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8

Using Concept Mapping in Evaluation

> Ideas won't keep. Something must be done about them.
>
> —Alfred North Whitehead

A program evaluator can be seen as a type of cartographer (Trochim, 1999)—someone who can understand and chart the terrain of a program and its outcomes, develop maps that guide observation and measurement, and use the maps to assess the progress that is being made toward the desired destination. The concept mapping methodology is an ideal way to operationalize this metaphor of cartography. Like traditional cartography, concept mapping creates maps that can be used to guide subsequent efforts, in this case, planning and evaluation. The maps are always from a particular perspective—the point of view of those who participate in the process—and provide a framework that can be linked to program activities, measures, and outcomes.

Before beginning the discussion of the ways concept mapping can be used in evaluation, it is useful to recall the model of the project life cycle presented in the beginning of this volume and shown in Figure 8.1.

The model presents the ongoing project life cycle of conceptualization, development, implementation, and assessment. The first two phases are traditionally associated with the idea of planning. Chapter 7 showed how concept mapping can be used to address those areas. This chapter focuses on evaluation, including the monitoring of implementation and the assessment of outcomes.

The distinction between implementation and assessment in the figure corresponds to the one often made in program evaluation between process and outcome evaluation. Process evaluation addresses the implementation phase of the life cycle, and includes both the development of process measures and their use in monitoring the program and its immediate outputs. Assessment is accomplished through outcome evaluation, which includes the development of output and outcome measures and their use in estimating the effects of the program or intervention. Here, rather than viewing the process-outcome evaluation categories as distinct, they are portrayed as a continuum that encompasses the assessment of the implementation of a program, its immediate outputs, and its longer-term outcomes in one integrated endeavor.

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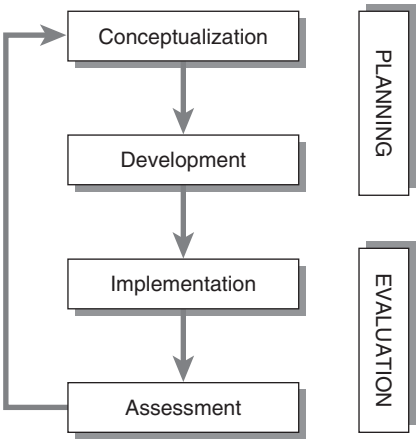

Figure 8.1 The Basic Project Life Cycle Model

CASE STUDY: USING CONCEPT MAPPING FOR PROCESS AND OUTCOME EVALUATION

The potential uses of concept mapping in evaluation are limited only by the creativity of the evaluator and the constraints of the context. This chapter does not attempt to describe all of the potential variations of these uses. Instead, it presents a particularly rich and detailed case study for using concept mapping to develop a conceptual framework for assessing a complex program that illustrates how concept mapping can be integrated to accomplish both process and outcome evaluation. This framework was directly transformed into an outcome logic model that depicted the expected immediate outputs and intermediate and long-term outcomes of the program; the map was also used to organize the development of the measures of outputs and outcomes. The structure of the map guided the synthesis of the data collected from a variety of methods through a mixed-methods approach, and the map and logic model provided a framework for examining the patterns of outcomes to assess whether the program appears to be achieving what it intended. This detailed case study illustrates many of the ways that concept mapping can be used in evaluation and provides a concrete point of departure for thinking about other potential variations.

The Program

The program that provides the context for this example is the Transdisciplinary Tobacco Use Research Centers (TTURC) initiative (Stokols et al., 2003), a

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project funded jointly by the National Institute on Alcohol Abuse and Alcoholism, the National Institute on Drug Abuse, and the National Cancer Institute originally for approximately $70 million over five years, and currently re-funded in a second five-year cycle. The program is a research initiative designed to engage people from multiple disciplines in the development of transdisciplinary perspectives on tobacco use and nicotine addiction, and interventions and methods for combating them, as well as encouraging the translation of research into practice. Seven major university-based centers, each with multiple projects and dozens of researchers, were funded in this program at the time of this study.

