creating an integrated framework for leveraging knowledge within the broader public health system

Framework for Strategy of Knowledge Management and Translation

The concepts described under the knowledge management and knowledge translation frameworks provide a rich taxonomy and models of understanding that can be used to devise specific strategies and actions for implementation. Three broad strategies are envisioned to manage the complex knowledge content that spans multiple stakeholder organizations, as is the case for tobacco control: (1) the 4Ps (purpose, people, process, and product) of KMT; (2) the underlying KMT infrastructures; and (3) the KMT strategy maps. Figure 7.4 shows this KMT strategy framework.

Four Ps of Knowledge Management and Translation

The 4Ps of KMT refer to the four aspects of KMT that should be leveraged as an essential part of an integrated KMT strategy—purpose, people, process, and product. These 4Ps provide the necessary focus and means to implement an effective knowledge infrastructure in and across organizations.

Purpose

Management of complex knowledge content, such as tobacco control policy, practice, and experience that span multiple stakeholder organizations or audiences, requires a shared understanding of the overall mandate, vision, goals, and objectives, even though they are high level, abstract, and evolving. Such a mental model can serve as

a road map from which concrete plans can be developed and implemented. This purpose encompasses four key actionable items:

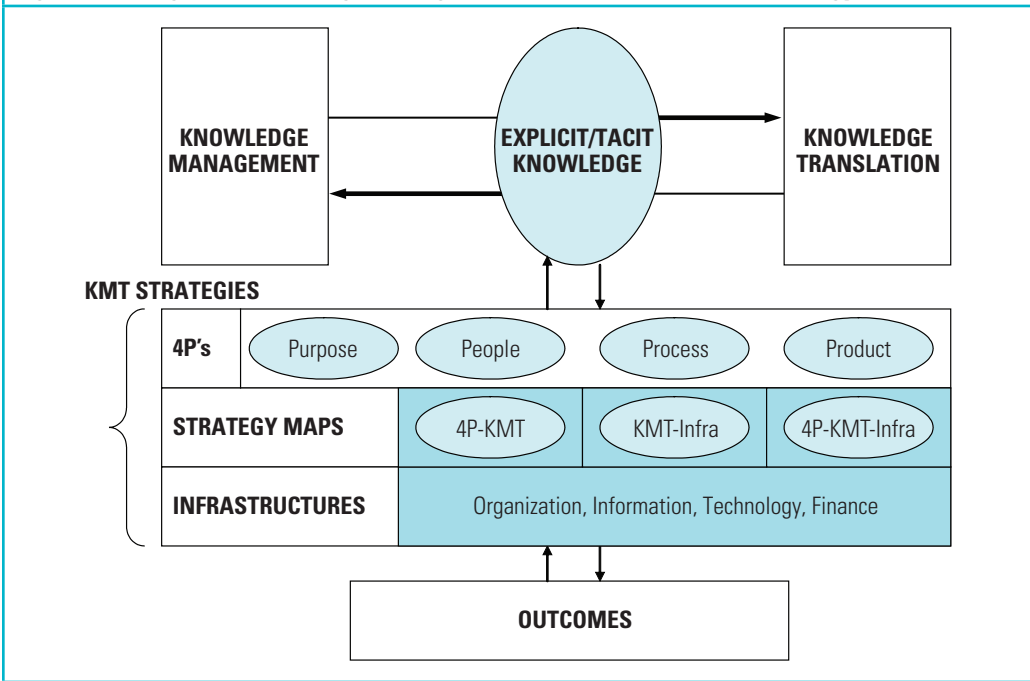
- *Agendas* are needed that are specific to individual audiences, such as the research agenda, the political agenda, and the public's agenda, in the case of tobacco control. The intent is to ensure that *everyone knows who should do what*.
- *Relevance* ensures that the coordinated agendas fit the mandate, goals, and activities of the stakeholder organizations. The intent is to ensure that *everyone knows that who should do what is relevant*.
- *Timelines* provide an overall schedule to implement coordinated agendas for stakeholder organizations according to priority, need, and the availability of resources. The intent is to ensure that *everyone knows that who should do what is relevant when*.
- *A business case* with well-articulated justifications for proceeding is essential for successful implementation of KMT. The intent is to ensure that *everyone knows that who should do what is relevant and justified when*.

People

Even with the best-coordinated agendas, nothing will happen unless the appropriate human resources are in place to implement these plans. Within the complex public health system, an effective KMT infrastructure that spans different stakeholder organizations requires the ongoing engagement of specific types of people, including the following:

- Knowledge champions are leaders who are respected in the field or have positional power to lead, lobby, or advocate for specific causes, expecting others to follow or comply with their actions. Their presence and actions are

Figure 7.4 Integrated Knowledge Management and Translation (KMT) Strategy Framework



crucial in introducing change in and across organizations because of their stature and conviction.

- *Knowledge brokers/managers* work as intermediaries to translate the knowledge required by different audiences according to their specific motivations. They are knowledgeable in KMT methodologies and are responsible for translating knowledge such as health policy, evidence, experience, and contact into tailored content, media, and formats that are relevant to local practice.
- *Knowledge architects* are responsible for the planning, design, implementation, and support of KMT systems in organizations or groups. Knowledge architects usually are trained in KMT and are responsible for the strategic, financial, technical, and organizational aspects of the knowledge infrastructures.
- Communities of practice are individuals and groups in and across organizations

that share common agendas and work practices. They provide the critical mass needed to collectively produce, use, and refine health policy, evidence, experience, and contact in ways that fit the specific motivations of different audiences.

Process

Process is made up of the activities that enable people in and across stakeholder organizations to work collectively on the coordinated KMT agendas. Key processes that form part of the KMT strategy and infrastructure include the following:

- *Consensus building* enables stakeholders to identify and negotiate a diverse set of issues or options to reach agreement on key issues or solutions.
- *Capacity building* enables stakeholders to develop local and practical expertise to address a specific health area or issue.

- *Knowledge development* enables stakeholders to engage in specific KMT activities related to health issues.
- *Network development* enables stakeholders across organizations to collectively engage in KMT activities.

Products

Products serve as the tools that enable people to work collectively on coordinated agendas through specific KMT processes. Representative tools that form part of the KMT strategy and infrastructure include groupware, knowledge repositories, tools for knowledge development, and tools for knowledge access, as follows:

- *Groupware* includes software tools for communication, coordination, and collaboration, which allow individuals, groups, and organizations to work together electronically and virtually on specific KMT activities.
- *Knowledge repositories* usually are interactive knowledge bases accessible through the Internet that contain a wide range of health knowledge content in various media and delivery formats.
- *Knowledge development tools* are software tools for generation and organization of knowledge content.
- *Knowledge navigation/access tools* are software tools used by audiences to retrieve specific knowledge content from knowledge repositories according to specific motivations.

The 4Ps provide a framework for implementation of a KMT strategy. Moreover, their components form an important part of the planning checklist for such an implementation. In a public health setting such as tobacco control, these factors also ensure that the unique needs of individual stakeholder groups are

addressed as an integral part of the design and implementation effort.

Underlying Infrastructures

The 4Ps provide the focus and means to implement KMT in and across organizations. However, the underlying KMT infrastructures provide the necessary foundations on which the 4P-KMT strategy can be deployed. Key aspects of the KMT infrastructures include the following:

- *Organization infrastructure* refers to the structures, procedures, and norms by which organizations can work collectively to manage and translate knowledge. The components include the sites of explicit and tacit knowledge resources in and across organizations; the procedures behind knowledge-related tasks; and the cultural norms and customs of stakeholder organizations.
- *Technology infrastructure* refers to the information technology capacity and tools with which organizations deploy the knowledge infrastructure, including software applications, computer networks, telecommunications, and Internet connectivity.
- *Information infrastructure* refers to the underlying electronic databases, library resources, and data definitions and taxonomies available in and across organizations as input into the knowledge infrastructure.
- *Financial infrastructure* encompasses the mechanisms used to define and measure the value of knowledge infrastructures. These mechanisms include the investment portfolios that finance the human and physical resources required, intellectual assets representing the value of knowledge resources, and the return-on-investment measures of this value relative to the original investment.

These components serve to illustrate the larger point that a KMT infrastructure encompasses an integration between computer and database technology and the surrounding organizational environment. This point underscores the concept that the KMT infrastructure cannot be purely approached as a computing issue. Instead, it should be seen in the context of the larger goals of affected stakeholder organizations.

4P-Knowledge Management and Translation Strategy Maps

KMT strategy maps provide detailed mapping of the actionable items under the 4P and infrastructure strategies to achieve the desirable outcomes. These strategy maps are intended to offer guidance in planning and implementing a knowledge infrastructure. Three KMT strategy maps are described here: 4P-KMT, KMT infrastructures, and 4P-KMT infrastructures.

4P-Knowledge Management and Translation Strategy Map

The 4P-KMT map is focused on the actionable items under the 4P strategy for KMT in and across organizations. For example, with respect to purpose, one needs to define the relevant agendas, the timelines, and the business case with regard to who should produce, use, and refine the knowledge, based on members of the audience, their motivations, and translation mechanisms. At the same time, the local social and ecological contexts must be considered. Table 7.2 shows the 4P-KMT strategy map.

Strategy Map for Knowledge Management and Translation Infrastructure

The strategy map for KMT infrastructures focuses on the actionable items under the

KMT infrastructure strategy in and across organizations. For example, with respect to organization infrastructure, one needs to establish the appropriate structure, procedures, and norms for the production, use, and refinement of knowledge. This process must take into account members of the audience, their motivations, and different translation mechanisms, as well as the local social and ecological contexts, such as affected stakeholder groups and their interaction with the broader health care system. Table 7.3 shows this strategy map.

Strategy and Outcome Map for 4P-Knowledge Management and Translation Infrastructures

The strategy and outcome maps for 4P-KMT infrastructures focus on the actionable items under the 4P strategy, taking into account issues related to the underlying KMT infrastructure and the desired outcomes. The purpose is to establish a comprehensive infrastructure for KMT. This strategy map (figure 7.5) can be used as a framework to expand its actionable items into a more detailed strategy map for each type of knowledge involved, which in turn can be expanded into detailed checklists for final planning and implementation. (For more details on 4P-KMT infrastructures, see appendix 7A.)

