85-10-10 The Delphi/Modified Delphi Technique: A Consensus Approach to Information Valuation

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Payoff
Recent advances in information technology management reflect the growing understanding that the most significant asset at risk is not hardware or facilities but, rather, the information that those assets service. An ongoing debate exists as to how—or whether—information can be valued. This chapter provides an overview and detailed guidance for one proven method of information valuation, the Delphi/Modified Delphi Technique.

Introduction
In April 1993, the Information Systems Security Association (ISSA) published the Guidelines for Information Valuation (GIV). This document was the result of more than 4,000 hours of analysis of the complex issues that apply to any valuation method. The GIV established a sound rationale and foundation for valuing information assets.

A target body of information has many potential subordinate elements of value; however, from an information security standpoint, there are three key perspectives: confidentiality, availability, and integrity. Although each of these values should be considered independently, attributes of each may overlap. The GIV addresses the rationale in valuing information as an asset and discusses the inherent philosophical and methodological considerations of six different valuation approaches. These approaches are:

- **Fiat, policy, or regulation.** A simple declaration of the value of the target body of information by executive fiat, a considered policy statement, or regulatory development.

- **Checklist.** A guide used by an experienced analyst to conduct interviews of individuals who are knowledgeable about the target body of information.

- **Questionnaire.** A standalone set of questions that can be sent to knowledgeable individuals to gather the necessary data in support of valuing the target body of information.

- **Consensus: Delphi/Modified Delphi Technique.** A valuation technique based on achieving consensus among a select group of individuals who are knowledgeable about the value of a target body of information.

- **Accounting.** The Generally Accepted Accounting Principles book value of recognized aspects or attributes of a target body of information (typically a substantial understatement of meaningful value).

- **Statistical analysis.** An analysis usually conducted in conjunction with one of the previous approaches when there are numerous information assets to be valued and a sampling process is appropriate.

The Delphi/Modified Delphi Technique
Information security practitioners have, since the birth of information security, recognized that information is an asset in its own right. Computers and facilities are obvious assets, as
are staff and other resources. However, in most organizations, their replacement costs often pale in comparison to that of the value of the information being processed.

Management has often failed to recognize this value. The concept of information as having value beyond simple replacement cost or, perhaps, competitive advantage, received little attention until information security pioneers began to consider just what it was that they were charged with securing and how they could justify the budgets that they were requesting. The first formal recognition of the value of possessing certain information and having reliable access to it came with the publication of Federal Information Processing Standard (FIPS) 31, which addresses automatic data processing, physical security, and risk management. In that document, the concept of “denial of use” was born and negative value attributed to it. Denial of use is characterized as negative value in light of the many costs attributable to the state of not having access to needed information, regardless of the cause. The term “unavailability” has now gained acceptance as a more appropriate characterization of the state wherein the target information asset is not available as expected.

Numerous methodologies and techniques have evolved that attempt to systematize the process of valuing information. These approaches range from an arbitrary assignment of value to statistical sampling and accounting methods. The Delphi/Modified Delphi Technique has emerged as both an efficient and cost-effective methodology. The following discussion outlines this technique in detail, focusing on these areas:

- General information.
- Features and benefits.
- Limitations.
- Factors potentially affecting information value.
- Staffing and participants.
- Planning, scheduling, and execution.

**General Information**

The Delphi/Modified Delphi Technique is an adaptation of the Delphi Technique for Estimating. The latter was developed by Olaf Helmer-Hirschberg and his associates at the Rand Corporation in the early 1960s and is documented in Helmer-Hirschberg’s book, Social Technology. Although there has been debate regarding the reliability of results achieved with the Delphi Technique for Estimating, concerns have focused on the thoroughness with which relevant factors are identified and considered rather than on the process of achieving informed consensus.

