1

An Introduction to Concept Mapping

> Ideas are like rabbits. You get a couple and learn how to handle them,
> and pretty soon you have a dozen.
>
> —John Steinbeck

Concept mapping is a generic term that describes any process for representing
ideas in pictures or maps. In this book, however, we use the term only to refer
to one specific form of concept mapping, an integrated approach (Trochim,
1989c; Trochim & Linton, 1986) whose steps include brainstorming, statement
analysis and synthesis, unstructured sorting of statements, multidimensional
scaling and cluster analysis, and the generation of numerous interpretable maps
and data displays.

Concept mapping can be considered a structured methodology for organiz-
ing the ideas of a group or organization, to bring together diverse groups of
stakeholders and help them rapidly form a common framework that can be
used for planning, evaluation, or both. It can be considered a type of integrated
mixed method (Caracelli & Greene, 1993; Greene, Caracelli, & Graham,
1989) because its qualitative and quantitative components are inextricably
interwoven to enable a diverse group of stakeholders to articulate their ideas
and represent them in a variety of quantitatively derived visual results—
concept maps, pattern matches, and value plots—that can be used in reaching
both awareness of the issues at hand and agreement on how to proceed.

This collaborative group process generates a conceptual framework for
planning and evaluation that has several benefits for social scientists and other
researchers, compared with less sophisticated conceptualization approaches
such as focus groups:

- It represents a systematic process that integrates structured group processes such
  as brainstorming, unstructured idea sorting, and rating tasks with sophisticated
  multivariate statistical methods to produce a well-defined, quantitative set of
  results.
- It graphically represents a domain of ideas in a framework that can be utilized
  directly for developing specific planning objectives or evaluation metrics.
- It facilitates the collection of input from a broad and diverse array of stakeholder
  groups and/or other data sources, in virtually any setting in which a group issue

or need requires definition, planning, and evaluation, and it enables feedback on these data to participants in a timely manner.

- It can be used with stakeholder groups of any size, ranging from small single-site meetings to hundreds of geographically diverse stakeholders providing information on-line.

- It provides a collaborative, participatory process, involving stakeholders in communities of interest directly in the interpretation of the results as well as initial idea generation. The stakeholders themselves, rather than the facilitator, drive the content for the entire conceptualization and results interpretation process.

Above all, concept mapping employs a methodology that integrates the planning and evaluation process, providing a unified framework for both within a systems perspective (Veney & Kaluzny, 1984). By representing the efforts of participants as a geography of thought, across multiple communities of interest, it provides a new, quantitative framework for effective planning and evaluation efforts.

Concept mapping seeks the open contribution of participant stakeholders' ideas on a specific issue, organizes the ideas, and portrays them in pictures or maps that are readily understood. Using the resulting concept map as a foundation, researchers can measure any number of variables of interest—such as the importance or feasibility of participant ideas—and display them as patterns on the map. They can then compare two or more patterns—in the aggregate and in their details—using pattern matching to look at consensus and consistency over time, along with bivariate displays known as "go zones," to identify the potential courses of action or types of measurement. The concept mapping process is useful as an integrating framework throughout the life cycle of a project, from the initial conceptualization of the project, to the development of actions, programs, and/or measures, to the initial implementation of them, and finally to evaluation and reformulation.

Some examples in which concept mapping has been employed successfully include the following:

- The Hawaii Department of Health (HDOH) used concept mapping techniques to engage local stakeholders and national subject area experts to define the community and system factors that affect individuals' behaviors related to tobacco, nutrition, and physical activity (Trochim et al., 2004). The results were immediately incorporated into an official plan, approved by the governor and state legislature, that recommended how Hawaii's tobacco settlement resources could be used to create sustainable changes in population health. This project was completed within a four-week deadline and successfully resulted in DOH funding from Hawaii's share of this tobacco settlement. Moreover, the results provided a framework that will be employed for future program evaluation.

- Concept mapping was employed by a project sponsored by the National Association of Chronic Disease Directors (NACDD), in conjunction with the Centers for Disease Control and Prevention (CDC), to address the role that state health departments could play in addressing epilepsy and other low-prevalence chronic conditions (LPCCs) in the event that increased federal funding were to be made available. Stakeholders included representation from the CDD, the CDC, public health agencies, advocacy groups, and others. This project recommended a range of activities through which state health departments could become more involved with addressing epilepsy or other LPCCs, including assessment, epidemiology, and surveillance; partnerships; state plans; intervention; and evaluation. Moreover, these recommendations were remarkably consistent with previously established best-practices program components for state-based chronic disease programs.

- The National Cancer Institute (NCI) employed concept mapping as part of the evaluation of a large, complex center grant program known as the Transdisciplinary Tobacco User Research Centers (TTURCs) (Stokols et al., 2003). The mapping was done to help determine the outcomes to be measured as a basis for evaluation. In this project, the use of concept maps clarified not only clusters of ideas, but a regionalization of these clusters into areas defining the process, structure, and outcomes of their efforts—leading to an almost exact mapping of these cluster groups into short-term, intermediate, and long-term evaluation criteria, as discussed in Chapter 8.

A researcher can implement concept mapping over the life course of a planning or evaluation project to help address many of the fundamental design, process, and outcome questions that are inherent to these projects:

- *What are the issues in a planning or evaluation project?* Concept mapping commences with development of specific focus and rating prompts, which require articulation of specific issues and desired outcomes, followed by a structured brainstorming process to generate stakeholder ideas. Moreover, the natural applicability of this process to the World Wide Web facilitates gathering ideas from large and geographically dispersed communities of interest.

- *Which issues are relatively more important or should have higher priority?* A sorting and rating process, driven by the stakeholders, provides raw data for a sophisticated, mixed-method analysis of how ideas are clustered and rated by participants.

- *Is there consensus among participant groups?* Concept mapping analysis produces visual displays of how the ratings of individual stakeholder subgroups agree or diverge.