Case Study: Knowledge Management in Tobacco Control

An illustrative case study of the current role of KMT in tobacco control efforts is presented here. A series of discussion meetings with key informants were conducted in June and July 2004 to examine KMT in the domain of tobacco control, as part of a substantive study of large-scale

Table 7.2 4P-Knowledge Management and Translation Strategy Map

	Production	Use	Refinement
Purpose	Define relevant agendas, timelines, and business case; and decide who should produce what knowledge	Define relevant agendas, timelines, and business case, and decide who should use what knowledge	Define relevant agendas, timelines, and business case, and decide who should refine what knowledge
People	Identify champions, brokers, managers, and communities of practice to produce knowledge	Identify champions, brokers, managers, and communities of practice to use knowledge	Identify champions, brokers, managers, and communities of practice to refine knowledge
Process	Incorporate consensus building and knowledge-development process to produce knowledge	Incorporate consensus building and knowledge-development process to use knowledge	Incorporate consensus building and knowledge-development process to refine knowledge
Products	Produce knowledge through groupware, knowledge development, and repository and access tools	Use knowledge through groupware, knowledge development, and repository and access tools	Refine knowledge through groupware, knowledge development, and repository and access tools

Note. Each 4P-knowledge management and translation strategy is specifically based on the audience, motivations, and different translations in social and ecological contexts.

Table 7.3 Strategy Map for Knowledge Management and Translation Infrastructure

	Production	Use	Refinement
Organization	Establish structures, procedures, and norms for producing knowledge	Establish structures, procedures, and norms for using knowledge	Establish structures, procedures, and norms for refining knowledge
Technology	Establish applications, networks, and connectivity for producing knowledge	Establish applications, networks, and connectivity for using knowledge	Establish applications, networks, and connectivity for refining knowledge
Information	Develop internal and external databases and information resources needed for producing knowledge	Develop internal and external databases and information resources needed for using knowledge	Develop internal and external databases and information resources needed for refining knowledge
Finance	Establish investment portfolios, intellectual assets, and return on investment for producing knowledge	Establish investment portfolios, intellectual assets, and return on investment for using knowledge	Establish investment portfolios, intellectual assets, and return on investment for refining knowledge

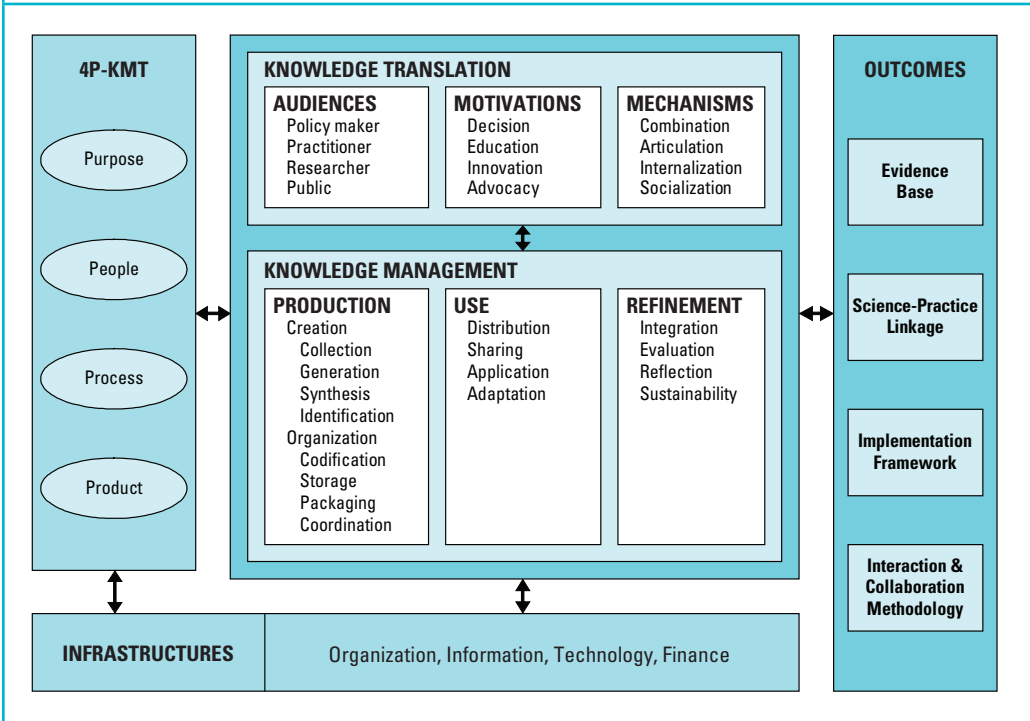
Note. Each 4P-knowledge management and translation strategy is specifically based on the audience, motivations, and different translations in social and ecological contexts.

change in health systems. The scope of these discussions was focused mainly on the recent Cancer Control PLANET⁴ initiative and several related Web-based knowledge resources outlined here, including the Cancer Biomedical Informatics Grid (caBIG)¹³ and the Cancer Intervention and Surveillance Modeling Network (CISNET).¹⁴ These efforts provide real-life case illustrations of the current state of the KMT

infrastructure that is emerging within the field and the challenges involved.

Key informants identified by the study team were invited to discussion meetings in person or by telephone to share their thoughts about KMT by using tobacco control or related areas as the domain. (See appendix 7B for discussion questions.) These key informants were researchers, policy makers, information-

Figure 7.5 4P-Knowledge Management and Translation Infrastructures Strategy Map



management professionals, community-based practitioners, and advocates involved with tobacco control and/or cancer control from NCI and selected partner organizations such as CDC and the Campaign for Tobacco-Free Kids. NCI was chosen as a focus organization because of its central role in funding and developing an infrastructure for tobacco control efforts and its key support for the Initiative on the Study and Implementation of Systems (ISIS). Definitions related to KMT (appendix 7A) were provided before the meetings to familiarize informants with KMT terms. The team also reviewed information on these initiatives that NCI published on its Web site. The purpose of this review was to facilitate an understanding of the nature of the KMT efforts, especially in the area of tobacco control.

Chapter findings are organized around the types of tobacco control and related knowledge needed and those currently

managed, how such KMT efforts can be viewed as part of an emerging KMT infrastructure, and suggested ways to advance this infrastructure to better meet the ongoing challenges in tobacco control.

Tobacco Control and Related Knowledge

At the discussion meetings, different types of tobacco and cancer control knowledge resources were reviewed with key informants from NCI and partner organizations. These resources included Cancer Control PLANET⁴ as an example of an evolving Web-based knowledge repository, as well as the Surveillance, Epidemiology, and End Results (SEER)¹⁵ registry program, CISNET,¹⁴ and audience segmentation tools such as the Consumer Health Profiles (CHP),¹⁶ as related knowledge resources that can be leveraged in tobacco control as part of the KMT

efforts. Key aspects of the newly established caBIG were presented to illustrate an evolving collaborative knowledge network that may be considered for the tobacco control domain. In addition, information was presented on the problem of missing, incomplete, or conflicting knowledge for some aspects of tobacco control, especially at the systems level. Related KMT efforts and needs are described here.

Cancer Control PLANET and Tobacco Control

Cancer Control PLANET⁴ is a Web portal for cancer control launched in April 2003 and developed over two years as a collaborative effort among key government and nongovernment agencies, including the following:

- *National Cancer Institute*: An agency of the U.S. Department of Health and Human Services (DHHS) that serves as the federal government's principal agency devoting resources to scientific research on cancer; also the coordinating agency for PLANET.
- *Centers for Disease Control and Prevention*: A DHHS agency focused on control and prevention of disease, injury, and disability. The Division of Cancer Prevention and Control of the National Center for Chronic Disease Prevention and Health Promotion is the lead CDC agency in the area of tobacco control.
- *American Cancer Society*: A nationwide nongovernmental organization dedicated to cancer prevention and treatment.
- *Substance Abuse and Mental Health Services Administration*: A federal agency involved with issues of substance abuse and mental health that provided the review of tobacco control programs for PLANET.
- *Agency for Healthcare Research and Quality*: A DHHS agency dedicated to improvement of the quality of health care. This agency supports the U.S. Preventive Services Task Force, which develops recommendations on effective clinical preventive interventions such as screening, counseling, and medication regimens.
- *American College of Surgeons Commission on Cancer*: A professional organization that joined as a PLANET partner in 2006 to help promote evidence-based comprehensive cancer control through its state-based liaison physician program.

PLANET's Web portal provides profile data on cancer nationally and by county and state, risk factor data by state, and resource information to assist program planners, educators, and researchers in the design, implementation, and evaluation of evidence-based cancer control programs. Users of the portal are assisted in "assessing the profile and risks of cancer within a state, identifying potential partner organizations already working with high-risk populations, understanding current research findings and recommendations, accessing evidence-based programs and products, and finding guidelines for planning and evaluation."⁴ As part of this Web portal, PLANET provides detailed step-by-step instructions for its audience to establish a comprehensive cancer control program in the local setting.

The portal also covers a wide range of cancer-related topics, including information on specific cancers (e.g., breast cancer), diet, nutrition, physical activity, tobacco control, and sun exposure safety. In the tobacco control domain, the same five-step approach to cancer control planning is used. The user audience can assess local program priorities based on state cancer profiles and risks for current smokers; identify local program and research partners involved in work related to cancer and tobacco control; determine

the effectiveness of different tobacco control interventions; access research-tested tobacco control programs and products; and plan and/or evaluate a local tobacco control program. Key aspects of this tobacco control portal that illustrate the KMT efforts are highlighted here.

- *State cancer profiles and risk factor data on current smokers* are available from sources such as the SEER registry program, the National Program of Cancer Registries, the Behavioral Risk Factor Surveillance System, and the Current Population Survey Tobacco Use Supplement. The types of information that can be obtained cover such areas as the prevalence of cancer for specific sites, incidence, mortality, and survival statistics, as well as smoking patterns and targets for smoking cessation in different population segments at the national and state levels and sometimes at the regional level. Coupled with additional statistics on local tobacco control policies and experiences, such knowledge resources can be used in planning specific tobacco control initiatives and evaluating their effectiveness based on local priorities and needs.
 - *Potential partners* can be identified through up-to-date directories listing regional tobacco control programs and information on contacting researchers. The organizations listed in the program directory include the American Cancer Society, the CDC Tobacco Control Network, and NCI's Cancer Information Service, which makes available regional representatives to provide coordination and support in local tobacco control initiatives. The researchers are potential partners who already are involved with tobacco control research in academic institutions, research foundations, or medical centers in different regions of the United States. These contacts provide the expertise and resources
- needed to plan, implement, and evaluate specific tobacco control initiatives at the local level.
- *Effective research-based tobacco control intervention strategies* include current systematic reviews and recommendations, available electronically via the Web from such sources as the *Guide to Community Preventive Services*, the *Clinical Guide to Tobacco Use Counseling*, and the *Clinical Practice Guideline on Tobacco Cessation*. These evidence-based knowledge resources are distributed by reputable groups including the Community Preventive Services Task Force, the U.S. Preventive Service Task Force, the Public Health Service, the Agency for Healthcare Research and Quality, CDC, and NCI.
 - *Research-tested tobacco control programs and products* are appraised for quality and made available to the audience according to their specific needs. NCI and the Substance Abuse and Mental Health Services Administration conduct ongoing peer reviews of scientifically tested tobacco control programs and products published by researchers for adoption by others. These knowledge resources can be downloaded at no cost and modified for local implementation by following specific guidelines for program adaptation. The adaptation includes determining the needs of the audience, working with expert advisors to maintain the integrity of the original program, pilot testing the modified program, and evaluating the implemented program for its effectiveness.
 - *Planning and evaluation of local tobacco control programs* can be accomplished by using the comprehensive cancer control planning framework from CDC. This planning framework outlines a specific set of objectives, planning activities, and outcomes that should be addressed

to successfully implement a cancer control initiative such as a local tobacco control program. The processes outlined in the framework are based on actual experiences from several states that undertook comprehensive cancer control planning in recent years.