The evaluation of this program presented a unique challenge for its funders and stakeholders on a number of fronts. The evaluation had to include everything from process assessment of the implementation of the centers through their immediate outputs and outcomes, and ultimately their effects on public health. Traditional models for controlled outcome evaluation were not possible here. For example, it was not feasible to use a clinical trials approach and randomly assign the program to some centers and use others as controls. Moreover, process evaluation alone was not sufficient to include consideration of intermediate and long-term effects; this evaluation called for an integrated approach that encompassed process and outcome approaches.

Also, by its very nature, a transdisciplinary research initiative brings together disparate types of researchers whose methods, outcomes, and expectations vary. In particular, a collaborative culture had to evolve that included clinical researchers, who tend to be oriented toward lab science and methodologies, and social researchers more oriented toward applied research methods and individual or population interventions. The centers needed to collaborate on the evaluation, so the methodology that was used had to be able to encompass broad-based participation across the members of the initiative.

The study described here was undertaken as a multiyear pilot project to explore how to evaluate complex scientific research initiatives. Concept mapping was selected as the central methodology for conceptualizing the evaluation, and for developing a logic model that could be used as a framework to coordinate the development of measures and synthesis of data, and to assess the effects of the initiative.

The Map

The initial concept mapping project involved a group of 34 stakeholders drawn from across the key groups associated with the initiative, including researchers from TTURC centers, representatives of funding agencies, initiative consultants, and other stakeholders such as tobacco control advocacy groups. These participants brainstormed evaluation criteria over the Web using the following focus prompt:

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"The TTURC initiative would be a success if . . ."

The stakeholder group generated a total of 262 brainstormed statements, which was ultimately reduced to a set of 97 unique statements. These statements were rated for importance on a five-point response scale, and the concept mapping analysis mapped the 97 statements into a set of 13 distinct clusters. Figure 8.2 shows the 97 statements mapped into clusters. To give an idea of the types of statements that were brainstormed, Table 8.1 lists the 13 clusters, showing the three statements with the highest average importance ratings within each cluster.

Interpretation of the map produced the final outcome map shown in Figure 8.3, showing the 13 clusters arranged in the five broader regions or meta-categories of communication, health impacts, professional validation, collaboration, and scientific integration. It also became apparent that the clusters could be arranged roughly in sequence over time. At the bottom of the map are clusters that reflect the immediate process of implementing the initiative such as communications, training, and transdisciplinary integration. Across the middle of the map were clusters related to the intermediate structural implications in terms of process, structure, and outcomes—which, in turn, correspond with immediate, intermediate, and long-term markers for success.

Using the Concept Map to Develop a Logic Model for Evaluation

One of the most important developments in evaluation over the past several decades is the evolution of program theory (Chen, 1990; Chen & Rossi, 1983). It constituted a direct reaction to the experimental evaluation model, which tended to view the treatment or program as contrasted against a comparison condition using a single dichotomous variable. The program theory approach involved developing a model or "theory" of how the program worked and how it influenced immediate outputs and, through them, longer-term outcomes. The idea of a logic model (Kellogg Foundation, 2001) is consistent with this emphasis. A logic model is a framework that typically shows environmental factors, inputs, outputs, and outcomes for a program or intervention, usually in graphic form.

In this project, the concept map was used to develop a subtype of logic model that we might refer to as an outcome logic model, where the emphasis is on showing the relationships between the major outputs and outcomes for an evaluation—the environment and input factors do not figure prominently. This type of model is especially valuable in evaluation because it can be directly related to measurement of outputs and outcomes, as we will show later.