This technique for valuing information relies on the identification of key individuals. Each individual must be knowledgeable about some subset of the specific body of information being valued, including the negative, or loss of positive, value attributable to the unavailability of the information. In the fully extended execution of this technique, at least three knowledgeable individuals—typically, a user representative, a financial representative, and a system representative—are first provided with a questionnaire. The primary purpose of the questionnaire is to trigger the participants’ thought processes about things that affect or contribute to information value. These individuals then participate in an interview process in which a Delphi facilitator attempts to forge a consensus on valuation as derived from the individuals’ differing and complementary perspectives. An experienced facilitator can often eliminate the questionnaire altogether, thus improving the cost-effectiveness of this technique.
Although two variations—Delphi and Modified Delphi—are discussed in this chapter, the preferred variation for this technique is the Modified Delphi. The fundamental difference between these variations is that Delphi is based on iterative, one-on-one interviews conducted sequentially with knowledgeable individuals. Modified Delphi is based on gathering these same individuals together and raising the issues for a structured discussion and immediate resolution, or consensus, among all participants simultaneously. Thus, the Modified Delphi Technique, unless its application is precluded by geographical constraints, can achieve consensus in a more time- and cost-effective manner.

**Features and Benefits**

By achieving consensus among the knowledgeable participants, the Delphi/Modified Delphi technique reduces the chances of later dissension among staff regarding the valued information. Moreover, approaching the valuation with a two-stage process—the questionnaire and Delphi interview (i.e., participants interviewed individually and iteratively) or the questionnaire and Modified Delphi meeting (i.e., participants interviewed in a group environment)—achieves a credible valuation in a minimum of elapsed and applied time. Other features and benefits of the Delphi/Modified Delphi technique include:

- Information values are established as bounded distributions with associated confidence factors that acknowledge uncertainty (e.g., “We are 90% sure that information XYZ is worth somewhere between $1.1 million and $1.3 million.”), which facilitates the achievement of consensus more readily than a process requiring the identification of a discrete value (e.g., “Information XYZ is worth $1,225,500.”).

- The Delphi/Modified Delphi Technique can be applied at any level of granularity, from individual data sets to clusters of interrelated applications to the entire body of information belonging to an organization.

- The Delphi/Modified Delphi Technique specifically addresses the passage of time relative to the accruing costs that are incurred when needed information is unavailable.

- The Modified Delphi meeting is conducted with all of the knowledgeable participants simultaneously, which results in a group synergy derived from their interactive thought processes. This synergy typically results in a timely integration of individual insights and group consensus.

- The Delphi Technique can be applied when it is impractical to gather the knowledgeable individuals in one location.

**Limitations**

Limitations that should be considered before an organization opts to implement the Delphi/Modified Delphi technique include:

- Resulting values are expressed as ranges, or bounded distributions, with associated confidence factors. These distributions may not be sufficiently accurate for some purposes.

- Budget constraints may preclude the technique.

- Time constraints may preclude the technique.
It may be impractical to secure the participation of all key knowledgeable individuals.

It may be politically expedient to engage a skilled, disinterested third party (e.g., a consultant) to act as the Delphi/Modified Delphi facilitator rather than draw on in-house resources, a choice that will likely increase the cost of implementing the technique. However, the ability of the facilitator to elicit a constructive and productive dialogue ensures that all relevant information is valued, and can be critical to the successful application of this technique.

An organization's construction, distribution, and use of its information assets may be sufficiently intertwined or remote from the user community to prevent valuation at certain levels of granularity.

The Modified Delphi Technique is vulnerable to the force of a dominant participant who may intimidate other participants into adopting an otherwise insupportable consensus.

Successful application of the Delphi Technique may be hampered or defeated by the lack of face-to-face negotiation among participants.

Some experts question the validity of the results derived from both Delphi variations, because they are achieved in the absence of scientifically rigorous techniques and social scientists versed in psychometrics.

The risk exists that the participating knowledgeable individuals may be unable to achieve consensus.

