

Accounting for Hidden Costs

According to the actuarial firm Tillinghast-Towers and Perrin, total corporate asbestos liability to U.S. plaintiffs is now expected to reach \$200 billion—\$70 billion of which may come from noninsured out-of-pocket expenses by the defendants. One company's total revenues from the sale of its asbestos-containing product were approximately \$135 million. To date, the company has received more than 460,000 asbestos personal injury claims and has agreed to pay more than \$5 billion for asbestos-related awards and settlements, legal expenses, and claims processing fees.

Asbestos liability is just one source of potential financial disaster. There are many others—polychlorinated biphenyl (PCB) contamination, oil spills, fire hazards, waste-disposal practices, and potential exposure of personnel to toxic substances. Community and employee dissatisfaction may also have a measurable effect on the bottom line. Such hidden expenses, however, are difficult to assess, although real and important to a company's success or failure. Now an industry-tested methodology called total cost assessment (TCA) can help a company improve its bottom line by allowing it to incorporate product or process life cycle assessment (LCA) information as well as to quantify hidden intangible costs in its decision-making processes.

A task force of the Center for Waste

Reduction Technologies (CWRT), a unit of the American Institute of Chemical Engineers (AIChE), has developed a flexible way to implement TCA across a broad range of industrial sectors. In response to a survey of AIChE members, the task force developed a multidisciplinary, scenario-based costing methodology that uses a combination of manual tools and new software to expand traditional cost-assessment models. TCA unites standard cost accounting with techniques to assess near- and long-term hidden costs associated with a decision. The task force's broad membership—



which included representatives from 10 multinational companies in the chemical, pulp and paper, pharmaceutical, and other consumer-products industries—provided a comprehensive approach that results in a system applicable to manufacturers of all sizes worldwide.

TCA has applications in product, processor, and facility-investment decisions. It is intended for use in evaluating the total cost of such decisions as whether to site a new plant in an urban or rural location, or which solvent to use in processing a product. TCA is not designed to replace an organization's traditional accounting system but to provide cost information for internal managerial decisions within existing systems. Each

company has its own policies, principles, and values that will guide how it applies the TCA model.

The ability to link environmental LCA results with an internal financial analysis can help provide information on external costs. LCAs quantify the economy-wide pollution and resource consequences of a product or process life cycle, and estimate the cumulative effects of the supply chain, usage, and end-of-life phases. Using these LCA results as part of a TCA analysis enables companies to put a dollar value on their LCA data.

How it works

Traditional decision-making typically focuses on direct costs—such as those for capital, labor, raw materials, operations, and maintenance—and indirect expenses, such as reporting, regulatory, and monitoring costs. The TCA model includes three additional types of cost: *future and contingent liability*, *internal intangible*, and *external intangible*. Direct and indirect costs are easily measured with standardized accounting methods. The other three categories are more difficult to assess.

Future and contingent liability involves the cost of potential fines, remediation, personal injuries, and industrial accidents that may or may not happen. Internal-intangible costs include customer or shareholder reaction to regulatory noncompliance, fines, and industrial accidents, all of

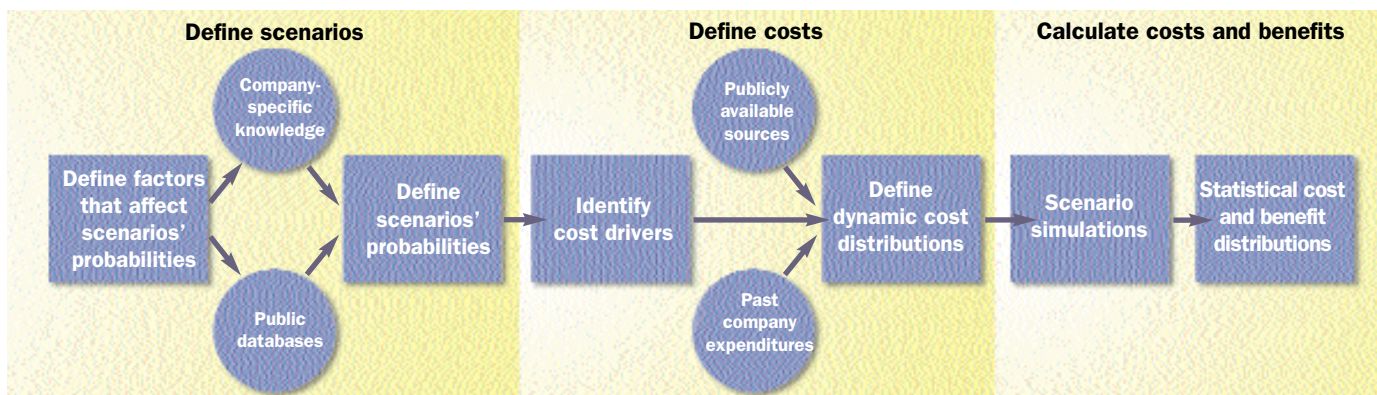


Figure 1. Hidden costs may be explored by brainstorming possible scenarios and probabilities of occurrence, defining costs, and then calculating cost and benefit distributions.