- *Do the stakeholders have a common vision of what they are trying to achieve that enables them to stay on track throughout the life cycle of a project?* The visual maps clarify core ideas for the participants—how they are clustered, how they relate to

each other, and how they are rated along specified criteria. Groups use this information to recognize the "current state" of their thinking and to track changes.

- *Are stakeholders able to assess the implementation of programs or interventions and check on the degree to which they reflect the originally intended focus, bridging the gap between planning and evaluation?* The concept mapping methodology provides a common framework for assessing both planning efforts and subsequent program evaluation.

- *Does the program work, and on which variables is it working?* The concept mapping approach of operating on both specific ideas and clusters of ideas and their associated rating values, enables the evaluation of specific aspects of program results. It also facilitates program evaluation across both time and the perspectives of multiple stakeholder groups.

- *Can stakeholders link program outcomes to original expectations or intentions to see if they are achieving what they set out to achieve?* By employing a concept mapping methodology, program evaluators can generate relevant outcome criteria as a natural output of the planning process.

- *What does our organization's evaluation system consist of, and how it is implemented?* Concept mapping develops a system framework and enables an organization to connect its requirements, progress indicators, and measures in an integrated way.

Concept mapping addresses questions like these within planning and evaluation projects by combining quantitative and qualitative analysis methods with participatory group processes, in a way that clarifies the understanding and analysis of overall stakeholder thought. It helps individuals to think more effectively as a group, but without losing the uniqueness of their individual contributions. It also helps the groups to manage the inherent complexity in most planning and evaluation situations without trivializing or losing important detail.

The conceptualization of an issue becomes the key to tangible outcomes in planning and evaluation. To develop a model like the ones above assumes that researchers understand the issue that the plan is supposed to address, fix, or improve. To conduct evaluation assumes that they can identify and measure the elements that will reflect the need and also show desired change. Conceptualizing the issue and drawing from that conceptualization a relevant approach to planning and evaluation are critical steps that are often challenging for applied researchers.

Social research uses many ways to accomplish the conceptualization task, but this volume is not an attempt to review all existing methods. Instead, we describe a specific process—concept mapping—that has been investigated in some detail over the course of the last two decades and is recognized as a valuable tool in planning and evaluation. It makes outcomes like the

ones described above possible through a process of brainstorming, statement synthesis, analysis, and mapping, which support conceptualization of issues by researchers. This chapter introduces concept mapping and shows how it works throughout the life cycle of a project. The chapters that follow describe each of the steps necessary to complete an appropriate and successful concept mapping project.

PLANNING AND EVALUATION IN THE PROJECT LIFE CYCLE

At the most general level, planning and evaluation tend to follow a rather simple process over the life of a project, as outlined in Figure 1.1.

In the first phase, *conceptualization,* the key stakeholders identify the major issues, try to make sense of them, and usually try to achieve some consensus or shared vision regarding what is to be done. If they are developing a program, they might try to come to agreement about the program's goals and objectives and delineate the important components or elements of the program.

In the second phase, *development,* some stakeholders begin to translate the conceptual framework into operational reality. They describe each phase of program delivery, the resources that are needed, and exactly how the work might best be accomplished.
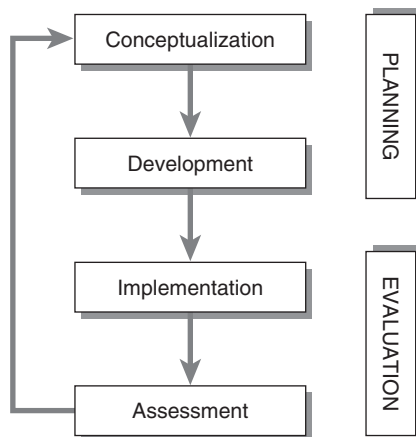

Figure 1.1   A Typical Project Life Cycle

In phase three, *implementation,* the program or plan is pilot-tested and the fidelity to the original vision is checked. If needed, the program is fine-tuned and adjusted to reflect more accurately what was intended.

Finally, in the fourth phase, *assessment,* the effects of the program are evaluated, both on short-term measures and on longer-term indicators of success or performance. The evaluation often leads to the initiation of an entirely new cycle with a more informed reconceptualization of the problem and a new, perhaps changed shared vision.

This project life cycle model highlights the general stages in almost any project. The detailed procedures would certainly differ depending on the nature of the project. For instance, the development phase methodology for designing a social program would be very different from the process for designing an interactive multimedia training program. Nevertheless, at this highest level, most projects follow some variation of the stages described in the figure.

Although planners and evaluators have described numerous variations of the project life cycle (Veney & Kaluzny, 1984), they usually lack a methodology for integrating all of its stages. A complex, multiphase structure like the one described above makes it a challenge to maintain a continuity of effort over the entire life cycle in the absence of an integrated methodology such as concept mapping. Multiple stakeholder groups are involved at different phases of most projects, each bringing their own values, perspectives, and preferences to the project. Unless there are methods that enable such multiphase projects to remain on track, miscommunication and disconnection can easily occur among groups and between stages.

The concept mapping model is a comprehensive approach that addresses the entire project life cycle. Suppose that you are a social researcher examining how to disseminate evidence-based health care practices effectively and then measure the effectiveness of these dissemination strategies. Using concept mapping at the very beginning of a project such as this helps the various stakeholder groups lay out their ideas for the project, organize these ideas, and explore consensus. It helps structure the shared vision in the form of a concept map that can guide detailed project development efforts. It can provide the framework to assess the initial implementation of the program and help assure that it is faithful to the program vision. It also enables evaluators to track the outcomes from the program, both immediate and longer term, to assess the degree to which the program is achieving what was intended and to suggest ways that the program could be continually improved.

For most applications, particularly in the social sciences, both planning and evaluation activities involve the articulation of thoughts, ideas, or hunches, and the representation of these in some objective form. Although some view planning and evaluation as distinct activities, we believe that they are necessary phases of one process and ought to be interlinked. This methodology approaches

both from a common systems perspective—as the analysis and interpretation of a geography of ideas. Foundationally, concept mapping as described here applies integrative mixed methods and connects structured group processes with several sophisticated multivariate statistical methods.