**Costs Potentially Affecting Information Value**

Three categories of costs potentially affect information value: the costs of acquiring or replacing information, the more complex unavailability (i.e., denial-of-use) costs, and costs associated with disclosure.

**Replacement Costs.**

The following costs to replace destroyed, contaminated, or otherwise unavailable information are straightforward in that they are a function of readily ascertainable marketplace variables:

- Purchase.
- Transcription from source document.
- Data collection.
- Data reconstruction.

**Unavailability Costs.**

These costs, which, in the aggregate, apply to the value of an information asset's availability, may accrue from many areas of an organization. These denial-of-use costs should be considered over a given series of time intervals that begin from the point in time that an information asset becomes unavailable and end at the point at which it again becomes available:
- Accounts payable (i.e., adverse impact on suppliers).
- Lost interest income.
- Extra interest expense (i.e., borrowed money).
- Accounts receivable (i.e., inability to bill).
- Inability to ship.
- Idled staff in all affected areas.
- Idled plant, real property, and equipment carrying costs.
- Inventory carrying costs.
- Alternative or supplemental facilities in all categories.
- Alternative or supplemental processing.
- Alternative or supplemental equipment.
- Idled information processing resources.
- Staff attrition.
- Staff overtime.
- Temporary staff.
- Training.
- Forms creation.
- Potential for fraud.
- Potential for misuse and abuse.
- Criminal penalties.
- Legal and regulatory penalties.
- Litigation expenses.
- Civil penalties.
- Loss of market share.
- Loss of goodwill.
- Adverse impact on credit ratings.

Modification costs begin to accrue when the target body of information becomes contaminated or is otherwise modified in such a way as to compromise the expected
integrity of the subject information. It is conceivable for the magnitude of such a modification to be so great as to render the information useless, or effectively unavailable. Thus, valuation of costs associated with modification includes nearly all the factors listed under unavailability costs.

**Disclosure Costs.**

These costs are associated with a loss of confidentiality to which some value can be assigned. Costs that may need to be considered relative to disclosure are:

- Potential for blackmail.
- Criminal penalties.
- Legal and regulatory penalties.
- Litigation expense.
- Civil penalties.
- Loss of competitive advantage.
- Loss of market share.
- Adverse impact on credit ratings.

**Consideration of Multiple Costs.**

Potentially, a target body of information is subject to multiple costs. A one-time tally of these costs results in an information value that is inappropriate and unrealistic. Although there are, as yet, no hard-and-fast rules for adding costs to develop a defensible aggregate value for a target body of information, these guidelines have proven reasonably effective:

- Replacement costs can be combined with unavailability and modification costs and disclosure costs as appropriate.
- Unavailability costs and modification costs cannot be combined because they overlap significantly and would, in effect, be counted twice.
- Disclosure costs, particularly those derived from various legislative, regulatory, and civil penalties, as well as litigation expenses, may be added to replacement costs, unavailability costs, and modification costs should these categories of loss occur in combination.

**Staffing and Participants**

Because information valuation is largely a task of gathering and analyzing information and then documenting and reporting the results, staff resources are the most critical resources. Automated resources other than word processing and, possibly, spreadsheets, are not necessary unless the valuation is part of a larger project, such as a risk analysis.
Project Team.

The members of the project team include the facilitator and the scribe. The facilitator or the scribe may also serve as the project manager. In selecting a facilitator, management should consider choosing a disinterested third party (e.g., a consultant) rather than an internal staff member. An experienced outside consultant can provide guidance to knowledgeable participants based on personal experience with the Delphi/Modified Delphi technique and an unbiased assessment of their statements. He or she may also more effectively be able to discover all of the organization's relevant information.

To ensure the most efficient execution of interviews or meetings, it is necessary to support the facilitator with a scribe. The individual undertaking scribe responsibilities may be assigned other responsibilities in the successful execution of this technique. However, it is of primary importance that the scribe carefully record the interviews and attribute all of the facts and observations for later analysis.