The design and implementation of PLANET as a dynamic knowledge repository have been an ongoing iterative process, with a great deal of effort spent on ensuring that it provides up-to-date knowledge resources, translated in ways that are usable to a wide range of audiences. An online “train-the-trainer” course also is available on PLANET, based on a 3.5-hour course delivered around the country through Comprehensive Cancer Control Leadership Institutes, to increase the uptake of PLANET in the field. When the site is accessed, limited information automatically is collected. The information includes the name of the domain and the Internet address of the provider, the Web site, and the computer used; the date and time of the visit; and the pages visited. Because of privacy concerns, it is not feasible to monitor how the audience actually uses the knowledge resources through the site, such as which products were downloaded from the Research-Tested Intervention Programs. A more formal evaluation on the effectiveness of PLANET will be conducted through a follow-up survey of those who have completed the 3.5-hour in-person training. Other issues on enhancing the adoption and use of PLANET in tobacco control include the following:

- Finding ways to encourage successful champions to take the evidence on what works in tobacco control and make it theirs as part of the knowledge transfer process
- Developing a version of PLANET for clinicians, with additional features such as real-time delivery of evidence at the point of patient contact, with concise

one-page fact sheets by topic area, to help them incorporate the available evidence as their choice of interventions in practice

- Translating the instruments used by researchers to simple program evaluation tools and sharing their experiences with the appropriate audience to encourage the adoption of evidence as part of practice norms

Surveillance, Epidemiology, and End Results Registry

The SEER program of cancer registries¹⁵ is a broad information source on cancer incidence and survival in the United States. When used in conjunction with its companion suite of analytic tools, SEER can be a valuable knowledge resource for statistics on cancer. Available statistics include the following:

- Cancer survival based on follow-up of cancer cases over time, measured in a number of different ways depending on intended purpose
- Probabilities of developing or dying from cancer
- Statistics that pool data from different sources to analyze cancer patterns and trends in particular segments of the population

The SEER program is an important knowledge resource for tobacco control, with its extensive repository of statistical evidence indicating that smoking is a major cause of many cancers.

Cancer Intervention Surveillance Network

CISNET¹⁴ is a community of NCI-sponsored researchers who use modeling to improve understanding of the impact of cancer

control interventions (i.e., prevention, screening, treatment) on population trends in incidence and mortality. These models are also used to project future trends and to help determine optimal cancer control strategies. When possible, comparative modeling projects are undertaken to answer important cancer control questions using an agreed upon set of common model inputs and outputs. CISNET's interactive, Web-based software for profiling models enables researchers to document components of their models in predefined templates. The synthesis of these disparate models into a common format enables comparison of model structures, tracking of model versions, searching of model components, and replication of the model and results by others. The design of CISNET has been an iterative process, ensuring that the tools developed are meaningful and useful to the research community. CISNET can be a valuable knowledge resource for tobacco control in terms of access to modeling expertise in predicting the effects of tobacco control interventions in cancer. One example is Levy's recent simulation study¹⁷ of the effects of tobacco policy on lung cancer in the population. The findings provide insights on (1) the effects of tobacco policies on the number of deaths attributed to smoking, (2) whether new tobacco products and related products may reduce risk of cancer, and (3) finding ways to coordinate tobacco control policies with improved detection and treatment of lung cancer.

Consumer Health Profiles

Being able to narrow audiences based on more than demographic characteristics is a critical component of social marketing approaches. Audience segmentation systems rely on a combination of demographic and lifestyle data to define lifestyle groups and provide insights into how to market to them. Systems such as these are used

extensively in consumer marketing and have been applied to social marketing campaigns since the mid-1990s.

NCI has developed CHP,¹⁶ a tool to support the use of audience segmentation information by health education program planners and implementers. The profiles in CHP are summaries of the demographics, health care attitudes, behaviors, media habits, and lifestyle characteristics of consumers in selected "lifestyle clusters." These profiles also outline suggested strategies for reaching these audiences with health information and behavioral interventions. Organizations can use these profiles along with maps and reports as a planning aid to identify and target underserved or at-risk populations most in need of cancer education and outreach programs. Used in conjunction with other resources such as the State Cancer Legislative Database,¹⁸ NCI's *Making Health Communications Programs Work: A Planner's Guide* (also known as the Pink Book),¹⁹ CDCynergy,²⁰ and PLANET, CHP can be a valuable resource for knowledge about tobacco control. These resources can be helpful in developing intervention programs for tobacco control by using approaches such as social marketing to increase reach and efficacy in specific population segments (e.g., female teenage smokers).

The knowledge resources described here are illustrations of KMT efforts that NCI has undertaken over the last few years in cancer and tobacco control to produce, use, and refine explicit and tacit knowledge for a specific audience. Resources such as PLANET, SEER, and CHP can help stakeholders understand the patterns and effects of smoking and can reveal which tobacco control interventions are effective. In addition, the CISNET initiative can foster interactions and collaboration across different groups of stakeholders, encouraging them to work collectively toward a common set of agendas for tobacco control.

Cancer Biomedical Informatics Grid: Evolving Knowledge Network

Launched by NCI in February 2004, caBIG¹³ is a collaborative initiative to build an integrated biomedical informatics infrastructure for sharing data, tools, and expertise. Nearly 900 individuals from more than 50 cancer centers and 30 other organizations across the United States were participating by the end of 2006. The overall aim of caBIG is to create a virtual community of researchers to expedite cancer research through the development of a set of common vocabularies and data elements, with standards-based software applications and technology platforms. It is expected that the researchers and organizations that make up this community will be able to easily share the resulting data, tools, and infrastructures. In addition, caBIG tools and infrastructure are freely available to all and are widely applicable beyond cancer.

Members of this virtual community have been working to define the agenda, projects, and priorities for this initiative. Activities of caBIG are organized into “workspaces,” each addressing a specific area of need identified by the community. The two types of workspaces are domain specific and crosscutting. Overall strategic planning and management and two types of working groups have been established to coordinate specific pilot projects within the workspaces. An online knowledge repository has been created as an inventory to store the data, application, and infrastructure artifacts and documentation generated to support various caBIG projects. NCI provides financial support for members to take part in these working groups and to work on specific projects. Current projects under the two workspaces are briefly described here.

Clinical trial management systems deploy existing and develop new information, applications, processes, services, and

infrastructures used to support the design, implementation, and administration of clinical trials. Examples include (1) the caBIG clinical protocols portal, a Web-based application that enables researchers to share protocols; and (2) the C3D, a remote application that captures data for conducting clinical trials by using standardized vocabularies and common data elements.

In vivo imaging focuses on identifying the ways in which the wealth of information provided by such imaging, performed at academic and other research centers across the country, can be shared, optimized, and most effectively integrated. The in vivo imaging technologies and modalities addressed include systems for research and clinical imaging of live patients and animals (including single-cell organisms) used as model systems for human disease.

Integrative cancer research tools are being developed and deployed to enable integration and sharing of basic and clinical cancer research data among researchers at different centers. These include tools used to support research on pathway mapping, proteomics, microarrays, and gene expression. In addition, raw data can be shared across platforms and organizations.

Tissue banks and pathology tools are being developed and deployed to enable the integration and sharing of information from repositories of cancer specimens from cancer research centers. These include tools that can enhance identification of tissue banks and access to research samples. They can also leverage existing sample-tracking systems and management systems for pathology information, providing additional support for decision making and analytic capabilities.

Vocabularies and common data elements refer to the development of cancer ontology content and standardization of clinical terms

used in cancer research. Examples include the NCI National Cancer Data Standards Repository and the Common Data Elements development and harmonization program. Because these activities and resources are part of the crosscutting workspace, it is expected that the outputs will be shared among other working groups and their projects under the domain workspace.

The architecture workspace is involved in developing architectural policies and standards based on the open-source environment principles. Its purpose is to ensure consistent application of these principles across groups in the caBIG community and to achieve seamless integration and sharing of the knowledge resources in cancer research.

In 2006, caBIG added a new special interest group focusing on population science. Its work includes analyzing key opportunities for and barriers to using informatics to strengthen population science, including data sharing and intellectual property issues, interoperability issues, and specific tools to enable population research (such as tools for generating standardized questionnaires).

An evolving informatics infrastructure, caBIG connects researchers and organizations in cancer and biomedical research to accelerate the pace at which their activities can be conducted in a coordinated and collaborative manner. Although its current emphasis is on the cancer and biomedical research community, the philosophy, objectives, framework, and process of caBIG can be readily applied to bringing stakeholder groups together to advance the field of tobacco use prevention and control. More important, the tobacco control field can build directly on caBIG's interoperable infrastructure and tools to avoid both duplicating efforts and creating new "silos" that do not permit researchers to integrate data from multiple sources.

Systems-Level Tobacco Control Knowledge: Missing Pieces

Over the years, the tobacco control community has made great strides in the prevention and control of tobacco use by conducting research on smoking and implementing tobacco control policies and intervention programs. A vast amount of knowledge about tobacco control has been accumulated during this time, as is illustrated through the various KMT efforts in tobacco and related cancer control initiatives at NCI. However, for some aspects of tobacco control, knowledge is missing, incomplete, or conflicting, especially at the systems level. Such deficiencies are seen as major obstacles to effective prevention and control of tobacco use in society.