The Concept Mapping Process

In the concept mapping method, groups of ideas are represented in the form of a picture or map—creating a visual, geographic representation of the topic of interest. To construct the map, the ideas are first described or generated and the interrelationships between them are articulated. Multivariate statistical techniques—multidimensional scaling and cluster analysis—are then applied to this information and the results depicted in map form. The content of the map (the group of ideas) is entirely determined by the participant group. The group brainstorms the initial ideas, provides information about how these ideas are related, interprets the results of the analyses, and decides how the map is to be used.

This concept mapping approach is effective when a group of people wants to develop a conceptual framework for evaluation or planning. The framework, which may describe the current state of an issue or a future desired state, is displayed as a series of concept maps that graphically represent the group's thinking. These maps display all of the group's ideas relative to the topic at hand, showing how these ideas are related to each other and, usually, showing which ideas are more relevant, important, or appropriate.

Concept mapping is particularly effective when known groups of multiple stakeholders, such as multiagency steering committees, are involved in planning and evaluation efforts. Groups like these might consist of the administrators, staff, or members of the board of directors of an organization; community leaders or representatives of relevant constituency groups; academicians or members of the policymaking community; funding agents or representatives of groups with oversight responsibility; groups of researchers and practitioners in specific areas of inquiry; representatives of relevant client populations; or combinations of these. Less appropriate to concept mapping as a tool are systems or cultures in which a hierarchical decision model is the norm or in which an organization's planning or evaluation models are predetermined.

The concept mapping process is guided by a *facilitator,* who could be an outside consultant or an internal member of the group responsible for the planning or evaluation effort. The facilitator manages the process, but the content, interpretation, and utilization of the concept map are determined entirely by the group. This facilitation process may be performed by a single person or a team and may involve people from inside or outside the organization.

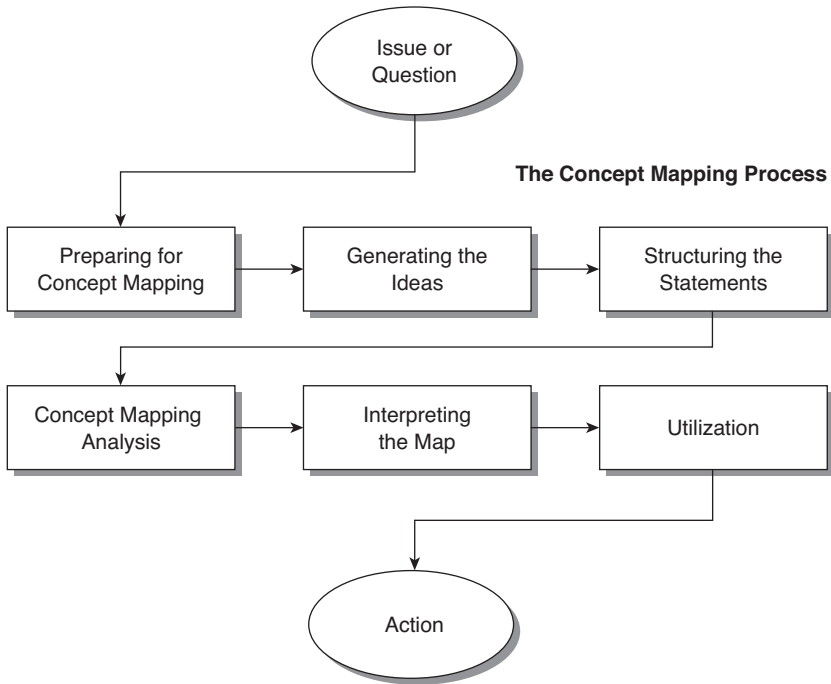Figure 1.2 shows an overview of the concept mapping process.

The Concept Mapping Process

Figure 1.2   An Overview of the Concept Mapping Process

Table 1.1 describes the critical elements of each of the steps.

The details behind these steps form the basis of a design for implementing a concept mapping project. Here, we briefly describe the steps, and show an example that illustrates each step as it is applied in a hypothetical example of the entire process. Each step is the subject of a subsequent chapter in this volume.

Step 1: Preparing for Concept Mapping

The facilitator helps to manage the beginning of the process, working with a group of key participants to set the structure, expectations, and desired outcomes. To begin, the facilitator works with the client or sponsor to ensure that desired outcomes of the effort are clearly articulated. The facilitator then helps

Table 1.1
Steps in a Concept Mapping Process

---

1. Preparing for Concept Mapping
    - *Focus.* The desired outcome of a study
    - *Sampling and Participants.* Identifying relevant stakeholders and how they will be engaged
    - *Scheduling and Logistics.* Orchestrating stakeholder participation

2. Generating the Ideas
    - *Brainstorming.* Gathering knowledge and opinions
    - *Ideas Analysis.* Creating a rationalized set of group ideas

3. Structuring the Statements
    - *Demographics (Organization and/or Personal).* Identifying stakeholder groups for comparative analysis
    - *Unstructured Pile Sorting.* Organizing ideas into groups
    - *Rating(s).* Assigning values to ideas

4. Concept Mapping Analysis
    - *Multidimensional Scaling*
    - *Hierarchical Cluster Analysis*
    - *Bridging Analysis*
    - *Production of Maps*
    - *Pattern Matching*
    - *Bivariate Plots ("Go Zone" Plots)*

5. Interpreting the Maps
    - *Structured, Participatory, Stakeholder-Based Interpretation.* Developing joint stakeholder authorship

6. Utilization
    - *Action.* Action items from a planning process
    - *Measurement.* Comparison of results against initial desired outcomes
    - *Evaluation.* Connecting measures to the desired outcomes and assessing change

the group arrive at a specific focus for the project and helps ensure the selection of relevant participant stakeholders.

Developing the Focus. The first important step in preparation is developing the focus or domain of the conceptualization. Two separate focus statements are

usually used to provide the direction for concept mapping. First, the facilitator guides participants in defining the focus for the brainstorming session, which is Step 2 of the process. Second, the participants and facilitator develop the focus for ratings that are performed during Step 3, the structuring step of the process. This focus defines the dimension(s) on which each of the brain-stormed statements will be rated.