If numerous (i.e., more than 10) information assets are to be valued, it may be appropriate to establish more than one project team to work simultaneously.

Facilitator: Skills and Characteristics.

The facilitator should possess and demonstrate these skills and characteristics:

- Analytical skills.
- Interpersonal skills.
- Communication skills, both spoken and written.
- Investigative skills.
- Interrogative skills.
- The ability to maintain control of interviews or meetings and not be readily intimidated by the presence of senior management.
- The ability to pursue a line of thought creatively.
- The ability to establish trust and to elicit cooperation and agreement.
- An understanding of the many attributes that contribute to the value of a target information asset.
- The ability to keep an interview on track.
- An understanding of the information processing environment and the business functions supported by it.

Scribe: Skills and Characteristics.

The scribe should demonstrate these skills and characteristics:

- The ability to capture and record the essence of a dialogue.
- Analytical skills.
- Communication skills, both spoken and written.
- An understanding of information valuation issues.
- An understanding of supporting information resources and their relationships to target information assets.
- An understanding of the many attributes that contribute to the value of a target information asset.
- The ability to remain unintimidated in the presence of senior management.

**Knowledgeable Participants.**

Whether the information valuation project analysis is focused on a single, clearly defined information asset or a complex and interdependent array of application systems, it is important to select participants who are knowledgeable about each target information asset and its relationship to one or more of these key areas:

- The business function supported by the target information asset and the allocation of resources necessary to sustain that activity.
- The cash flow generated by or supported by the target information asset and, when applicable, the carrying cost of resources idled by the unavailability of the target information asset.
- The information systems resources supporting the target information asset and the carrying cost incurred if they are idled as a consequence of the asset's unavailability.
- Legal or regulatory penalties that may arise from a failure to meet contractual or regulatory requirements or market expectations due to a degradation of the target information asset's integrity, confidentiality, or availability.

Typically, only one individual who is knowledgeable about each of these issues should participate in a given Modified Delphi meeting. However, when application systems or other information assets are clustered and considered as a body, more individuals may participate. The project team should keep in mind, however, that the ability to achieve consensus efficiently may be undermined as the number of participants increases.

Knowledgeable individuals are responsible for at least two key tasks. First, they must respond to the questionnaire and, second, they must participate in the Delphi/Modified Delphi interviews or meetings. It may also be necessary, in some cases, to participate in brief follow-up tasks.

**Planning, Scheduling, and Execution**

Numerous factors affect the schedule and allocation of resources for the execution of a Delphi/Modified Delphi information valuation project. In general, however, certain key tasks should be accomplished in the valuation process that will, initially, serve as an effective guide for the development of a schedule. Each task is discussed briefly in the following sections.
**Identify the Project Team.**

Facilitators and scribes must be selected with care, especially with regard to the requisite skills and characteristics previously discussed. Facilitators are a primary key to the successful execution of this technique. Management should allot sufficient time to evaluate personnel and choose those best suited for the project team.

**Identify the Knowledgeable Participants.**

Although the Delphi/Modified Delphi Technique is usually straightforward and requires, at the most, no more than a few weeks to execute, it is possible in large and complex environments for this particular task to be difficult and time consuming. As much time as is needed to identify the participants that are most knowledgeable in all areas under consideration should be allotted.

**Develop the Questionnaire.**

Up to ten workdays are necessary to develop or adapt a suitably targeted questionnaire. Adapting an existing questionnaire can often substantially reduce the time required. Moreover, an experienced facilitator can often dispense with the questionnaire altogether and thus eliminate the significant work effort necessary to develop, distribute, gather, and analyze it. One key factor to consider if this questionnaire is omitted is that knowledgeable participants will likely be unversed in the Delphi/Modified Delphi Technique and will, consequently, be unprepared for the interviews or the Modified Delphi joint meeting. To offset this possibility, the facilitator should plan to spend about twenty minutes briefing the knowledgeable participants about the process before the interviews begin or the joint session is held.