During the discussion meetings on KMT, the key informants offered their views on the major types of tobacco control knowledge that they perceived to be missing, incomplete, or conflicting. These obstacles include the following and are described below:

- Lack of current data on the tobacco industry
- Need for knowledge about current activities in tobacco control
- Need for knowledge of current needs in tobacco control efforts and who should address these needs
- Lack of "receptor capacity" in local settings, in terms of the ability of some local program staff with insufficient expertise and experience to absorb new ideas
- Need to make research findings more relevant

Lack of intelligence about the tobacco industry is problematic because the industry constantly adapts to counter tobacco control efforts and maintain profits.^{21,22} Without such intelligence it is difficult to

know where attention should be focused and where the scarce resources should be deployed to anticipate and counteract the actions of the industry.

Knowing who is doing what in tobacco control is difficult. Many stakeholders are committed to tobacco control, and new initiatives, such as research findings, policy initiatives, and intervention programs, are continually being introduced. Even though these diverse initiatives are worthy in their own right, they tend to put tobacco control in a constant state of flux, making it difficult to keep abreast of all the happenings in the field.

Knowing who should do what in tobacco control also is difficult, because stakeholders, such as policy makers, researchers, practitioners, and the public, may have their own agendas, priorities, and so they engage in tobacco control in different ways. Such diverse motivations have led to duplication of efforts, competition for resources, and even conflicting results. Some efforts have been made to improve communication among stakeholders, but better coordination and collaboration still are needed.

Lack of receptor capacity in tobacco control in local settings is another obstacle to efficacious tobacco control. The concept of “receptor capacity” refers to the ability to absorb new ideas and paradigms. It has become an increasingly key issue as stakeholder organizations restructure their public health programs and combine multiple initiatives (e.g., obesity, smoking, and physical activity), often with reduced funding and human resources. Consequently, some local program staff have insufficient expertise and experience in tobacco control and thus do not know what knowledge is needed, where to find this knowledge, or how to apply it in the local setting.

Research should be more relevant to practitioners so it can be more applicable

in the field setting. The current funding mechanisms are largely research driven, and less attention is given to the needs of stakeholders. This situation has led to gaps between the results of research and the knowledge required in the field to develop effective tobacco control programs. There also is a perception that tobacco control researchers conduct their studies, publish their findings, and move on to the next project without translating their knowledge into meaningful instruments that can be used by tobacco control policy makers and practitioners.

National Cancer Institute’s Emerging Knowledge Management and Translation Infrastructure

The knowledge resources and initiatives described thus far represent selected KMT efforts that NCI has undertaken over the past years. These efforts have evolved both as part of an overall organizational strategy and from the practical day-to-day need to move the cancer and tobacco control agendas forward. Here, these KMT efforts are examined under the lens of the proposed framework for KMT strategy. Thus, how the field of public health can move toward a systems view of establishing a coherent KMT strategy, leading to the intended KMT outcomes, can be demonstrated. The components of the strategy maps for 4P-KMT infrastructure are briefly described by using tobacco control as the focus. The illustrations include both existing KMT efforts in tobacco control through NCI and suggested efforts drawing on those from cancer control.

Tobacco Control and Related Knowledge Resources

Based on the types of tobacco control and related knowledge resources described

earlier in this chapter, an example of a high-level map of tobacco control knowledge can be produced according to explicit and tacit knowledge. The knowledge resource examples included are PLANET, SEER, CISNET, CHP, and caBIG. All of these resources are considered explicit knowledge in that they capture specific knowledge related to tobacco and/or cancer control as tangible objects. In addition, some of these resources, notably caBIG, focus more on the interaction of tacit knowledge with explicit knowledge by nurturing the formation of face-to-face and virtual knowledge networks within and between organizations.

This knowledge map also identifies systems-level knowledge sources for tobacco control that are perceived to be missing, incomplete, or conflicting. Examples include public data on tobacco industry strategies and products; a coordinated agenda for tobacco control research and practice; existing tobacco control policy, research, and practice initiatives; knowledge brokers at the local, state, and national levels; and improved mechanisms for knowledge translation, especially by researchers. Table 7.4 shows this high-level example of a tobacco control knowledge map.

4P-Knowledge Management and Translation Strategy for Tobacco Control

Again, the strategic components of the 4P-KMT strategy for tobacco control at NCI are purpose, people, process, and products. For each strategic action, the actionable items that should be considered to achieve effective tobacco control can be defined. Related resources for knowledge of cancer control (e.g., CISNET and caBIG) should be expanded, adapted, and adopted for the tobacco control domain. The 4P strategic actions and the corresponding actionable items are described here.

Purpose

The relevant agenda, timelines, and business case for the production, use, and refinement of the resources for tobacco control knowledge at NCI need to be defined based on the specific audiences, their motivations, and translation mechanisms. The knowledge should include (1) resources for the explicit and tacit knowledge of tobacco control currently managed at NCI and other stakeholder organizations, and (2) the systems-level tobacco control knowledge viewed as missing or incomplete.

Table 7.4 High-Level Map of Tobacco Control Knowledge

Type of knowledge	Explicit knowledge	Tacit knowledge
Policy	PLANET, caBIG, tobacco industry data, TC agenda, existing TC initiatives, knowledge translation	caBIG, tobacco industry data, TC agenda, existing TC initiatives, knowledge translation
Evidence	PLANET, SEER, CISNET, caBIG, existing TC initiatives, knowledge translation	caBIG, existing TC initiatives, knowledge translation
Experience	PLANET, CISNET, CHP, tobacco intelligence, existing TC initiatives, knowledge translation	tobacco intelligence, existing TC initiatives, knowledge translation
Contact	PLANET, CHP, existing TC initiatives, knowledge brokers, knowledge translation	caBIG, existing TC initiatives, knowledge brokers, knowledge translation

Notes. PLANET = Plan, Link, Act, Network with Evidence-based Tools; caBIG = Cancer Biomedical Informatics Grid; TC = tobacco control; SEER = Surveillance, Epidemiology, and End Results; CISNET = Cancer Intervention and Surveillance Modeling Network; CHP = Consumer Health Profiles.

People

There is a need to identify the champions of tobacco control knowledge, brokers and managers, architects, and communities of practice within and outside NCI who can help to define and implement the resources for tobacco control knowledge needed as part of the emerging KMT strategy. This is especially true for tobacco control knowledge at the systems level in ways that can benefit the entire tobacco control community.

Process

Rigorous yet adaptable methods and approaches must be used to encourage interaction and collaboration among stakeholder organizations using the knowledge infrastructure at NCI. The tobacco control community needs methods for consensus building and capacity building, development of tobacco control knowledge resources, and a network in which tobacco control knowledge converges. These methods should be sufficiently generic to incorporate different knowledge domains, including tobacco control and other areas as needed.

Products

Appropriate groupware that can facilitate the various communication, coordination, and collaboration tasks needed by the tobacco control community needs to be incorporated in knowledge resources. This groupware includes technologies such as real-time Web conferencing, asynchronous discussion forums, and brainstorming and concept-mapping tools. Also needed are robust knowledge repositories with the appropriate navigation and access tools that can be used to manage and translate the resources for tobacco control knowledge available through and needed by the tobacco control community.

Knowledge Management and Translation Infrastructure: Strategy for Tobacco Control

Application of the principles of KMT infrastructure outlined in this chapter as

a strategy for tobacco control at NCI can be examined in terms of the underlying organization, technology, information, and finance infrastructures needed. For each strategic infrastructure, parameters for corresponding infrastructure that could help achieve a more effective knowledge framework for tobacco control can be proposed. Strategic components and corresponding parameters for infrastructure are described here.

Organization

There is a need to define the organizational structures, procedures, and norms appropriate for the production, use, and refinement of resources for tobacco control knowledge aimed at specific audiences based on their motivations and through tailored translation mechanisms. Because of the large number of stakeholders involved in tobacco control, the organizational infrastructures being used must be sufficiently flexible and adaptable to accommodate the different bureaucracies that are in place.

Technology

Appropriate computer applications, networks, and connectivity components must be incorporated to ensure that the technology infrastructure can support the deployment of the proposed KMT framework for tobacco control. This infrastructure needs to support the ongoing interactions of the tobacco control community, as well as the day-to-day management and use of robust online repositories of knowledge and tools for knowledge development and navigation and access by different tobacco control stakeholders within and outside individual organizations.

Information

Electronic databases, library resources, and data dictionaries relevant to tobacco control need to be established. In particular, there is a need (1) to synthesize the vast amount of information on tobacco control and related issues, including all relevant tobacco control

policies, practices, and experiences; and (2) to coordinate contact information for use by the tobacco control community.

Finance

There is a need to establish a balanced investment portfolio so that the resources for tobacco control knowledge can be used effectively. A means of evaluating these resources as intellectual assets must be established. Where feasible, the return on investment for the production, use, and refinement of specific resources for tobacco control knowledge for selected audiences should be estimated.

Knowledge Management and Translation Strategy and Outcome Maps for Tobacco Control

The strategies for 4P-KMT and KMT infrastructures for tobacco control can be expanded by creating the corresponding detailed strategy and outcome maps. The intent of these maps is to provide a set of checklists that can be helpful for planning and implementing the KMT infrastructure for tobacco control. Figure 7.6 and tables 7.5 and 7.6 show examples of these maps.

KMT efforts, which often have their roots in addressing specific needs, must move toward a greater level of synthesis to serve the future global needs of tobacco control. Initial efforts in this area have tended to be largely centered on databases. The 4P-KMT framework outlined here provides a valuable mechanism for extending these efforts to a more integrated environment encompassing the needs of its stakeholders for both explicit and tacit knowledge. This environment has the potential to move in some important directions:

- From contact directories to repositories of tacit knowledge
- From data sources to an integrated KMT environment
- From silos of information and knowledge created for specific needs to an infrastructure for the global knowledge needs of tobacco control, driven by the 4P-KMT framework

Moreover, these needs point to the importance of integrating the KMT environment for tobacco control with other systems efforts. Examples include using network analysis as a factor in managing tacit knowledge, integrating KMT with data that drive systems models, and leveraging a systems management environment in the ongoing planning and oversight process inherent to the 4Ps. Seen as part of an integrated systems environment, the efforts in process in tobacco control research and programs form the beginnings of a valuable knowledge infrastructure for tobacco control, with the aid of a more global view of their future evolution.