The focus for brainstorming is often first expressed as a *focus statement,* which is worded to give the specific instruction intended. For example, the brainstorming focus statement in a strategic planning process might be worded as follows:

> "Generate short phrases or sentences that describe specific things that Organization XYZ should do to address its mission."

To facilitate the brainstorming process, this focus statement is then often recast as a *focus prompt,* worded in a complete-the-sentence format:

> "One specific thing Organization XYZ needs to do in order to address its mission is . . ."

The focus prompt is typically arrived at through facilitated inquiry as to the desired outcomes and requirements of the initiative.

An *importance* rating focus for a program evaluation might be worded like this:

> "Rate each potential outcome on a five point scale in terms of its importance to the program, where '1' means 'Not at all important,' '3' means 'Moderately important,' and '5' means 'Extremely important.'"

Ratings can be collected on any measure of interest to the project at hand, like priority, current capability, relevance to mission, preference, and so on. The group should agree on the specific wording for each of these rating scale statements.

Selecting the Participants. Identifying the participants in a concept mapping process is one of the most important tasks. Concept mapping is most useful when it includes a range of people whose knowledge or experience is relevant to the question, although some situations (e.g., product development planning) call for smaller, more homogeneous groups because the map's use is very targeted and other logistics are easier to accommodate. There is no strict limit

on the number of participants; concept mapping projects have ranged from small groups of 8 to 15 people to ones involving hundreds of participants. In the early days of the method, participant groups tended to involve a relatively small group meeting in a single location; now, interactive tools employing the World Wide Web enable larger groups of participants spread across remote geographic locations to participate in brainstorming, sorting, and rating at their convenience.

It is not necessary that all participants take part in every step of the process. For instance, a large group may complete the generation (i.e., brainstorming) step; a much smaller group may perform the sorting task; and the same large group that generated the content may be responsible for rating the ideas. This model is particularly useful in projects with large groups of stakeholders. In general, however, we have found that concept maps are better understood by people who have participated in all phases of the process than by those who have taken part in only one or two steps.

Step 2: Generating the Ideas

Once the participants and focus statements have been defined, the actual concept mapping process begins. The participants generate a set of statements that, ideally, will represent the entire conceptual domain for the topic of interest. In a typical case, brainstorming is used and the focus prompt constitutes the basis for the brainstorming process. The usual rules for brainstorming apply (Osborn, 1948). People are encouraged to generate many statements and are told that there should be no criticism or discussion regarding the legitimacy of statements that are generated during the process. This process may take place in the form of a live meeting, where a facilitator records the statements as they are generated so that all members of the group can see the set of statements as they evolve; or occur remotely and asynchronously via the Internet or other means.

Ideas Analysis. Theoretically, there is no limit to the number of statements that can be processed, but large numbers of statements impose serious practical constraints in the subsequent participant activities. Because it is not unusual nowadays for hundreds of statements to be brainstormed, particularly in large, distributed groups of stakeholders, we often subsequently employ a process for analyzing and editing the statements to a more manageable set. This process always involves members of the stakeholder group. On the basis of our experience, we typically limit the final set of statements to 100 or fewer. This enables breadth of representation of contributed ideas while providing sorting and rating participants with manageable tasks to complete, as described below.

Step 3: Structuring the Statements

Once the group has a set of statements describing the conceptual domain for a given focus, we usually ask each participant to perform two "structuring" tasks—grouping (or sorting) and rating. For the grouping or sorting task (Coxon, 1999; Rosenberg & Kim, 1975; Weller & Romney, 1988), each person is instructed to group the ideas into piles "in a way that makes sense to you." Participants may not sort all items into *one* pile, sort every statement as its own pile (although *some* items may be grouped by themselves), or sort an item into more than one pile.

Participants can perform this sorting process either manually or electronically. The manual method involves printing each statement on a separate card and having each participant physically sort the cards into piles. This method has the advantage that you can spread all of the card piles in front of you and see them all simultaneously. Alternatively, a Web-based interface enables participants to sort by selecting statements from a list and clicking on a button to move them into the appropriate group. The Web-based method is the electronic equivalent of the manual process.

For the rating, each participant rates each statement on one or more dimensions as described in the rating focus statement. For example, the following is a *feasibility* rating focus prompt:

> "Rate each issue on a five point scale in terms of the feasibility of accomplishing it within the next three years, where '1' means 'Not at all feasible,' '3' means 'Moderately feasible,' and '5' means 'Extremely feasible.'"

Although many researchers apply a Likert-type response scale, any numeric scale can be used to elicit judgments from the participants. Here, as well, participants can either perform this step manually via pencil and paper or electronically with a software tool. In the analysis, the arithmetic mean of the ratings (and sometimes other descriptive statistical information) will be computed.

Step 4: Concept Mapping Analysis

The concept maps are computed at this stage with a multidimensional scaling analysis, which locates each statement as a separate point on a map. Statements that are closer to each other on this map are generally grouped together by the sorters more frequently; more distant statements on the map are in general grouped together less frequently. Next, a hierarchical cluster analysis partitions the statements on this map into clusters. These clusters are more general conceptual groupings of the original set of statements. Finally, average ratings are computed for each statement and for each cluster.

Step 5: Interpreting the Maps

To interpret the conceptualization, we assemble certain materials and follow a specific sequence of steps—a process that has been developed on the basis of our experiences with many different projects. The materials consist of the original statements and clusters, a series of maps depicting these statements and clusters as well as related variable data, and rating comparison graphs known as pattern matches and go-zones. These materials start with the following:

1. *The Statement List.* The original list of brainstormed statements; each item is shown with an identifying number.
2. *The Cluster List.* A listing of the statements as they were grouped into clusters by the cluster analysis.