**Distribute and Retrieve the Questionnaire.**

No more than ten workdays should be allowed from the time questionnaires are distributed until they are due. This deadline must be pursued vigorously to ensure that the respondents' recollections of issues are fresh when the pending interviews or meetings are conducted.

**Analyze the Questionnaire Responses.**

This task can be performed as soon as questionnaires are returned and in tandem with the scheduling and execution of interviews and meetings. The retrieved questionnaires should be organized and analyzed by target information asset, and no more than two to three hours should be allotted for the analysis of each information asset. The questionnaires provide preliminary insights into the knowledge of value held by the respondents that will, in turn, be revealed in greater depth in the interview or meeting process.

**Schedule the Interviews.**

This task should be executed as quickly as completed sets of questionnaires for specific target information assets are assembled and analyzed and interviews with associated participants can be arranged. Timely scheduling and the interviewees' full participation is key to the successful execution of this technique. The project team should try to meet these goals when scheduling interviews:

- Interviews should be scheduled as close as possible to the questionnaire return deadline to keep the issues fresh in the participants' minds.
Sufficient time (e.g., from one to three hours) for each interview should be allocated. Each participant should expect to allocate up to three hours of time per targeted information asset but, in many cases, one hour per interview is sufficient. If clusters of information with complex interdependencies are addressed as a whole, it may be appropriate to schedule all participants, up to a maximum of ten, for a single half-day meeting when using the Modified Delphi technique.

No more than two interviews per day, per project team should be scheduled, unless the valuation process for each target information asset is relatively straightforward and each can be accomplished within an hour, to avoid key team members’ mental exhaustion or confusion of the details. Interviews are intensive and demanding for the facilitator and scribe.

Conduct and Record the Interviews.

This task should be executed in parallel with the retrieval, analysis, interview scheduling, postanalysis, and follow-up (Modified Delphi only) tasks. One to three hours per interview should be scheduled, depending on the complexity of the specific target information asset.

Conduct and Record the Iterative Interviews (Delphi Only).

The Delphi Technique stipulates that each participant will be interviewed repeatedly, with the facilitator serving as a channel of communication and mediator to achieve consensus among the participants (i.e., agreement as to the range of values for the target information asset). It may be necessary to schedule several interview cycles to achieve consensus. Iterative interviews typically require less time than the initial interview.

Analyze the Interview Records.

This task should be executed in tandem with the retrieval questionnaire and analysis, interview, and follow-up (Modified Delphi only) tasks. Typically, no more than two hours should be required to review the records for each target information asset and to determine whether follow-up is necessary.

Follow-Up (Modified Delphi Only).

This task should be executed only when necessary and should ordinarily require no more than two or three phone calls, or possibly a brief meeting, to resolve action items. On average, one hour per targeted information asset should be allowed for the discussion, unless it is a complex cluster of individual information assets. Relevant parties should be encouraged to discuss any such issues offline to optimize the timely achievement of consensus.

A Discussion of the Delphi/Modified Delphi Central Tasks

The following sections provide further guidance for effectively preparing for, conducting, and recording the Delphi/Modified Delphi interviews or meetings.
The Nature and Purpose of the Questionnaire and Related Tasks

It is essential to the success of the Delphi/Modified Delphi Technique execution to develop or adapt an appropriately focused questionnaire. The purpose of the questionnaire is twofold. First, it should stimulate the participants' awareness and consideration of the many factors of cost and value that may be relevant to the target information asset, including the negative value, when applicable, of the unavailability of the information. Second, it should give the facilitator insight into the participants' perspectives regarding the target information asset. Before designing a questionnaire, the project manager should consider using a sample questionnaire as a benchmark. Exhibit 1 illustrates an example of a questionnaire that was developed to support the Delphi/Modified Delphi information valuation process.