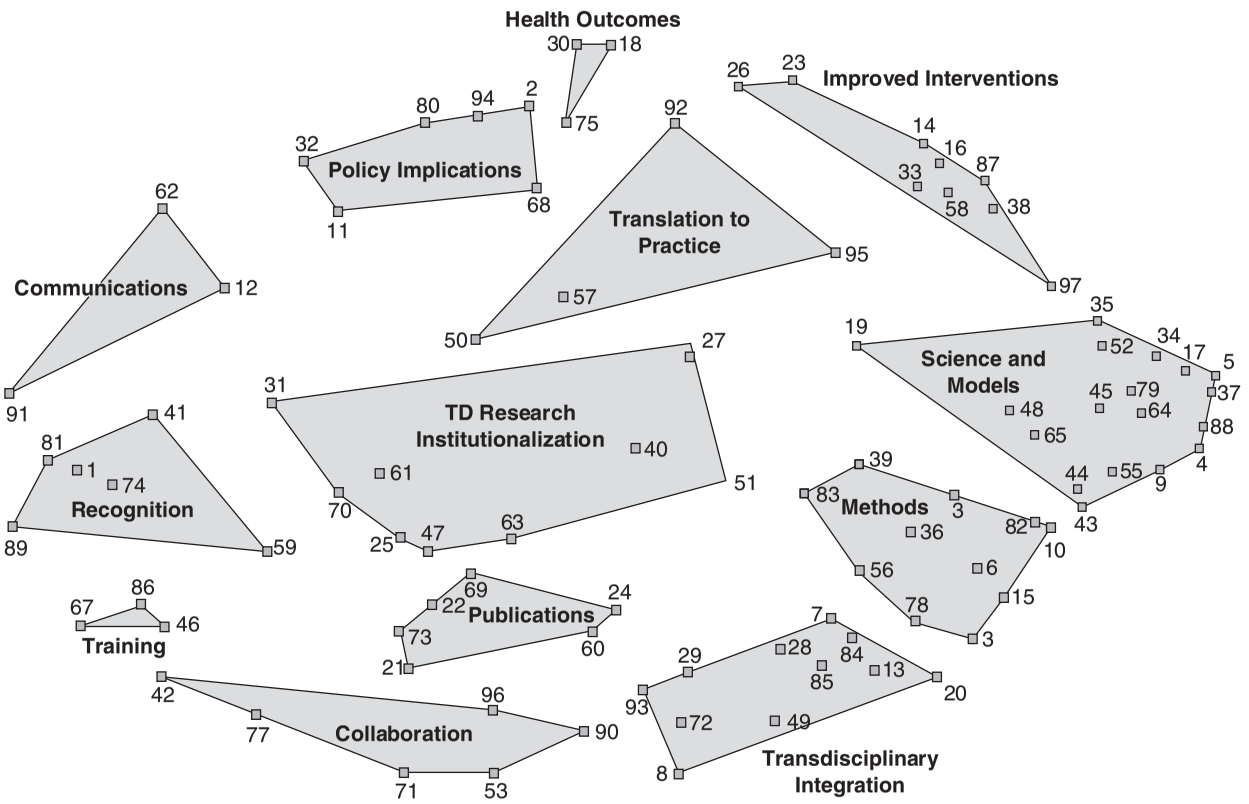

Figure 8.2 Point Cluster Map of 97 Statements into 13 Clusters for the TTURC Evaluation

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Table 8.1
Clusters from TTURC Evaluation Project, With Three Statements Having the Highest Average Importance

Collaboration		
90	The diversity of disciplines participating and collaborating in tobacco research is increased	3.86
53	Sustainable transdisciplinary collaborations occur between and within existing centers	3.76
42	Ease of communication exists both across and between TTURCs	3.57
Communications		
12	Research concerning tobacco use is more effectively communicated to the public	3.62
62	Interesting and important research findings are produced that are widely covered in the media	3.27
91	TTURC research results in frequent press releases	2.65
Health Outcomes		
18	Tobacco use prevalence is reduced	3.97
30	Tobacco related morbidity and mortality is reduced	3.95
75	Widespread understanding results of the harm to public health that tobacco product marketing leads to	2.91
Improved Interventions		
26	Interventions that are effective in decreasing tobacco use are developed and disseminated	4.30
23	Research findings were translated into successful interventions.	4.30
16	New methods of preventing youth uptake of tobacco, incorporating several disciplines, are developed	4.27
Methods		
15	New syntheses of tobacco research that integrate evidence across levels of analysis are achieved	3.86
6	Methods not previously applied to nicotine addiction or tobacco cessation are developed/adapted and applied	3.81
10	Research areas are addressed more expeditiously and thoroughly, rather than piecemeal	3.68
Policy Implications		
94	Findings from research are disseminated rapidly into policy	3.89
2	Dissemination and implementation of improved tobacco control methods occur at the policy level	3.76