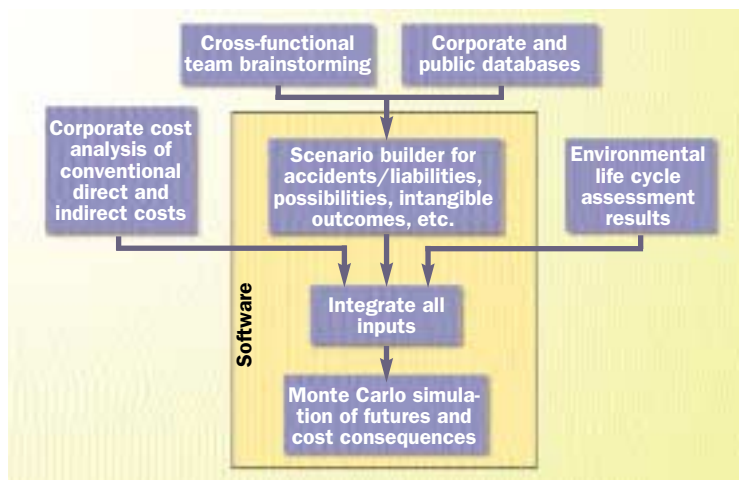


Figure 2. The TCAce software integrates four inputs (conventional cost analysis, cross-functional brainstorming, corporate and public databases, and life cycle assessment results), builds possible scenarios, and simulates futures and cost consequences.

which involve costs that are hard to quantify. External-intangible costs pose an even greater assessment challenge. Costs such as degradation of habitat and changes in property values are difficult to quantify and have only a probability of occurring. The method the task force developed to estimate the costs of these contingent and intangible costs proved one of the most important outcomes of the project. It is consistent with sound business decision-making processes yet allows the incorporation of variables that do not directly affect the manufacturing process.

Seven-step program

To implement the TCA methodology, a multidisciplinary team follows six planning, research, and analysis steps and then takes the final step of providing input to the company's decision-making process. Along the way, the team participates in a series of brainstorming and reality-checking sessions. Real-world applications have shown that the insight generated by teams during an interactive TCA process far exceeds what could come from the individuals working separately. The seven TCA steps are:

1. **Goal definition and scoping.** This requires defining the project and the purpose of the TCA analysis.

2. **Streamline the analysis.** Here, the team determines the relevant activities within the analysis that may influence the decision.

3. **Identify potential risks.** This involves defining alternative choices, each of which can have many risk-cost scenarios, specifying the cost drivers—compliance obligations and remediation costs, for example—and evaluating their relative importance and the feasibility of collecting cost data for them.

4. **Conduct a financial inventory.** Direct, indirect, contingent liability, and intangible internal and external costs are calculated. Direct and indirect costs are derived from a company's internal cost accounting system. Contingent and intangible costs incorpo-

rate probability, frequency of occurrence, and timing of occurrence for important cost categories where relevant data are available.

5. **Do an impact assessment.** Reviewing costs to determine which are the most significant enables the team to decide how that information can best be incorporated into the decision-making process.

6. **Support results.** Documenting the assumptions and results for each scenario and cost decision is important, especially for potential impacts that are not currently feasible to cost.

7. **Feedback to the decision loop.** To be useful, TCA results must be included as part of the company's main decision process. However, the final step recognizes that the TCA is only one consideration in an overall process that needs to include many different types of information.

Each step may require multiple work sessions before it is completed. The third step, in particular, involves risks and costs that may seem difficult to pin down but which resolve themselves after a few discussions. The details of each alternative are required for the actual costing and analysis functions.

When asked to give a probability or a dollar value for scenarios with contingent and intangible costs, team members often say, "I have no idea!" The task force compiled several cost databases and descriptions of how some cost values could be represented to help the brainstorming process. Users can also enter company-specific data—a company's past fines and penalties, for example—and create new databases with similar his-

torical data. CWRT is currently sponsoring projects to develop more data for societal (external intangible) costs, which will further enhance the usefulness of TCA.

To support the TCA methodology, the task force developed several tools, both manual and software. The manual data-gathering tools include checklists to

ensure that the project identifies corporate goals and other critical constraints, and cost spreadsheets to ensure that a comprehensive set of environmental and health costs is represented. The spreadsheets provide summary locations for cost items and comment fields for documenting full details of the analysis assumptions.

The manual tools, however, lose their power when the number of uncertainties, scenarios, and alternatives multiplies and the need for an in-depth analysis of cost-drivers increases. To deal with complex situations, the task force commissioned the development of a dedicated software package called TCAce.