Case Study: Concept Mapping of Knowledge Base for Tobacco Control

One case study illustrates several key components of the KMT framework. It involves use of concept mapping to help create a knowledge base for tobacco control. (See chapter 4 for a more detailed description of methodology for concept mapping.) In this case study, planners from stakeholder organizations in the public and private sectors were identified and brought together through a coordinated effort to generate new tobacco control knowledge in a way that could be codified, stored, and packaged. In doing so, these planners engaged in a process of knowledge translation. They socialized through the planning session and articulated their tacit knowledge on tobacco control as ideas that eventually were turned into formal explicit knowledge. As the audience

Figure 7.6 4P-Knowledge Management and Translation (KMT) Strategy Maps: Templates for Knowledge Resources Needed in Tobacco Control

PLANET		Production		Use		Refinement	
		Audience	Motivations	Mechanisms	Audience	Motivations	Mechanisms
Purpose	Agenda						
	Relevance						
	Timelines						
	Case						
People	Agenda						
	Relevance						
	Timelines						
	Case						
Process	Agenda						
	Relevance						
	Timelines						
	Case						
Products	Agenda						
	Relevance						
	Timelines						
	Case						

Notes. caBIG-TC = Cancer Biomedical Informatics Grid; CISNET = Cancer Intervention and Surveillance Modeling Network; SEER = Surveillance, Epidemiology, and End Results; PLANET = Plan, Link, Act, Network with Evidence-based Tools.

Table 7.5 Example of Detailed Knowledge Management and Translation (KMT) Strategy Checklist for Cancer Control PLANET: One Knowledge Resource Being Deployed in Tobacco Control

PLANET-RTIPs		Production		
		Audience	Motivations	Mechanisms
Purpose	Agenda	Encourage researchers, policy makers, practitioners, and the public to participate in RTIPs; increase total number of RTIPs available	Identify specific motivations for researchers, policy makers, practitioners, and the public that can increase their participation in RTIPs	Increase socialization, articulation, and internalization opportunities for researchers, policy makers, practitioners, and the public to promote RTIP participation
	Relevance	Determine relevance of RTIPs for specific audiences to increase participation	Determine relevance of RTIPs based on audience motivations for decision, education, innovation, or advocacy to increase participation	Translate relevant RTIPs with timelines to specific audiences through articulation, internalization, or socialization to increase participation
	Timelines	Establish timelines to implement RTIPs for audiences that can increase their participation	Establish timelines to implement RTIPs based on specific audience motivations for decision, education, innovation, or advocacy	Translate relevant RTIPs with timelines to specific audiences through articulation, internalization, or socialization to increase participation
	Case	Develop business case to justify the value of RTIPs to specific audiences to increase participation	Develop business case to justify RTIPs with timelines based on specific audience motivations for decision, education, innovation, and advocacy to increase participation	Translate business case with justified relevant RTIPs and timelines to specific audiences through articulation, internalization, or socialization to increase participation

Notes. PLANET = Plan, Link, Act, Network with Evidence-based Tools; RTIPs = Research-Tested Intervention Programs.

Table 7.6 Example of Knowledge Management and Translation (KMT) Strategy and Outcome Map for Tobacco Control, Based on Resources for Tobacco Control Knowledge and Potential Linkage to Desired Outcomes

Type of knowledge	Evidence base	Science–practice linkage	Implementation framework	Interaction and collaboration methodology
PLANET	<ul style="list-style-type: none"> ▪ State cancer profiles relevant to TC ▪ RTIPs ▪ Community guides on TC 	<ul style="list-style-type: none"> ▪ RTIPs for TC ▪ Feedback on local TC programs 	<ul style="list-style-type: none"> ▪ Five-steps planning approach for TC ▪ CDC cancer control planning framework adapted for TC 	Contact list of regional TC programs and researchers
SEER	Cancer epidemiology and statistics relevant to TC	People/population statistics for TC	Companion suite of tools for data collection, analysis, and reporting on TC	Sharing of experience with people and of population statistics for TC
CISNET	<ul style="list-style-type: none"> ▪ Modeling of TC impacts ▪ Metadata-level description of models 	Replication of model and results with local data on TC	Iterative design process to share metadata-level description of models	Modelers to understand and share models through metadata-level description
CHP	Lifestyle clusters on tobacco use	Feedback on lifestyle clusters and link to TC	Combined use with other resources such as CDC Pink Book and State Legislations Database on TC	
caBIG		<ul style="list-style-type: none"> ▪ Relevance of TC research ▪ Feedback on TC programs 	TC agendas, policies, and infrastructures and projects for TC community	Workspaces and working groups for different focuses of TC (e.g., more smoking prevention, cessation, and environment)

Notes. PLANET = Plan, Link, Act, Network with Evidence-based Tools; TC = tobacco control; RTIPs = Research-Tested Intervention Programs; CDC = Centers for Disease Control and Prevention; SEER = Surveillance, Epidemiology, and End Results; CISNET = Cancer Intervention and Surveillance Modeling Network; CHP = Consumer Health Profiles; caBIG = Cancer Biomedical Informatics Grid.

of this process of knowledge translation, the planners assumed the roles of researchers, policy makers, practitioners, and the public. They were motivated by the innovation in creating a tobacco control knowledge base. They used the mechanisms of concept mapping to articulate their ideas from tacit to explicit knowledge.

Two support companies conducted this project on behalf of CDC to create a conceptual framework to guide the development of a knowledge base for use in tobacco control programs and research. The project engaged members of a diverse stakeholder group in a process

that mapped their ideas and defined a taxonomy for the subsequent knowledge base. A planning group identified an initial group of 36 participants, including stakeholders in the private and public sectors at federal, state, and local levels. They were asked to brainstorm ideas by completing the following focus prompt: “Specific information I would need to plan, implement, and evaluate a tobacco prevention and control program or to conduct tobacco control research is...”

The participant group generated 184 ideas, which the planning group synthesized into a set of 97 unique ideas used in subsequent

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analyses. Each participant was asked to sort these statements into categories that made sense and to rate each statement for importance on a scale of 1 to 5 (1 = relatively unimportant; 5 = extremely important).²³⁻²⁵

A concept mapping analysis²⁶ was then performed on these statements to organize and display this information in a series of easily readable concept maps and displays for pattern matching.²⁷⁻²⁹ These maps show the relationships among the 97 ideas, the clustering of the ideas into themes or issues, and the relative importance of the ideas as rated by the participants (figure 7.7).

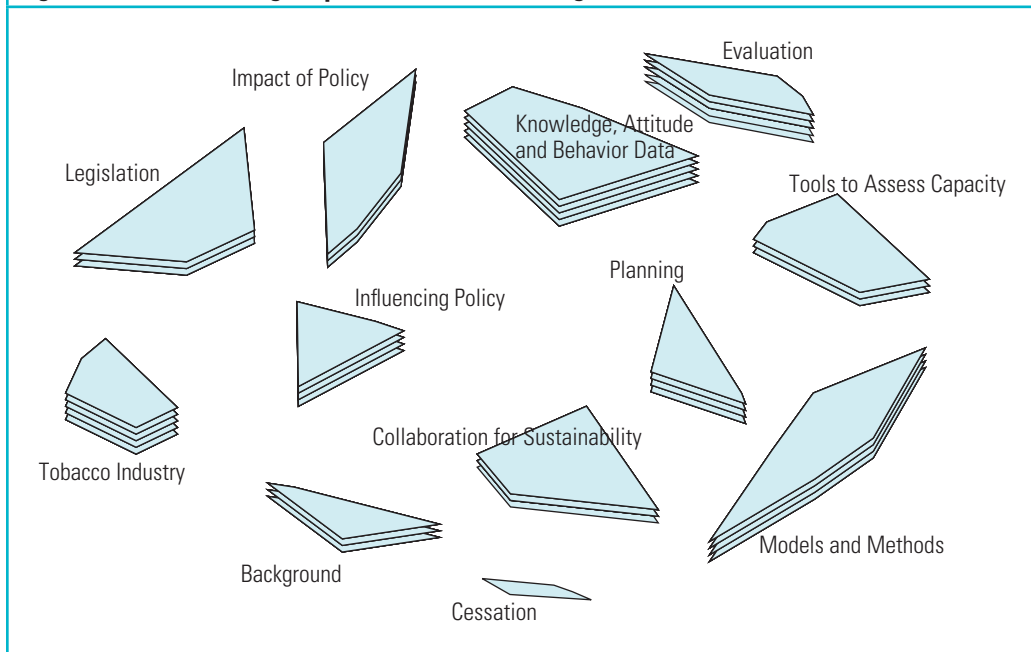
The multivariate analysis generated maps and other statistical results that participants then interpreted in a structured, facilitated session. Using the concept map analysis, the participants identified 12 clusters of issues relevant to knowledge management in tobacco control: (1) data on knowledge, attitude, and behavior; (2) evaluation; (3) tools to assess

capacity; (4) collaboration for sustainability; (5) models and methods; (6) planning; (7) smoking cessation; (8) tobacco industry; (9) background; (10) legislation; (11) impact of policy; and (12) influencing policy.

Participant ratings then were displayed graphically on a concept map, with clusters that represent groupings of ideas mapped according to their relationship(s). Rating values are shown as the height of individual clusters, with higher clusters relatively more important. For instance, the clusters for “evaluation, knowledge, attitude, and behavior data,” and “tobacco industry” were seen as relatively important; and the cluster for “smoking cessation” was ranked lowest in importance. Figure 7.7 shows this cluster rating map. The planning group used these clusters and their ratings to create the taxonomy shown in table 7.7 for the planned knowledge base for tobacco control.

The taxonomy categories and the 97 statements within categories provide a

Figure 7.7 Cluster Rating Map for Tobacco Knowledge Base



comprehensive and detailed list of issues that should be considered in developing a tobacco control knowledge base. The concept map clusters and the ultimate taxonomy categories are closely correlated. Moreover, the statements in each cluster provide details on specific information the stakeholders wanted to see in the knowledge database. For example, statements in the highest rated cluster, “evaluation,” included both evaluation methods and measures for tobacco control, as well as their relationship to outcomes. Typical statements included the following:

- “Examples of evaluation designs and evaluation tools that could be adapted”
- “Identification of key indicators for evaluation—what to measure and monitor”
- “Measures for evaluation of health outcomes such as decrease in tobacco-attributable morbidity and mortality”

Similarly, statements within the cluster for “tobacco industry” ranged from marketing

initiatives and policy positions to specific tactics to counter tobacco control efforts. Participants in the highly rated cluster for “knowledge, attitude, and behavior data” proposed data sources ranging from public attitudes to hard data (e.g., population surveillance data). Some of statements for this cluster, such as “Indicators and data sources for each major goal area,” also pointed to sublevels of taxonomy to be considered within the design of the knowledge base.