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11	Useful policy interventions or implications with clear transdisciplinary roots emerge	3.75
Publications		
73	Tobacco research published in highly visible and cited journals (e.g., *Science, NEJM, Nature, JAMA*) increases	3.92
69	Tobacco-related manuscripts are published in non-tobacco journals	3.22
22	Research produced by TTURC scientists has high citation counts	3.19
Recognition		
1	Research from the centers is recognized as important or noteworthy by independent sources (journal, organization, etc.)	4.05
74	Transdisciplinary research becomes more valued by academic institutions and receives increased support	3.81
41	Tobacco research is seen as a high priority (e.g., given resources) by universities and administrators	3.73
Science and Models		
4	Progress in understanding the relationship between biological and environmental factors in smoking is accelerated	3.97
17	The multiple determinants of the stages of nicotine addiction are better understood	3.86
65	Useful transdisciplinary theories or models emerge and yield new insights or prompt interesting research	3.81
Transdisciplinary Research Institutionalization		
51	Results are judged to be a greater contribution than would have been achieved without the TTURC mechanism	4.03
27	Interventions, insights, or programs with clear transdisciplinary roots	3.57
47	Understanding of the limitations of (single) discipline-based research is increased	3.41
Training		
67	New investigators are trained who become interested in and develop unique lines of innovative tobacco research	4.14
46	New scientists are trained in and comfortable with transdisciplinary research	4.11
86	More training opportunities are provided for ethnic minorities as tobacco control researchers	3.22

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Transdisciplinary Integration		
20	Tobacco control research and programs are informed by the role of genetics, neuroscience, and pharmacology in addiction	3.84
7	New transdisciplinary research proposals are derived from truly novel pilot work from the centers	3.84
85	Tobacco use and nicotine research scientists integrate research from fields different from their own	3.81
Translation to Practice		
92	There is a better integration of tobacco dependence treatment into everyday health care	3.89
50	The process shows the advantages of linking from basic research to applied output in practice	3.78
95	New constructs deriving from multidisciplinary interaction emerge and are adopted in practice	3.65

Figure 8.3 Outcome Map From the TTURC Evaluation Project

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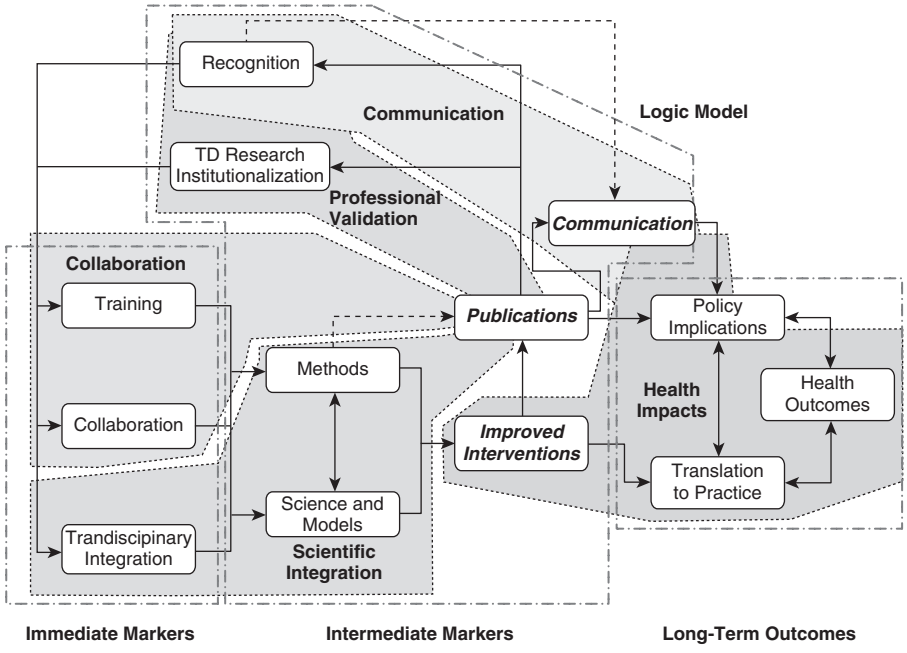

Figure 8.4 Logic Model Resulting From Concept and Outcome Maps for the TTURC Evaluation Project

The outcome logic model that was created from the concept mapping is shown in Figure 8.4. The connections to the map are immediately apparent. Essentially, rotating the map 90 degrees aligned the clusters roughly in sequence from left to right, and flowed from immediate markers, to intermediate ones, and on to long-term outcomes. Then, on the basis of the proximity of the clusters, the likely flow of causality over time, and the possibility for feedback, the major causal connections were drawn in with arrows.