The software includes a scenario builder that handles probabilities, cost ranges, and other uncertainties. It expands on the manual method by using Monte Carlo probability techniques to calculate contingent and intangible costs. This type of calculation has the advantage that it can identify significant potential cost factors and eliminate scenarios that do not provide an improvement over the status quo.

TCAce analyzes costs and benefits using a range of financial calculations that conform to standard industry practice for economic evaluations and corporate accounting conventions. It also provides features for building and managing extensive databases of costs and project information. TCAce was developed for CWRT by Arthur D. Little, Inc. (Cambridge, MA), and Sylvatica (North Berwick, ME) in collaboration with the task force and is available for licensing.

Example

Suppose a company wishes to reduce waste generated by its industrial process. Currently, the company produces two waste streams: liquid hazardous waste (Stream 1) and aqueous sludge (Stream 2). In Step 1, the company specifies its goal: to decide which waste stream will receive research and development funding for waste reduction.

The company currently incinerates Waste Stream 1 on-site and sends Waste Stream 2 off-site to a landfill. During its brainstorming step, the TCA team identified other waste treatment options. In Step 2, the team streamlines the analysis and decides to focus only on the two disposal options currently used.

The team brainstorms risk scenarios for both waste streams during Step 3 to identify potential risks. One scenario considers a new air-emission standard scheduled to take effect in the next year. The probability of the standard taking effect is 100%, the consequence is a one-time capital investment in equipment (contingent liability: environmental compliance), and the cost of the equipment is \$1.2 million at the end of Year 2.

The team next conducts a financial inventory to complete Step 4. In doing so, it calculates a total net present-value cost, that is, the TCA method compensates for the time-value of money over the three-year evaluation period for each risk scenario by using CWRT cost databases and the company's own previous experience.

With a completed financial inventory, the team then carries out an impact assessment, Step 5, to analyze the results. Traditional decision-making, using only direct and indirect costs, indicates that Waste Stream 1 is the more costly disposal method and more deserving of research funding. In the third year, however, TCA reveals the strong possibility of an unauthorized disposal activity by a waste hauler, which affects the total cost of Waste Stream 2. This future liability weights the results so

that Waste Stream 2 appears 30% more costly than Waste Stream 1. Had it wished, the team could have extended its analysis out 10 or 15 years using TCA, an advantage that is useful in understanding the long-term costs and savings that result from many decisions made in industry.

The team then completes Step 6 by documenting its results, and Step 7 by providing its analysis to company decision-makers. The results will show which disposal system is the more costly and where the highest costs will occur.

As this example illustrates, TCA can identify a scenario with significant potential costs and allow the team to review both the probability of the occurrence and the uncertainties of the cost magnitude. If external-intangible costs are included, the company must determine how to use those costs in its decision-making.

Designed for industry

Among the task force members were representatives of Bristol-Myers Squibb, Merck, Dow Chemical, Monsanto, Eastman Chemical, Owens Corning, Eastman Kodak, Rohm and Haas, Georgia Pacific, and Glaxo-SmithKline. Because major manufacturers helped develop the TCA methodology, it is specifically designed for internal managerial decision-making. It provides an industry-standard costing framework for assessing process development, product mix, waste management, pollution prevention, facility location and layout, outbound logistics, and other businesswide issues. When there is risk, TCA can make the analysis easier.



Figure 3. TCA's scenario builder combines probabilities and cost drivers for each scenario, allowing users to take into account high-dollar risks that may have a very small probability of occurring.

Using TCA allows a business to better understand overhead costs and to better forecast the cost of products and services.

The task-force companies tested the TCA methodology and the TCACE software, and the lessons learned during early testing were incorporated into the final methodology and the TCACE software.

Dow Chemical Co., for one, regards the TCA methodology as real progress in addressing the challenge of combining tangible and intangible


costs. "Historically, projects were discussed in either the language of economic value or of environmental performance, but we have figured out how to translate from one language to the other," says Samuel L. Smolik, Dow's vice president for Global Environment, Health & Safety.

Applying TCA methodology to internal decision-making processes provides a more complete evaluation of important and difficult-to-assess costs and/or benefits. As a means for integrating information and judgments from across the company, the methodology aids managers in making better informed decisions about environmental, health, and safety opportunities and effects, and can contribute to improved long-term competitiveness.

Further reading

Center for Waste Reduction Technologies. *Total Cost Assessment Methodology*; American Institute of Chemical Engineers: New York, 1999; 202 pp. Available for download at <http://www.aiche.org/cwrt/projects/cost.htm>.

Deutsch, C. H. Together at Last: Cutting Pollution and Making Money. *The New York Times*, Sept. 9, 2001, sec. 3, p. 1, col. 1.

Information on the TCA software is available at www.TCAce.com. 

B I O G R A P H Y

Joseph E. L. Rogers is director of the American Institute of Chemical Engineers' Center for Waste Reduction Technologies in New York, New York (jorogers@aiiche.org).