Next, there is a series of maps:

3. *The Point Map.* A map that shows the statements as they were placed by multidimensional scaling.
4. *The Cluster Map.* A map that shows how statements were grouped by the cluster analysis.
5. *The Point Rating Map.* The numbered point map with average statement ratings overlaid.
6. *The Cluster Rating Map.* The cluster map with average cluster ratings overlaid.

Notice that there are several different types of maps here. Which of them is *the* concept map? In fact, they are all concept maps. Each of these maps tells us something about the major ideas and how they are interrelated. Each emphasizes a different aspect of the conceptual information. Two additional displays facilitate comparison of the rating results across different criteria:

7. *Pattern Matches.* Pairwise comparisons of cluster ratings across criteria such as different stakeholder groups, rating variables, or points in time, using a ladder graph representation. The structure and use of these graphs are described later in this chapter.
8. *Go-Zones.* Bivariate graphs of statement values for two rating variables within a cluster, divided into quadrants above and below the mean of each variable, showing a "go-zone" quadrant of statements that are above average on both variables.

Although these maps and graphs are distinctly different ways of portraying or representing the conceptual structure, it is important to remember that they are all interrelated and simply reflect different views of the same phenomenon.

Interpretation involves distributing the materials in sequence to the participant group and directing certain interpretive tasks such as examining and naming clusters of statements.

Step 6: Utilization

At this point, the group discusses ways to use the final concept maps, pattern matches, and go-zones to enhance either planning or evaluation. The uses of these tools are limited only by the creativity and motivation of the group. For planning, these results might be used for structuring the subsequent planning effort or as the framework for an outline of a planning report. In evaluation, the concept map, pattern matching, and go-zones can act as an organizing device for operationalizing and implementing the program, as a guide for measurement development, or as a framework for examining patterns of outcomes.

How Concept Mapping Works: An Example

To illustrate how the concept mapping process works, we consider here a hypothetical, decontextualized example that shows each step in the process. Each of the remaining chapters concentrates on a specific step of the process in considerable detail and shows numerous examples of real-world projects to illustrate some of the issues and variations involved in concept mapping.

Imagine a situation where a local organization that serves the community is involved in a planning process to determine its future priorities and decides to use the concept mapping methodology to help accomplish this. First, at the preparation stage, the organizers would discuss desired results of the initiative, identify groups of stakeholders, and generate the *focus statements*—specifically, a brainstorming focus statement and focus prompt designed to elicit ideas about the topic of interest and one or more rating focus statements for rating the statements on characteristics of interest. A typical brainstorming focus statement might look like this:

"Generate statements that describe specific services that our agency should provide to its community in order to address our organizational mission."

This might then be translated into a focus prompt:

"One service that our agency should provide in the future in order to address our organizational mission is . . ."

A typical rating focus statement might be as follows:

"Rate the importance of each statement on a scale from '1' to '5,' where '1' equals
the lowest level of importance and '5' equals the highest level of importance."

At the next stage, generation of ideas and issues, a brainstorming process is
conducted (using the brainstorming focus prompt defined earlier) to generate
statements. For example, statements in response to the above prompt might
include the following:

1. Employee assistance programs

2. Outpatient services for the elderly

3. Foster parent training

At this point, collected statements are processed to consolidate duplicate or
nonrelevant statements. If the number of brainstormed statements is suffi-
ciently large (e.g., greater than 100), the statement set may be analyzed and
edited, maintaining as much as possible the original ideas of the group within
the smaller edited set of statements.

Next, each participant sorts the statements for similarity, either manually or
using computer software, subject to the constraints discussed earlier: that each
pile cannot consist of one statement (in other words, the result cannot be a one-
to-one correspondence between number of statements and number of piles);
that all statements cannot be in a single pile, and that no statement can be in
more than one pile. Then each participant rates each statement according to the
rating focus statement(s) established earlier.

Now, the grouping and rating data are analyzed as described in Chapter 4
of this volume, using a sequence of analyses (e.g., multidimensional scaling
and cluster analysis) to produce the following results displays:

1. *Point Map.* This map (shown in Figure 1.3) is a display of the two-
dimensional multidimensional scaling of the grouping data, showing points
corresponding to each statement. The proximity of these statement points is
based on which statements were more likely to have been placed in the same
pile by the participants.

In the map shown, the points for statements 10 and 76 on the left are physically
close to each other. This indicates that these statements were more likely to have
been grouped together in the same pile by the participants. For example, in a public
health planning study, the following statements would be likely to be grouped
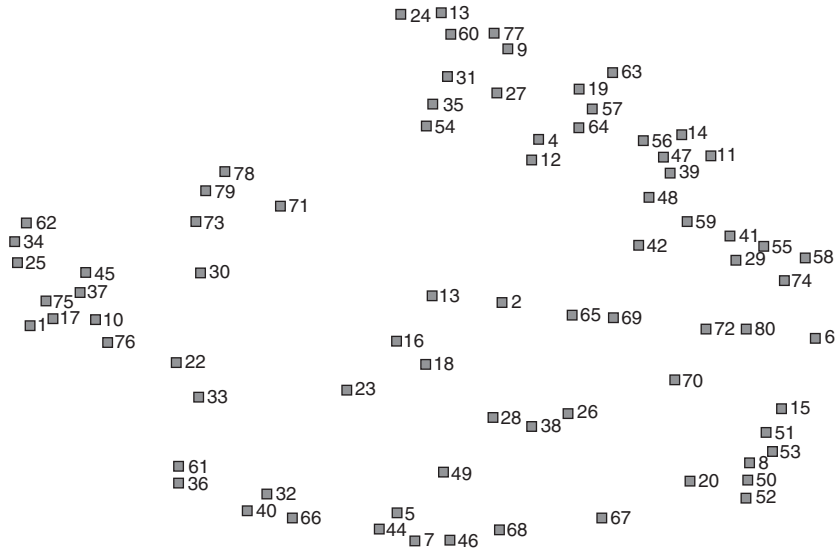together by most sorters under a category of "Working With Providers":

Figure 1.3   Point Map

Statement 10: "Educate providers about community beliefs towards preventive health screening."