Beginning on the left of the map, the clusters represent both the major activities of the initiative and their most immediate outputs—*Training, Collaboration,* and *Transdisciplinary Integration.* Ideally, these would lead to the most immediate products and outcomes, improvements in *Methods* and advances in *Science & Models.* These would, in turn, have two primary consequences. Researchers may develop *Improved Interventions,* and the research about these (along with advances in *Methods* and advances in *Science & Models*) may lead to scientific

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Publications. In scientific contexts, peer-reviewed publications are basic units of productivity and indicators of scientific advance. They lead to greater *Recognition* for the researchers and their centers and encourage greater *Transdisciplinary Research Institutionalization* within their sponsoring organizations (university, medical school, or school of public health). This greater recognition and institutionalization results in greater support for the centers themselves, thus constituting a feedback loop that leads to more support and, presumably, more training, collaboration, and transdisciplinary integration. The publications, and the recognition that comes from them, are the primary inputs for *Communication* of the research, and this communication is a major factor for engendering *Policy Implications.* Improved interventions developed in research contexts undergo a *Translation to Practice,* and this practice, along with policy changes that support it, are major drivers for long-term *Health Outcomes* of reduced prevalence and consumption of cigarettes and tobacco products and for reduced morbidity and mortality. The concept map provided the basis for this simple outcome logic model and the text explanation that describes an implicit program theory from the point of view of the participants themselves. For another example of a logic model derived from a concept mapping exercise, see Anderson et al. (2006), and to learn more about how concept mapping can be used to develop program theory, see Rosas (2005).

Using the Concept Map to Develop Evaluation Questions

In any complex evaluation, especially one that encompasses both process and outcome evaluation, there are multiple questions that need to be addressed. A major challenge is to identify these questions and organize them so that they can be addressed effectively. A concept map provides a useful device for developing such questions, and the structure of the map helps guide the use of the questions. In this project, for example, we used the implicit hierarchy of the map—of time period (immediate to long term), the cluster categories, and the statements within them—to identify key evaluation questions. We grouped the clusters roughly by time period (in the outcome logic model), and for each cluster we formulated an overarching question. Within each cluster, we used the statements to guide the development of specific subquestions of interest.

Table 8.2 shows the resulting evaluation questions. There is a direct correspondence between the map content and the questions. This has implications for data synthesis and analysis as well. But perhaps one of the most important features of using the map as the basis for question development is that the content then traces directly back to the participants (in this case, to the researchers,

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Table 8.2
List of Evaluation Questions Derived From the Concept Map

Short-Term Markers

How well is the collaborative transdisciplinary work of the centers (including training) accomplished?

- What are TTURC researcher attitudes about collaboration and transdisciplinary research?
- How do researchers assess performance of their centers on collaboration, transdisciplinary research, training, institutional support, and center management?
- What are examples of collaboration, transdisciplinary, and training activities of the centers?
- What is the quality and impact of the collaboration, transdisciplinary, and training activities of the centers?
- Do TTURC research publications provide evidence of collaboration and transdisciplinary research, and how do they compare with "traditional" research?
- How effective and efficient is the management of the TTURCs?

Intermediate Markers

Does the collaborative transdisciplinary research of the centers lead to the development of new or improved research methods, scientific models, and theories?

- What is the TTURC researchers' assessment of progress in development of methods, science, and models?
- What progress has been made in methods, science, and models?
- What are examples of progress in methods, science, and models?
- How productive are TTURC researchers at obtaining new grants?

Does TTURC research result in scientific publications that are recognized as high quality?

- How productive have TTURCs been in publishing? How does this change over time?
- What is the quality of research published?

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Table 8.2 (Continued)

Is TTURC research internally and externally recognized as high-quality research that is likely to address its objectives successfully?

- Do home institutions provide the TTURCs with adequate space, resources, and support for their work?
- Do home institutions reward TTURC work through standard academic reward mechanisms like promotion and tenure?
- Do external individuals and organizations (e.g., funders, professional associations) recognize and reward TTURC work?

Does TTURC research get communicated effectively?

- How effectively do the TTURCs communicate among researchers and externally?
- What are the major barriers to effective communication in the TTURCs, and do they change over time?