The process the planning group followed in defining this taxonomy from the concept maps serves as a good example of how stakeholder input can evolve into a pragmatic, deliverable outcome. It was informed by both the participant statements and the clusters resulting from an analysis of these statements, as well as participant ratings of these cluster categories. The end result was a knowledge base taxonomy that was isomorphic and in many cases identical to the categories derived from participant data.

Table 7.7 Categories for Knowledge Base Taxonomy and Related Clusters from Concept Mapping

Concept map clusters	Taxonomy category
Legislation Influencing policy	Policy
Influencing policy	Influencing policy
Impact of policy	Impact of policy
Planning Background Models and methods	Policy and program planning
Evaluation	Policy and program evaluation
Knowledge, attitude, and behavior data	Sources of data
Tools to assess capacity	Assessment tools
Models and methods	Models and methods
Collaboration for sustainability	Working with communities
Tobacco industry	Tobacco industry
Background	History of tobacco control
Smoking cessation	Smoking cessation
Models and methods	Harm reduction

In addition to analyzing participant input to help define the knowledge base categories, the process provided valuable input on how subgroups of participants differ about what is important. Using a technique known as pattern matching,²⁷⁻²⁹ the project compared relative importance ratings of several subgroups, including federal versus state and local levels of government and participants from the public sector versus those not from the public sector. Private-sector participants include stakeholders such as private industry and nongovernmental organizations.

Figure 7.8 shows results of two pattern matches. The correlation between cluster importance ratings for the federal government versus those in state or local government was extremely high ($r = .94$). This finding indicates strong agreement on the relative importance of these ideas for inclusion in a database for tobacco knowledge management. However, the correlation between cluster importance

ratings in the public sector and those not in the public sector was relatively lower ($r = .55$). This finding indicates that the two groups have different opinions about what should be included in the database for tobacco knowledge management. Representatives from public agencies thought that the importance of including ideas related to evaluation was high. Representatives from nonpublic agencies ranked ideas related to “knowledge, attitude and behavior data” as more important.

This concept-mapping study had several immediate products. First, it created the potential categories for a knowledge management database for tobacco prevention and control. The detailed statements in each category provide more specific information to guide knowledge management. In addition, the process enabled prioritization of categories, indicating which should be emphasized in the database. Perhaps most important, the process provided a summary of the

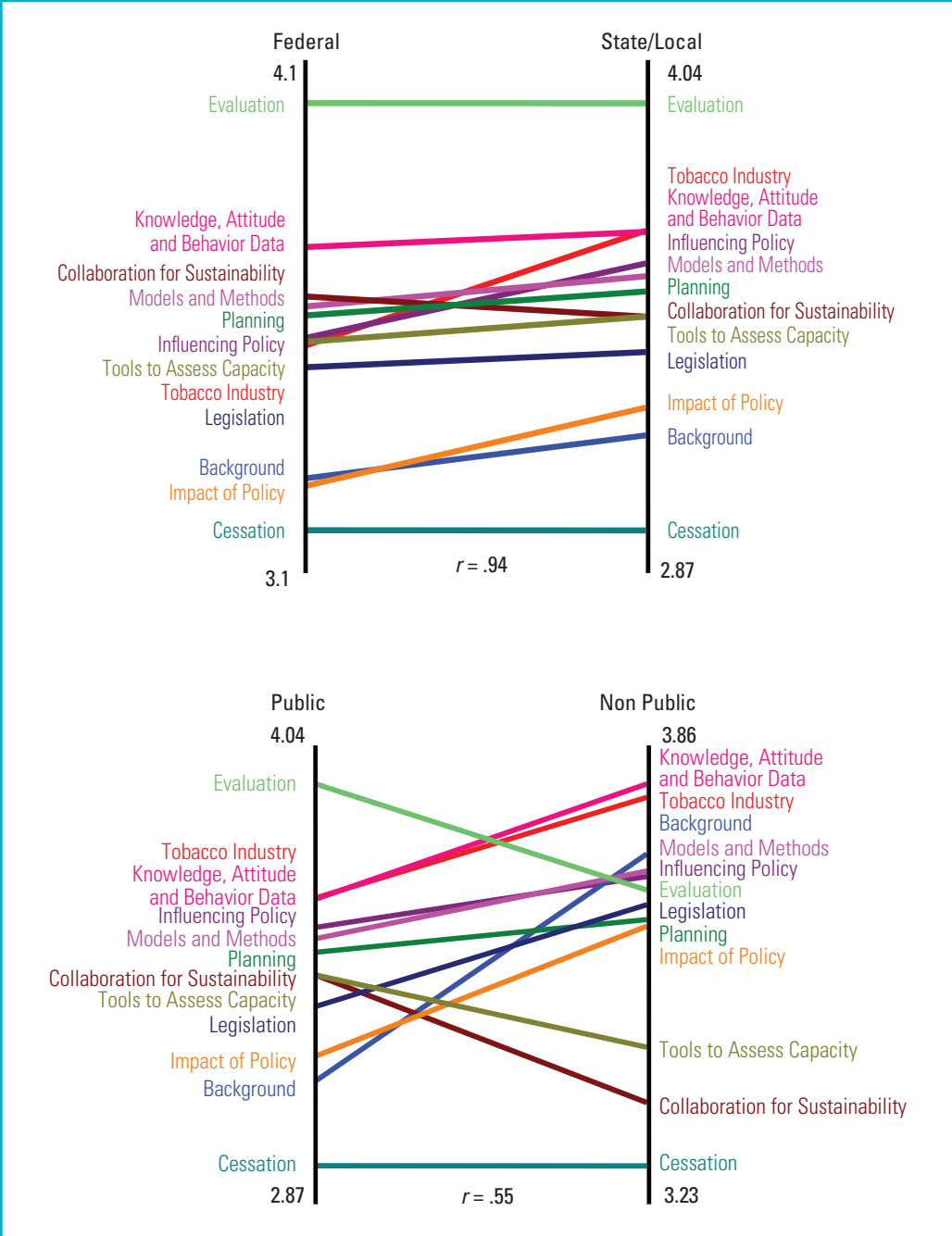
Concept Mapping and the 4P-Knowledge Management and Translation (KMT) Approach

The case study outlined here not only serves as a practical example of designing a knowledge base taxonomy from stakeholder input, but it also aligns in several key ways with the 4P approach outlined earlier for designing KMT strategy and infrastructure. As discussed at the beginning of this case study, this project served above all as a structured process that acquired tacit knowledge and translated it to explicit knowledge. Other parallels include the following:

- The tobacco prevention and control knowledge concepts derived from concept mapping serve as an innovative method of knowledge generation, as part of the knowledge production process.
- By including a wide range of stakeholders and analyzing their responses, this process highlights the generation of new knowledge by a specific audience on the basis of their motivations, by using the mechanism of articulation to translate tacit knowledge into an explicit form.
- Use of a visual map for linking knowledge to the evidence base and the science–practice linkage is similar to the broader process described earlier of creating a 4P-KMT infrastructures strategy map in designing a knowledge infrastructure.

The end product of this process is highly relevant tobacco knowledge that can be applied as explicit knowledge resources by using the KMT infrastructures mentioned earlier. Moreover, this knowledge can be expanded by using 4P-KMT strategy maps to detail the purpose, people, process, and products, as part of an integrated KMT effort.

Figure 7.8 Pattern Matching to Compare Importance of Cluster Ratings in Demographic Subgroups of Participants (correlation coefficient, *r*)



Integrating Knowledge Management and Translation (KMT) with a Systems Approach to Tobacco Control

Beyond serving as a technology infrastructure for sharing information, KMT strategies have the potential to share a base of knowledge that helps the tobacco control environment evolve and, as such, form an important part of the systems strategies discussed in other chapters of this monograph.

A key example is in the interface between KMT and tobacco control networks. Overcoming turf issues and developing more effective collaboration are critical to advancing the tobacco control community as a whole. Other relevant objectives include better coordination of initiatives from different stakeholder organizations; improved translation mechanisms to enable sharing of tobacco control knowledge in ways that are relevant and meaningful to the stakeholder organizations; and translating tobacco control knowledge into action that can be implemented by practitioner communities. Ongoing dialogue that results from bringing researchers, practitioners, policy makers, and the public together to engage in such activities as joint planning, sharing lessons, role playing, and thinking outside the box can help the tobacco control community become a network of tobacco control knowledge.

Another challenge is to keep abreast of the strategies and actions of the tobacco industry. As discussed in chapter 2, this approach is analogous to the concept of disease in epidemiology. The host (human) has an illness (cancer) caused by an agent (tobacco) through a vector (tobacco industry). The vector and the agent, in this case the tobacco industry and tobacco products, respectively, are in a constant state of flux and disguise, leading to manifestations of the illness in varying forms and severity in unsuspecting or maimed hosts. The tobacco control community needs knowledge to be able to anticipate and counter tobacco industry actions.

perspectives of key stakeholders in the tobacco control field with regard to crucial elements and priorities for inclusion in this database. Through this process, a consensus framework based on the ideas of the participants was created.

Summary

An integrated KMT strategy for tobacco control is outlined here. This strategy, in turn, addresses a larger goal—the broad sharing of knowledge in a systems environment and the sustainability of this knowledge as this system evolves. As the tobacco control community moves toward this goal, it increases its ability to address more complex issues and improve public health outcomes.

The tobacco control domain is complex and dynamic, and many stakeholders are

involved. Stakeholders in this domain need to address parts of a puzzle. However, no one has all the current requisite knowledge to understand or address the entire system. The kinds of knowledge needed range from very specific information, such as how many schools have effective smoke-free policies or ongoing statistics on use of hotlines for help in stopping smoking (quitlines), to the broad base of tacit information required for sharing of best practices or network building. Where can one find this knowledge, and how valid is it? How will this knowledge be updated over time? A system must be developed to collect and synthesize such knowledge for distribution and sharing, without causing information overload for the tobacco control community.

The fundamentals of a KMT infrastructure for the tobacco control domain are outlined here as a step toward the systematic production, use, and refinement of explicit

and tacit tobacco control knowledge for specific audiences, based on their motivations, through different translation mechanisms. A strategic approach to KMT can advance such efforts from a project-by-project basis to becoming a coherent knowledge infrastructure, in which tobacco control and other initiatives can converge as a comprehensive set of knowledge resources. By addressing the respective components of the KMT framework, at the level of detail that makes sense for the organization based on its expertise and resources, the tobacco control community can advance to work collaboratively as a network of tobacco control knowledge enabled by technology.