Statement 76: "Work with providers to increase understanding and buy-in for existing screening guidelines and practices."

The point map is a *relational* map, in that it shows the statements in relation to each other. The orientation of the map is not important to the analysis of the results—this map could be rotated clockwise or counterclockwise or flipped horizontally or vertically and the points would still have the same positions relative to each other. This map often serves as a discussion tool for participants to explore the relationship among statements and to start to define categories for proximate groups of statements.

2. *Point Cluster Map.* A point cluster map represents the overlaying of the hierarchical cluster analysis results onto the original multidimensional scaling point map, as shown in Figure 1.4. The cluster analysis groups related statements into discrete groupings, represented by two-dimensional polygons. This map is useful in relating each cluster to its relevant statements and for asking
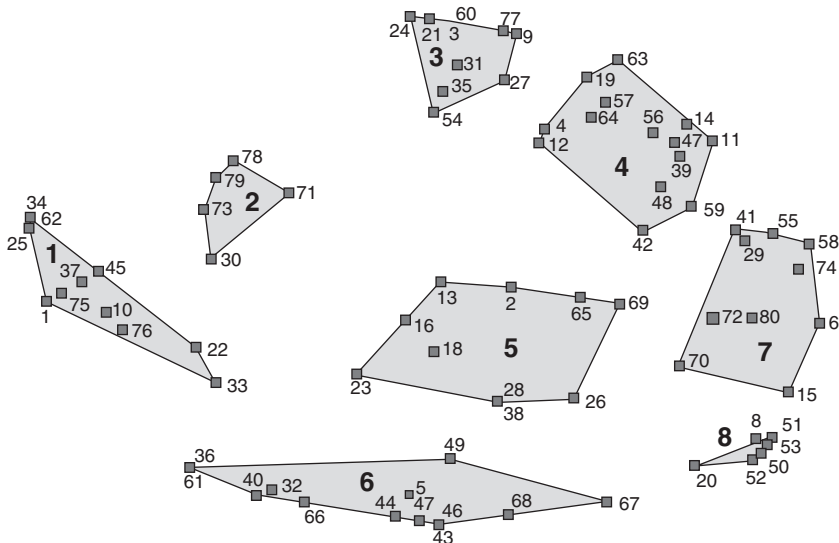
Figure 1.4   Point Cluster Map

participants to suggest appropriate labels for the clusters. For example, in a
community mental health planning study, the statements in cluster 1 on the left
might all be about educational outreach efforts, whereas the larger cluster 4 on
the right may contain statements about outpatient treatment options.

Note that the polygon shapes of the clusters are produced by joining the out-
ermost points in each cluster as determined by the analysis. Regarding the size
of the clusters, broader cluster shapes usually represent broader concepts,
whereas more compact clusters generally represent more narrowly focused
concepts. In the sample figure above and in subsequent cluster maps shown in
this introductory example, the clusters are shown using placeholder labels of 1,
2, 3, and so forth. In an actual study, some or all of the stakeholders would be
involved in a process of labeling these clusters with descriptive labels such as
"Education" or "Outpatient Services," in ways that make the most sense to
them. These labels, in turn, represent a key summary of the domain of ideas
generated by the brainstorming process. Actual examples of maps provided
throughout this volume show clusters with stakeholder-authored labels.

3. *Cluster Map.* The cluster map displays the labeled results of the cluster
analysis and provides a "big picture" overview of the domain of ideas. Figure 1.5
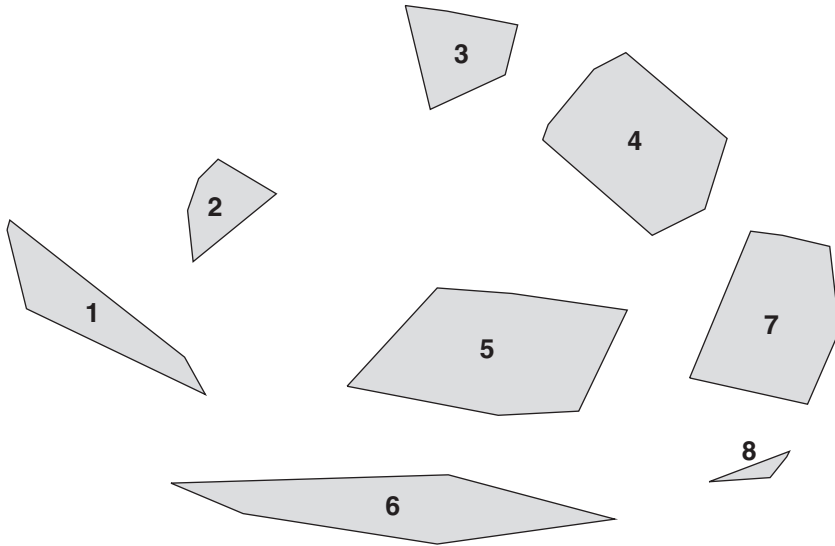shows an example of a cluster map.

Figure 1.5   Cluster Map

Together, the point and cluster maps (Figures 1.3 through 1.5) constitute the conceptual framework generated for a study. The following two maps then simply use these structures as a framework for displaying the rating data.

4. *Point Rating Map.* A point rating map overlays the point map with a graphical representation of the rating priorities that have been averaged for each statement. Figure 1.6 shows an example of a point rating map.

In this map, the number of "blocks" in a column's height indicates the average relative importance for each statement, according to the stakeholders who contributed rating input. In this figure, for example, it is visibly apparent that the items of highest importance tended to fall in the eastern or northeastern portions of the map.