Long-Term Markers

Are models and methods translated into improved interventions?

- What progress has been made in developing new or improved interventions (for different types of interventions)?

Does TTURC research influence health policy?

- What policies have been influenced by TTURC research?

Does TTURC research influence health practice?

- How effectively has TTURC research been translated into practice (including development of written, video, or software materials; training of practitioners; developing guidelines; affecting benefit packages)?

Does TTURC research influence health outcomes?

- What is the researcher's and peer evaluator's assessment of the impact of TTURC research on health outcomes?

NOTE: Questions are organized by time period.

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funders, and associates) and is stated in their language. Because they also participated in interpreting the map, the framework of evaluation questions should be especially consonant with their own conceptual frameworks. This alignment of intentions (what stakeholders believe the desired outcomes for the initiative are) and evaluation questions helps the entire initiative keep track of the strategic vision of the project, while also being able to manage an enormous amount of operational detail related to the individual missions in their work.

Using the Concept Map to Develop Measures and Scales

The detailed content in a concept map can be especially useful for developing measures and scales. This should hardly be surprising, because concept mapping has multidimensional *scaling* as its core analysis. In this project, the map was used to develop the initial draft of a Researcher Form, a survey instrument designed to elicit the opinions and evaluative assessments of the TTURC researchers regarding the entire range of outcome markers. The form consists of 25 closed-ended questions (each with multiple subitems) and three open-ended questions. The instrument was designed collaboratively by participants who were divided into subgroups, assigned specific clusters, and asked to review the statements in those clusters and develop potential questions or survey items. TTURC funders, consultants, and researchers generated several hundred potential items for this form. These were classified into the outcome categories in the outcome logic model and grouped into multi-item questions in the Researcher Form. The form measures researchers' judgments about progress on all of the outcome categories in the logic model, including collaboration; transdisciplinary integration; science, models, and methods; internal and external support and recognition; communications; and the effects of TTURC research on policy, practice, and health outcomes. The instrument went through multiple cycles of review and revision with a variety of groups including the TTURC evaluation methodology team, the funders, the TTURC consulting committee, and the TTURC principal investigators.

The form included four scales (satisfaction with collaboration, trust and respect, outcomes of collaboration, and transdisciplinary research) with multiple items on each scale. Confirmatory factor analysis results indicated that the a priori factor structure of the collaboration and transdisciplinary scales suggested by the map was validated with some minor modifications. In addition, 26 index variables were constructed by adding or averaging different items as appropriate. Finally, it also included a question that asked the researchers to rate their overall performance assessment for the center in each of the concept

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Table 8.3
Items for Overall Performance Assessment From the Researcher Form Developed From the TTURC Concept Map

Please evaluate *the overall performance of your center* over the past 12 months in each of the following areas:

Circle One Code for Each Item	*Inadequate*	*Poor*	*Satisfactory*	*Good*	*Excellent*
a. The training of students, new researchers, and staff	1	2	3	4	5
b. The effectiveness of research collaborations within the center	1	2	3	4	5
c. Integration of research across disciplines	1	2	3	4	5
d. Ability to conduct transdisciplinary research	1	2	3	4	5
e. Development of new scientific theories or models, or enhancement of existing ones	1	2	3	4	5
f. Research leading to the development of new research methods	1	2	3	4	5
g. Publication productivity	1	2	3	4	5
h. Quality of publications	1	2	3	4	5
i. Development of improved interventions	1	2	3	4	5
j. Institutional support for research	1	2	3	4	5
k. Recognition of center-related research	1	2	3	4	5
l. Communication of research findings (other than through publications)	1	2	3	4	5
m. Translation of research into practice	1	2	3	4	5
n. Translation of research into policy	1	2	3	4	5
o. Ability to affect ultimate health outcomes (e.g., prevalence, morbidity, mortality)	1	2	3	4	5
p. Overall management of the center	1	2	3	4	5

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map cluster areas (with several areas divided into multiple subareas). Table 8.3 shows these questions.

The implementation of this Research Form itself ultimately constituted a collaborative, transdisciplinary evaluation methodology that both was scientifically rigorous and reflected a consensus on the part of its key stakeholders.