Application Valuation Worksheet

Delphi questionnaires require a different format than that of Modified Delphi questionnaires, mainly because Delphi interviews are conducted one-on-one, and the Modified Delphi meetings are group sessions. Because there will be no group synergy in the Delphi interview process, the Delphi questionnaire must be more precise to accommodate the lack of direct interaction among respondents. In either technique, instructions should direct respondents to spend no more than one hour on the questionnaire and to skip any questions for which they do not know, or cannot readily find, the answer.

When the questionnaire is distributed, all respondents should be instructed to return it, completed, by a specific date. If possible, the questionnaire should be distributed under a cover letter expressing executive support and stating that respondents must participate in the interview in person. The project manager should follow up promptly on all questionnaires that are not returned by the deadline. Respondents should keep a copy of their completed questionnaires for reference at the interview.

The project team's key members (i.e., project manager, facilitators, and scribes) should review and analyze all questionnaire responses to gain as much familiarity as possible with the target information assets and other response-related considerations. The project team may find that the participants' responses suggest ways to achieve rapid consensus on various target information assets.

Interviews and Meetings

In the Delphi/Modified Delphi Technique, the central evaluation occurs largely in the interviews and the project team's subsequent analysis of the interview records. It may also occur occasionally in the follow-up task associated with the Modified Delphi Technique. The idea that shapes the Delphi/Modified Delphi interview method is that the knowledgeable participants have among them the facts required to establish the value and the negative value of target information assets.

It is important that values be expressed as low and high bounds (i.e., bounded distributions) with associated confidence factors (e.g., “We agree, with 80 percent confidence, that the value of information asset XYZ is between $350,000 and $400,000.”). This method of notation facilitates consensus by avoiding conflicts associated with specific, single-point values.
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Features of the Modified Delphi Meeting.

The Modified Delphi Technique is based on the idea in group psychology that group synergy can facilitate a rapid achievement of consensus. In the Modified Delphi meeting, the unique knowledge each participant brings is quickly shared and integrated in a process that could otherwise take much longer to complete.

The facilitator employs a variety of roles and techniques to elicit a common understanding of the many attributes of value and to secure consensus from the participants. These roles include:

- Devil's advocate.
- Mediator.
- Police officer.
- Interrogator.
- Catalyst.
- “What if” poser.
- Scenario poser.

It is the facilitator's responsibility to ensure that rules of conduct are outlined and agreed to at the outset of the meeting. The rules, at a minimum, are:

- The facilitator is fully authorized to enforce the rules.
- Only one person at a time may speak.
- All differences must be resolved by consensus.
- When a specific value consideration cannot be resolved, it will be tabled as an action item.

Features of the Delphi Interview.

The Delphi Technique is based on the concept of iterative one-on-one interviews with knowledgeable participants. In these interviews, the facilitator serves as a channel for communication among the participants without attributing specific ideas to certain personnel. Thus, the participants' unique perspectives on value are shared and integrated via the facilitator, who then constructs a valuation model for the target information asset.

In the Delphi interviews, the facilitator uses a variety of roles and techniques to elicit a common understanding of the many attributes of value and to forge a consensus among the participants. These roles and techniques include:

- Devil's advocate.
- Interrogator.
- Catalyst.
- “What if” poser.
Scenario poser.

All of these roles are employed at one time or another as the facilitator seeks to secure the participants' effective consideration of all the issues that are pertinent to the value of the target information asset and their consensus on that value. It is imperative that the facilitator objectively convey all considerations among the participants, without attribution, to ensure the optimum integration of all applicable knowledge. This is particularly important in the Delphi Technique in which the facilitator, without the potential for group synergy, must measure consensus in a less direct fashion.

Attributing Negative Values

The negative values of the unavailability of target information assets should be expressed as a series of bounded distributions with confidence factors. Each bounded distribution represents the accrued negative values attributable to the incremental duration of the unavailability of the target information asset. Exhibit 2 illustrates this concept in a denial-of-use loss potential matrix.