5. *Cluster Rating Map.* In a cluster rating map, the average rating values are computed for each cluster of statements and displayed as a third dimension on top of the cluster map. As with the point rating map, clusters with higher values in the third dimension contain statements that participants gave higher
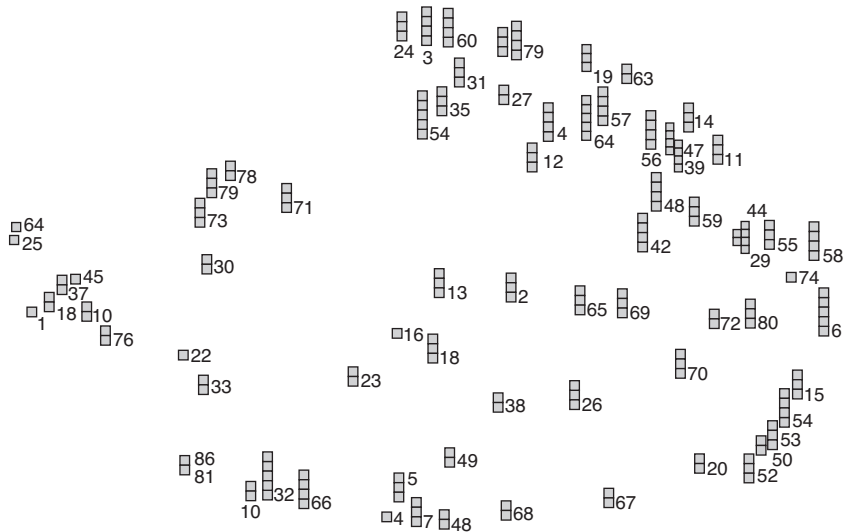
Figure 1.6   Point Rating Map

average ratings. Figure 1.7 shows an example of a cluster rating map. The relative heights of each cluster indicate the relative importance of each group of ideas compared to the others on the map.

Thus far, we have computed maps showing the statement domain in the form of their proximity (via the multidimensional scaling analysis), their clusters (via the cluster analysis), and average statement ratings relative to these points and clusters. However, an important part of the planning and evaluation process is the comparison of these results across multiple variables, subgroups, or over time. Two additional kinds of displays, known as *pattern matches* and *go-zone* displays, are designed specifically to address this.

6. *Pattern Matches.* A pattern matching display provides a comparison of average cluster ratings between two variables, such as

- Between two separate stakeholder groups
- Between two different rating variables, such as impact and feasibility
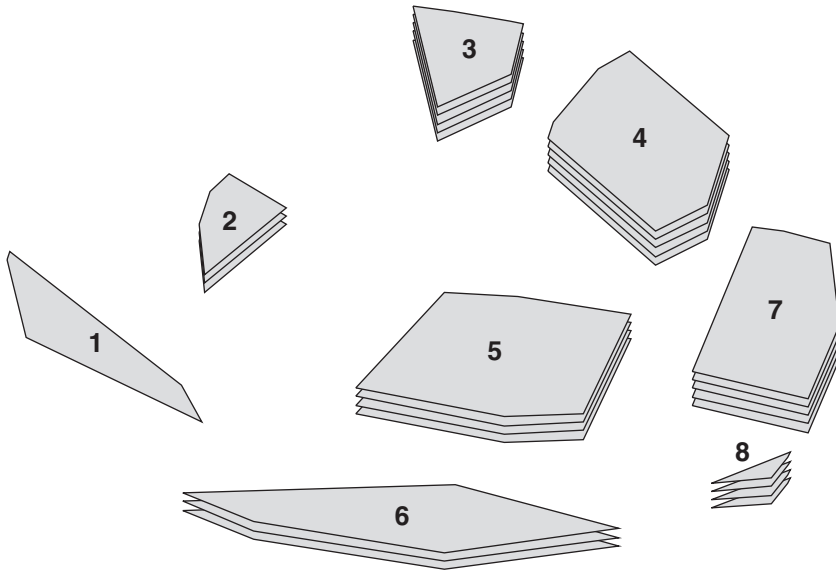- Across different points in time

Figure 1.7   Cluster Rating Map

A pattern matching display uses a "ladder graph" representation of the data, so named because a perfect correlation between the two *patterns* would display as straight lines between all clusters, like rungs on a ladder (see Figure 1.8). The display is constructed as follows:

1. The analysis computes averages across participants to arrive at a statement average and then computes averages across all statements within a cluster to arrive at a cluster average on the scale in question.

2. One variable is shown on each side, and clusters are listed on each side in the order that they are rated according to this variable by the participant group.

3. The position of each cluster on the ladder graph is based on its rating value for the variable in question.

4. Straight lines are drawn between the same cluster on each side of the graph. The data can be represented by color-coded, dashed, or grayscale lines that link
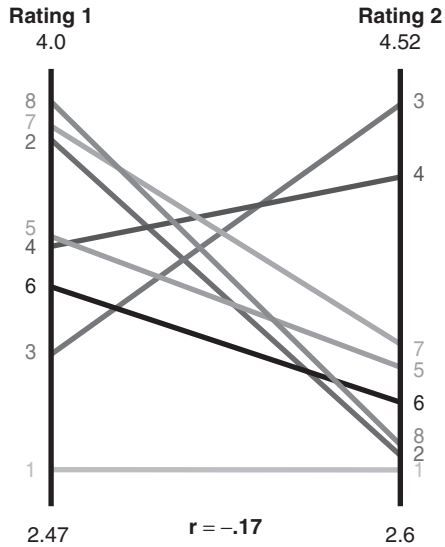
Figure 1.8   Pattern Matching Between Two Variables

the cluster name on the left to the same cluster name on the right for ease of viewing.

5. A correlational value known as the Pearson product-moment correlation, representing the relationship between the two variables, is displayed at the bottom of the graph.

Recall that each line on this pattern match represents a group of ideas that are now represented as a cluster.

Some of the variables that can be reviewed via pattern matching include the following:

- Comparison of two rating variables, such as the importance versus feasibility of statement clusters. Such comparisons can provide valuable guidance to the planning and evaluation process, as in the case where stakeholders see difficulties in implementing a desired outcome or do not value some solutions as highly as others.

- Results of a specific variable between two separate stakeholder groups. For example, a concept mapping effort for a public health study may show that

stakeholders from the medical community value research efforts most highly, whereas stakeholders from the aging community may place a much higher value on caregiver support services.