Using the Concept Map as a Framework for Synthesis and Analysis

The structure of the map provided a content-based taxonomy that was used to synthesize the results of mixed-methods data from a variety of sources. The survey results obtained through the Researcher Form were clearly classifiable by the clusters on the concept map, because that was the structure that was used to guide their development. In addition, several other measures were constructed that enabled results to be directly related to the map structure. We conducted a systematic peer review of the annual progress reports for each project from each center (272 research projects across three years). Each project was randomly assigned two independent reviewers who rated it for general progress, for its potential impact on different groups (scientists, practitioners, policy makers, and clients), and for progress in each of the cluster categories; the reviewers also provided qualitative comments. We did a content analysis of all of the annual project report summary narratives, coding whether the summaries addressed each of the concept map outcome categories.

These three different data sources—the survey, the peer evaluations, and the content analysis of annual reports—were deliberately structured in terms of the concept map and its accompanying logic model. This provided an especially useful framework for integrating results across three different mixed methods, thus enabling more direct synthesis of results and understanding of their patterns across data source.

Using the Concept Map to Examine Patterns of Outcomes

As described earlier, the TTURC logic model suggests a sequence of outcomes of the initiative, beginning with the short-term markers and, over time, reaching the long-term markers. This pattern makes it possible to examine the degree to which the observed results correspond with expectations suggested by the logic model, a type of pattern matching design (Trochim, 1985, 1989d). In general, on the basis of the logic model, we would expect that the most immediate outputs or markers would be affected earliest, with outcomes further to the right in the model showing results later. As results build over

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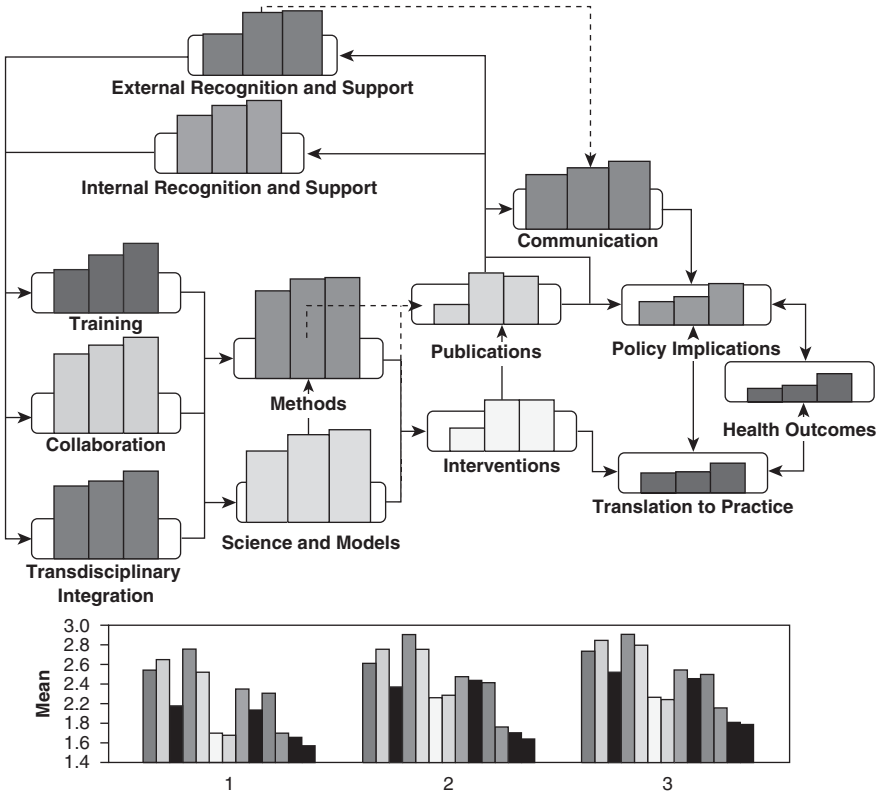

Figure 8.5 Results of Average Peer Evaluation Ratings of Progress Reports of TTURC Projects by Concept Map (and Logic Model) Category for Years 1–3 of the Initiative

successive years, we would expect the pattern to look like a wave that moves through from left to right on the logic model, with more immediate markers continually leading intermediate ones, which in turn lead long-term ones.