Conclusions

1. Effective knowledge management is based on a social context revolving around knowledge production, use, and refinement, as well as an ecological context based on audience, motivations, and mechanisms.
2. A formal strategy for knowledge management is essential to the creation of a consistent knowledge environment. One framework defines knowledge capabilities in terms of purpose, people, process, and products, together with a knowledge management and translation infrastructure defined in terms of its underlying organization, technology, information, and finance infrastructures.
3. A review of resources for tobacco control knowledge at the National Cancer Institute confirmed the existence of extensive resources for tobacco control, combined with growth areas for the future, such as integration, visibility among stakeholders, and knowledge gaps.
4. A concept-mapping project that engaged stakeholders to examine specific information needed for tobacco prevention, control, or research yielded clusters of knowledge categories that helped form the taxonomy for a planned knowledge base for tobacco control.

Appendix 7A. 4P-Knowledge Management and Translation Infrastructures: Strategy and Outcome Maps

The infrastructures map is focused on the actionable items under the strategy of four Ps (purpose, people, process, and product). The map takes into account the underlying issues of the infrastructure for knowledge management and translation (KMT) and the desired outcomes, to establish a comprehensive KMT infrastructure. Figure 7A.1 shows this strategy map.

Depending on need, the components of this 4P-KMT infrastructures strategy map can be expanded to provide further details. The actionable items in the 4P-KMT and the KMT infrastructures strategies can be elaborated into detailed strategy maps for each type of knowledge involved. In addition, each of the actionable items can be further elaborated into detailed checklists that can be used in final implementation planning and execution. The KMT strategy also can be mapped to outcomes to ensure that they are being achieved. Figures 7A.2 and 7A.3 and table 7A.1 provide examples of detailed KMT strategy maps.

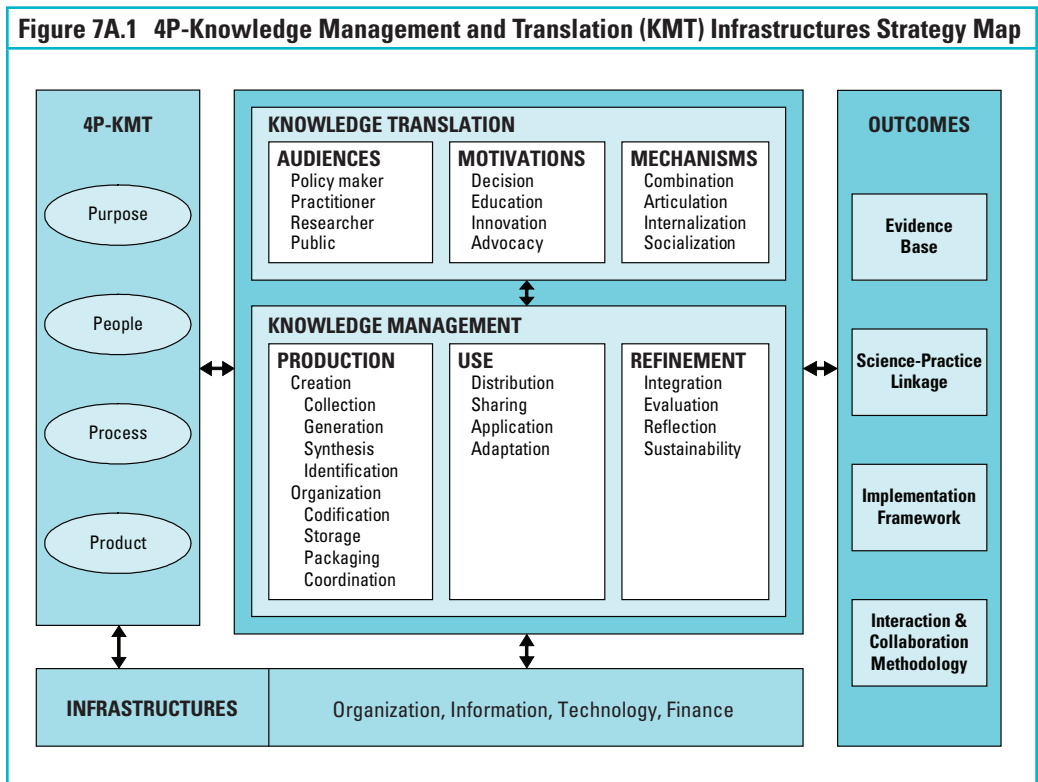
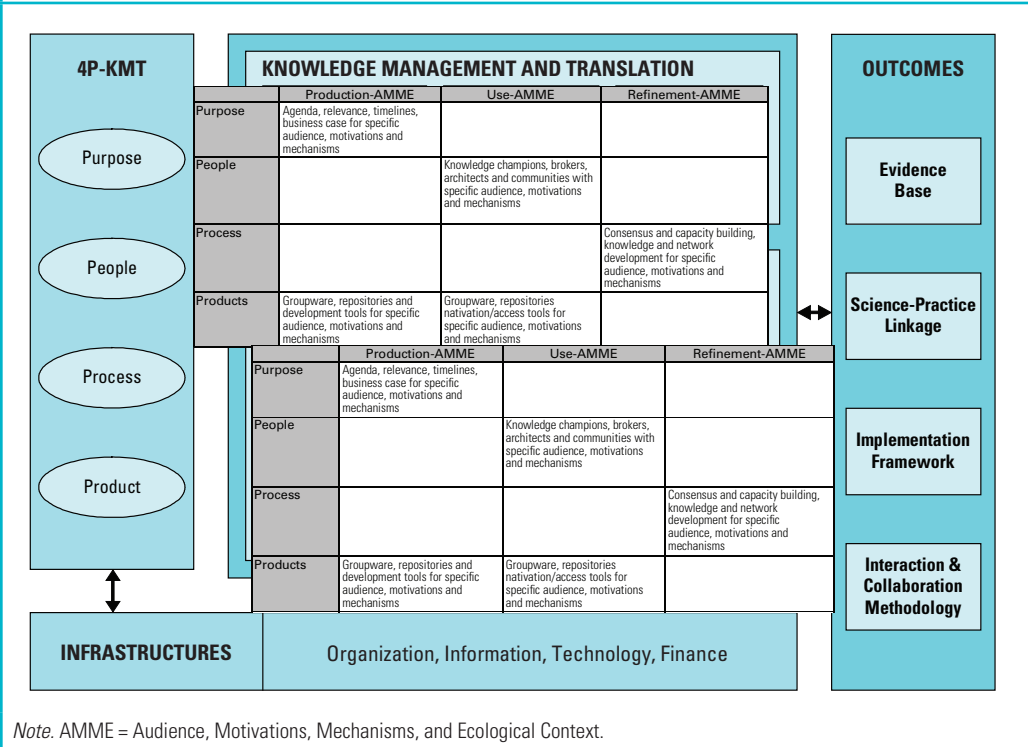


Figure 7A.2 Detailed Knowledge Management and Translation (KMT) Strategy Map: Template for 4P-KMT and KMT Infrastructures



Note. AMME = Audience, Motivations, Mechanisms, and Ecological Context.

Figure 7A.3 Example of Template for Detailed 4P-Knowledge Management and Translation Strategy Map for Production, Use, and Refinement of Particular Type of Knowledge

Type of Knowledge	Production			Use			Refinement		
	Audience	Motivations	Mechanisms	Audience	Motivations	Mechanisms	Audience	Motivations	Mechanisms
Purpose	Agenda								
	Relevance								
	Timelines								
	Case								
People	Agenda								
	Relevance								
	Timelines								
	Case								
Process	Agenda								
	Relevance								
	Timelines								
	Case								
Products	Agenda								
	Relevance								
	Timelines								
	Case								

Note. Each cell can contain a detailed checklist of actionable items for implementation.

Another important knowledge map links the knowledge resources to the corresponding outcomes. The rationale for this knowledge-outcome map is to ensure that the KMT strategy for each type of knowledge resource being deployed is able to accomplish the intended

Table 7A.1 Example of Detailed 4P-Knowledge Management and Translation (KMT) Strategy Checklist for Production of Particular Type of Knowledge

Type of knowledge	Production			
	Audience	Motivations	Mechanisms	
Purpose	Agenda	Define agendas for researchers, policy makers, practitioners, and the public	Define agendas based on the audience motivations for decision, education, innovation, or advocacy	Translate agendas for audience through combination, articulation, internalization, or socialization
	Relevance	Determine relevance of agendas for researchers, policy makers, practitioners, and the public	Determine relevance of agendas based on the audience motivations for decision, education, innovation, or advocacy	Translate relevant agendas with timelines to audience through combination, articulation, internalization, or socialization
	Timelines	Establish timelines to implement agendas for researchers, policy makers, practitioners, and the public	Establish timelines to implement agendas based on the audience motivations for decision, education, innovation, or advocacy	Translate relevant agendas with timelines to audience through combination, articulation, internalization, or socialization
	Case	Develop business case to justify agendas with timelines for researchers, policy makers, practitioners, and the public	Develop business case to justify agendas with timelines based on the audience motivations for decision, education, innovation, and advocacy	Translate business case with justified relevant agendas and timelines to audience through combination, articulation, internalization, or socialization

Note. Checklist outlines how the purpose of particular knowledge resource can be defined in terms of agenda, relevance, timelines, and business case, for specific audiences and their motivations, through different translation mechanisms.

outcomes. In the study presented here, the proposed outcomes are the establishment of an evidence base for dissemination, a knowledge base for linking science and practice, an implementation framework for change, and an interaction and collaboration methodology. By performing mapping using the specific types of explicit and tacit knowledge resources being deployed, the salient aspect of each knowledge that can contribute to the respective outcome can be determined. Table 7A.2 shows an example of this knowledge-outcome map.

Table 7A.2 Example of Knowledge-Outcome Map

Type of knowledge	Evidence base	Science–practice linkage	Implementation framework	Interaction and collaboration methodology
Knowledge A	Web knowledge repository			
Knowledge B		Coordinated contacts Translated knowledge		
Knowledge C			4P-KMT infrastructure strategy maps	
Knowledge D				4P-KMT strategy framework

Note. 4P-KMT = 4P-knowledge management and translation.