The Denial-of-Use Loss Potential Matrix

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The confidence factor, in combination with the bounded distributions, is a reflection of the uncertainty associated with the assigned monetary values. Specifically, the confidence factor asserts the probability that the real value of the target information asset falls within the specified bounds. For example, the confidence factor that Mount Everest is between 10,000 feet and 100,000 feet in height is 100 percent, or certain, but the confidence factor that a disk array storage device is worth between $75,000 and $76,000 is probably very low or, perhaps, 10 percent. Simply stated, the broader the distribution, the higher the confidence factor will be that the actual value falls between the bounds and the narrower the distribution, the lower the confidence factor will likely be. Of course, when a value is readily knowable, it is reasonable to express that value as a narrowly bounded distribution with a high confidence factor.

No values should be entered for early time intervals in which the unavailability of information will have no attributable negative value. The maximum value potential for any given asset should not exceed the organizational net worth without due consideration. Government organizations not otherwise constrained by the rules of the marketplace may be required to establish some other basis for a defensible maximum value.

**The Modified Delphi Briefing**

Regardless of whether a preliminary questionnaire has been distributed, it is essential that the project team provide knowledgeable participants in the Modified Delphi process with a careful description of the process and its rules of conduct. The briefing should occur before the group meeting and these points should be addressed:

- This is a consensus process and all participants must agree.
- The roles and rules of conduct for the facilitator, scribe, and knowledgeable participants should be explained.
- The process for determining the value of availability discussed in the previous section should be described. Participants should be made aware that low and high value bounds, with associated confidence factors, must be established for a series of time intervals that begin from the instant that the information becomes unavailable until one of three criteria is met:
  - The net worth of the organization is reached.
  - An otherwise maximum acceptable loss is reached.
  - The consensus of the knowledgeable participants is that the availability of the target body of information could be restored upon reaching a specific time interval. This interval is called the “terminal interval”.

A scenario will be created to establish a reference reality on which to base all assumptions. For example, a toxic spill contaminates the facility for what is determined, at first, to be an indefinite period, and everyone is ordered to leave the facility immediately. The knowledgeable participants should first establish the worst possible time in the organization’s business cycle that such an event could damage the target body of information. The loss values relative to this scenario must be identified by the knowledgeable participants and inserted as the high bounds for the time intervals. To maintain continuity, a worst-case scenario will be followed, from time interval to time interval, until the maximum monetary loss value emerges and a terminal interval is established. The process typically starts very slowly, often taking as long as three of the
four hours allocated to answer the worst-case question. Often, there is little apparent progress in the first hour, typically because many assumptions, all of which are carefully recorded by the scribe, must be made and agreed to along the way. Because these assumptions are largely cumulative, and fewer new assumptions must be made at each subsequent time interval, the process accelerates naturally. Upon reaching the terminal interval for the worst-case scenario, the Modified Delphi group should address the low bounds of the matrix relative to a best-case scenario. This best-case scenario is defined as the same toxic spill, but one that happens at the best possible time (i.e., least damaging) in the organization's annual business cycle. The final step is to assign confidence factors to each interval. Knowledgeable participants will have many assumptions fresh in their minds and will have a good sense of the confidence that they have in the values derived based on those assumptions. An 80 percent confidence factor implies that the value is accurate give or take 10 percent.

**Documentation of the Delphi/Modified Delphi Valuation Project**

Finally, all project planning documents, work papers, questionnaires, interview or meeting notes, project team member names and responsibilities, and participants' names and responsibilities should be retained for future reference, much as an auditor's work papers are maintained. All such material should, whenever possible, be organized by target information asset. Thus, should there be a future need to revisit the valuation process, these papers could provide a solid foundation from which to proceed.

**Author Biographies**

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Will Ozier is President and founder of The Integrated Risk Management Group (TIRMG), a firm specializing in information security products and consulting services in risk assessment and contingency planning. Ozier has published numerous articles in the field and gives seminars in the US and abroad. Copyright held by TIRMG. Reprinted with permission.