To illustrate, we have graphed the results for the peer review assessments of progress in each of the concept map and logic model outcome categories for all projects over the first three years of the initiative. These results are graphed onto the logic model graph in Figure 8.5. For each cluster, three vertical bars represent the first three years of the initiative. Each bar represents the average

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ratings for that cluster of two randomly assigned peer reviewers across all research projects (N = 272, approximately 85 each year). Several things are striking in the figure. As expected, higher bars appear on the left of the model for the immediate and intermediate markers, and lower progress for the longer-term markers on the right. And, in almost every case, an increase in rated progress across the three years is evident.

Formal statistical tests of such pattern matching hypothesis models have not yet been developed, but the pattern of observed TTURC markers for all three data sources corresponds well visually with what would be predicted by the TTURC logic model. In general, short-term markers (i.e., process measures) show the greatest progress, with intermediate and longer-term markers showing lower but gradually increasing progress levels as expected. The visual trends over time suggest that the TTURC initiative is making progress along the lines that would be expected given the logic model that constitutes their program theory. The overall correspondence of the pattern with expectations suggests that something systematic is occurring that corresponds to the logic model that was based on the concept map.

This kind of pattern matching assessment has important implications for causal assessment in evaluation. In situations where it is not feasible to have comparison groups, the spectrum of outcome variables and their particular expectation pattern enable the variables themselves to act as control factors in a pattern matching version of a nonequivalent dependent variables design (Cook & Campbell, 1979). When the patterns of outcomes across variables correspond to theoretically based expectations—and there are no other plausible causal factors that would be likely to generate that pattern of outcomes—this can be taken as evidence supporting the idea that the program or intervention has a causal effect.

SUMMARY

Concept mapping can play a critical role in evaluation. These maps are especially useful from an evaluation systems perspective, where they can be used as the "glue" or conceptual framework that can guide the planning, development, implementation, and evaluation of programs. The hierarchical nature of the maps provides a structure for linking the strategic level vision with more specific action in a planning context. For evaluation, this hierarchy improves our ability to operationalize measures, structure data and analyses, and relate specific data elements to larger patterns of outcomes.

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We presented in this chapter a detailed example of the use of concept mapping in an evaluation context that illustrates well a variety of useful applications. We demonstrated its utility in developing logic models of implicit program theories of stakeholders, developing measures or scales, linking data from different data sources in a mixed methods evaluation, and creating pattern matching analyses of outcomes to explore causal relationships in program evaluation.

However, the potential variations of applications go considerably beyond just the elements provided. Concept mapping has meaningful potential advantages for qualitative research as well. It can be used to develop a taxonomy of thematic categories for a thematic qualitative analysis of data (Jackson & Trochim, 2002). Or, it can be used directly with participants to map how programs have affected them. It can be used as an organizing methodology in participatory action research (PAR) studies (Reason & Bradbury, 2001) or in community-based participatory research (CBPR) work (Krieger et al., 2002; Macaulay, 1999). In these cases and others, concept mapping not only provides a useful and rigorous method for evaluation, but it opens up new models of evaluation, especially ones that involve participants—not just in generating data, but directly in the collaborative process of analysis and interpretation.

Although concept mapping has great value in an evaluation, it does not preclude or supersede currently used methodologies. Rather, it is a supplemental or alternative method to accomplish evaluation. Concept mapping can effectively be coupled with standard survey research, to enhance both our ability to generate survey questions and provide a framework for analyzing survey results. It can serve well as a useful supplemental or alternative needs assessment approach. Mapping is not in opposition to focus group approaches; it can be viewed as complementary, as providing a statistical and process framework for conducting a particular type of focus group. Concept mapping can also play a critical role in venerable methodologies for causal assessment such as experimental and quasi-experimental design. In those contexts, concept mapping can provide a conceptual and mathematical framework for addressing the construct validity of both the program and the measures used to assess it. In all of these uses, concept mapping complements established methodologies and provides a multiple-stakeholder participatory framework for enhancing evaluation. We will still conduct qualitative evaluations, and we will still use experimental and quasi-experimental designs to assess outcomes. Concept maps are useful, fundamentally because they extend and enhance the traditional analyses of evaluation data by improving our ability to articulate and test the theoretical bases for an evaluation, and by encouraging the presentation of results in a pictorial form that may be more comprehensible to the relevant audiences and constituencies.