Appendix 7B. Discussion Questions Used in National Cancer Institute Review of Knowledge Management and Translation

Discussion Questions

1. Types of knowledge being managed
 - (a) What do you think are the important types of knowledge needed to advance tobacco control in the United States? Why do you think these types of knowledge are important?
 - (b) How much of this tobacco control knowledge do you think is being managed through your organization and others? Is it being managed effectively? If so, how? If not, why not?
2. Challenges and suggestions for knowledge management and translation (KMT)
 - (a) What do you think are the key challenges in managing tobacco control knowledge across these networks of organizations? What are the barriers and incentives?
 - (b) What suggestions do you have to improve the ways this tobacco control knowledge is managed within and across the networks of tobacco control organizations? Which is the highest priority action item?
3. Experience of KMT in practice
 - (a) What should local/state communities do to share their questions, viewpoints, findings, and lessons regarding specific local tobacco control programs and interventions through your organization?
 - (b) What other experiences and lessons would you like to share with the study team, in terms of managing tobacco control knowledge within and across the networks of tobacco control organizations?

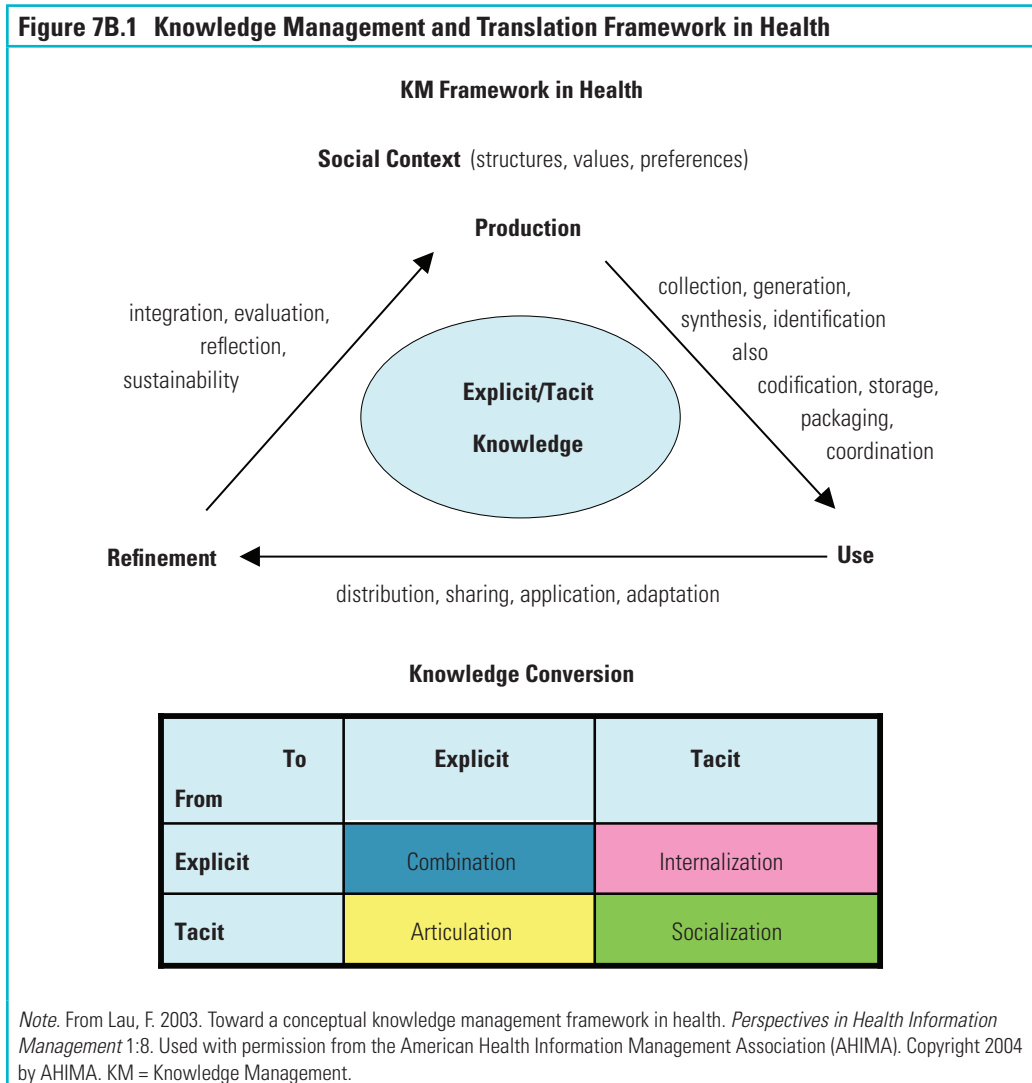
Definition of Knowledge Management and Translation Terms

- **Knowledge**—A fluid mix of framed experience, practice routines, contextual information, and expert insight that provides a mental framework for evaluating and incorporating new experiences and information in domains such as tobacco control.
- **Explicit and tacit knowledge**—Explicit knowledge often is precise and can be formally articulated in organizations such as a tobacco control policy or program. Tacit knowledge is the know-how or expertise in tobacco control that resides within individuals.
- **Knowledge management**—A set of formal and informal structures, processes, and measures used to manipulate explicit and tacit knowledge within and across organizations such as those in tobacco control.
- **Knowledge conversion**—Ongoing processes to translate between explicit and tacit knowledge, such as in tobacco control through combination, internalization, articulation, and socialization.

7. What We Know: Managing the Knowledge Content

- **Knowledge networks**—A collection of individuals, groups, and organizations with the requisite explicit and tacit knowledge that work collaboratively to generate ideas, products, and services, such as specific tobacco control policies and intervention programs within and across these networks of organizations.
- **KMT framework in health**—The production, use, and refinement of explicit and tacit knowledge within a particular social context of the health system such as in tobacco control.

Figure 7B.1 provides the KMT framework in health and illustrates linkages within knowledge conversion.



References

1. Centers for Disease Control and Prevention. 2005. New citations. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Tobacco Information and Prevention Source. <http://apps.nccd.cdc.gov/shrl/newcitationssearch.aspx> (for November 11, 2005, through December 29, 2005).
2. Tobacco Technical Assistance Consortium. 2005. Web site. <http://www.ttac.org>.
3. Centers for Disease Control and Prevention. 2005. *Guide to community preventive services*. Atlanta: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Marketing, Community Guide Branch. <http://thecommunityguide.org>.
4. National Cancer Institute. 2005. Cancer Control PLANET: Plan, Link, Act, Network with Evidence-based Tools. <http://cancercontrolplanet.cancer.gov>.
5. Wikipedia. 2005. Knowledge management. http://en.wikipedia.org/wiki/knowledge_management.
6. Nonaka, I., H. Takeuchi, and K. Umemoto. 1996. A theory of organizational knowledge creation. *International Journal of Technology Management = Journal International de la Gestion Technologique* 11 (7–8): 833–45.
7. Eliasmith, C., ed. 2005. *Dictionary of philosophy of mind*. Waterloo, ON: Univ. of Waterloo, Philosophy Department. <http://philosophy.uwaterloo.ca/minddict>.
8. Davenport, T. H., D. W. De Long, and M. C. Beers. 1998. Successful knowledge management projects. *Sloan Management Review* 39 (2): 43–57.
9. Lau, F. 2003. Toward a conceptual knowledge management framework in health. *Perspectives in Health Information Management* 1:8.
10. Street Jr., R. L. 2003. Communication in medical encounters: An ecological perspective. In *Handbook of health communication*, ed. T. L. Thompson, A. M. Dorsey, K. I. Miller, and R. Parrott, 63–89. Mahwah, NJ: Lawrence Erlbaum.
11. World Health Organization. 2003. International classification of diseases, 10th revision (ICD-10). <http://www.who.int/classifications/apps/icd/icd10online/>.
12. Health Level 7. 2006. What is HL7? <http://www.hl7.org>.
13. Cancer Biomedical Informatics Grid. 2006. Welcome to the caBIG community Website. <https://cabig.nci.nih.gov>.
14. Cancer Intervention and Surveillance Modeling Network. 2006. <http://cisnet.cancer.gov>.
15. Surveillance, Epidemiology, and End Results. 2006. <http://seer.cancer.gov>.
16. National Cancer Institute. n.d. Consumer Health Profiles. National Cancer Institute, Office of Communications, Cancer Information Service Research Program. http://cis.nci.nih.gov/research/CHP_FACT_SHEET.pdf.
17. Levy, D. T. 2005. A simulation of tobacco policy, smoking and lung cancer. Calverton, MD: Pacific Institute for Research and Evaluation. <http://cisnet.cancer.gov/grants/lung/levy.html>.
18. State Cancer Legislative Database. 2006. <http://www.sclld-nci.net>.
19. National Cancer Institute. 2002. Making health communication programs work: A planner's guide. Bethesda, MD: National Cancer Institute. <http://www.cancer.gov/pinkbook>.
20. Centers for Disease Control and Prevention. 2006. CDCynergy. CD-ROM. <http://www.cdc.gov/healthmarketing/cdcynergy/index.htm>.
21. National Cancer Institute. 2005. *ASSIST: Shaping the future of tobacco prevention and control* (Tobacco control monograph no. 16, NIH publication no. 05-5645). Bethesda, MD: National Cancer Institute. <http://cancercontrol.cancer.gov/tcrb/monographs/16/index.html>.
22. National Cancer Institute. 2006. *Evaluating ASSIST: A blueprint for understanding state-level tobacco control* (Tobacco control monograph no. 17, NIH publication no. 06-6058). Bethesda, MD: National Cancer Institute. <http://cancercontrol.cancer.gov/tcrb/monographs/17/index.html>.
23. Rosenberg, S., and M. P. Kim. 1975. The method of sorting as a data-gathering procedure in multivariate research. *Multivariate Behavioral Research* 10 (4): 489–502.
24. Coxon, A. P. M. 1999. *Sorting data: Collection and analysis*. Quantitative Applications in the Social Sciences series 127. Thousand Oaks, CA: Sage.

25. Weller, S. C., and A. K. Romney. 1988. *Systematic data collection*. Qualitative Research Methods series 10. Thousand Oaks, CA: Sage.
26. Trochim, W. M. K. 1989. An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning* 12 (1): 1–16.
27. Trochim, W. M. K. 1989. Outcome pattern matching and program theory. *Evaluation and Program Planning* 12 (4): 355–66.
28. Trochim, W. M. K. 1985. Pattern matching, validity, and conceptualization in program evaluation. *Evaluation Review* 9 (5): 575–604.
29. Trochim, W. M. K., and J. A. Cook. 1992. Pattern matching in theory-driven evaluation: A field example from psychiatric rehabilitation. In *Using theory to improve program and policy evaluations*, ed. H. Chen and P. Rossi, 49–69. Westport, CT: Greenwood.