- Comparison of a variable over time, such as the importance ratings of statement clusters during the planning versus evaluation stages of a project.

In Figure 1.8, the average cluster ratings have a relatively low correlation across the two variables shown, as evidenced by both the low Pearson product-moment correlation of –0.17 and the wide divergence between cluster rating values on either side. As can be seen on the graph, cluster 1 compares very closely across both variables, being low on average for both, whereas clusters 4 and 6 have moderately different ratings and other clusters have very divergent average ratings.

Within a study, pattern matching represents an important technique for understanding the divergence of opinion between different stakeholder groups, rating variables, points in time, or other criteria, as a means of discussing these differences and understanding their impact on the goals of the study.

7. *Go-Zones.* The third major concept mapping graphic, in addition to the maps and pattern matches, is known as a "go-zone" graph. A go-zone is a specific type of bivariate plot of the data in a pattern match, generally showing the averages for each statement within a cluster. It plots the statement results in an *X–Y* graph, divided in quadrants above and below the mean value within the cluster of each rating variable. Figure 1.9 shows a go-zone display.

The vertical line describes the mean of the values in this cluster on the *X* axis, and the horizontal line describes the mean of the values in this cluster on the *Y* axis, thus dividing cluster contents into four quadrants.

The term go-zone springs from the fact that upper-right quadrant displays statements of a cluster that were rated above average on both variables. In many situations, these will represent the most actionable statements within the cluster. This upper-right quadrant contains statements that were ranked above the mean for both variables—for example, those statements that are rated above the average in both importance and feasibility, and would thus indicate a higher implementation priority.

The other quadrants provide important feedback as well. In this example, presuming that the *X* axis describes importance and the *Y* axis describes feasibility, the upper-left quadrant would contain statements that are higher on average in feasibility but lower in importance, indicating a lower priority from the stakeholders. Similarly, the lower-right quadrant would contain statements with higher
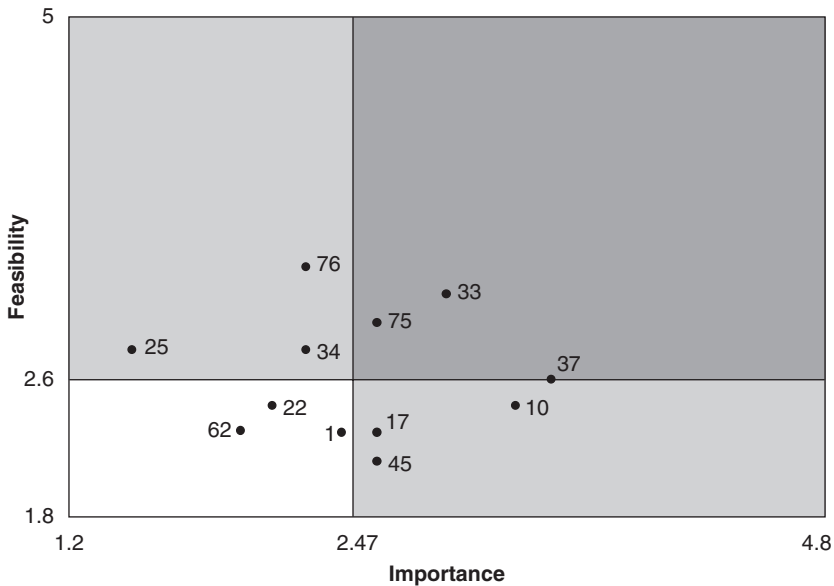
Figure 1.9   A Go-Zone Display Comparing Statements Across Two Rating
                    Criteria

importance but lower feasibility, indicating challenges for implementation.
Finally, the lower-left quadrant would identify statements that are below average
in both importance and feasibility, indicating a lower priority for implementation.

The example shown in Figure 1.9 uses different shading colors to clearly
differentiate a white zone of statements below both mean values, lightly
shaded zones of statements that are rated above the mean for only one variable,
and a darker shaded go-zone of statement above the mean for both rating vari-
ables. In the case in which these variables were to represent importance and
feasibility, as described above, the statements within the shaded quadrant
would represent the most likely initial targets for action within the cluster.

Once these maps and graphs are distributed to the participant groups and
interpreted, the study can then progress to the utilization phase, in which the
representation of ideas can become a framework for action. The facilitator nor-
mally guides this process, with the planning or evaluation outcomes driven by
the participant group's interpretation of the results.

SUMMARY

The group concept mapping process described in this volume can be used to help develop a conceptual framework for planning or evaluation efforts. The process involves a series of six major steps:

1. Preparing for concept mapping
2. Generating the ideas, usually through brainstorming
3. Structuring the statements, usually through grouping the statements into piles and rating each one
4. Concept mapping analysis, representing ideas in maps that are computed using a combination of multidimensional scaling and hierarchical cluster analysis
5. Interpreting the maps
6. Utilization

The remaining chapters of this volume describe in detail how concept mapping processes like these can be constructed and used in planning or evaluation contexts.

EXERCISES

1. Together with others in a small group, brainstorm and write down as many different conceptualization situations as you can think of in a few minutes. Classify these into the following categories: operational planning, strategic planning, process evaluation, outcome evaluation, and other. For the others, come up with a simple classification scheme.

2. For one of the conceptualization situations you brainstormed for Exercise 1, or for some other situation of your own choosing, begin to outline how you would set up a concept mapping process. Write brief answers for each of the following:

    a. What type of conceptualization situation is this (e.g., operational planning, outcome evaluation)?

    b. What is the purpose of the concept mapping in this case?

    c. Is concept mapping justified in this case, or could a conceptual framework be readily devised using some other process?

    d. Who are the likely and/or desirable participants in this concept mapping project?

    e. Are there any factors you're aware of that might interfere with or jeopardize the concept mapping process?

    • Are the participants likely to be motivated? By what? What stake do participants have in the outcome?

    • Are there political and/or interpersonal tensions that might affect the process?

    • Does the organization have the motivational and financial resources to support the concept mapping and subsequent activities?

    • What are the possible "hidden agendas" that might be motivating this project?