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Preparing financial models; AICPA practice aid series 06-2

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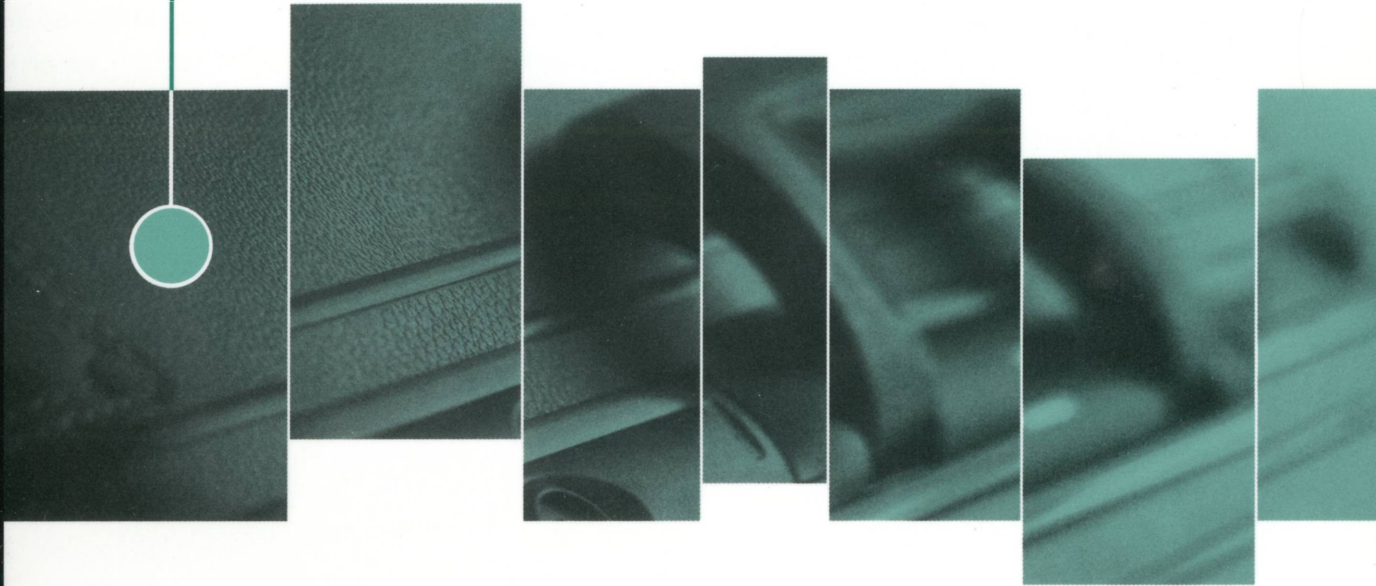Follow this and additional works at: https://egrove.olemiss.edu/aicpa_guides

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Preparing
Financial Models

Supersedes Practice Aid 92-6

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Notice To Readers

This Practice Aid will be integrated into a manual for consulting services issued by the AICPA Business Valuation and Forensic & Litigation Services Membership Section and is numbered for that purpose. It is designed as educational and reference material for Institute members and others who provide consulting services as defined in the Statement on Standards for Consulting Services (SSCS) issued by the AICPA. It does not establish standards nor should it be considered preferred practices.

Business Valuation and Forensic & Litigation Services Practice Aids are part of a series of Practice Aids issued by the Institute for its membership. The Institute expresses its appreciation to the original author of this Practice Aid, Philip L. Blumenthal, Jr., CPA. At the time of the initial publication of this practice aid, in 1992, he was a consulting services practitioner in Indianapolis, Indiana, with extensive experience in the field. His work, including the bibliography, has been updated to reflect the current trends and information.

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Members of the 2005–2006 AICPA Forensic & Litigation Services Committees provided information and guidance for this practice aid and advised the authors and staff. The committee members are listed below.

Preface

This AICPA Practice Aid is one in a series intended to assist practitioners in applying their knowledge of organizational functions and technical disciplines in the course of providing their services. Although these Practice Aids often address aspects of consulting services knowledge in the context of a consulting engagement, they are also intended to be useful to practitioners who provide advice on the same subjects in the form of a consultation. Consulting services engagements and consultations are defined in the Statement on Standards for Consulting Services (SSCS) issued by the AICPA.

This series of AICPA Consulting Services Practice Aids should be particularly helpful to practitioners who use the technical expertise of others while remaining responsible for the work performed. It may also prove useful to members in industry and government in providing advice and assistance to management.

Technical consulting Practice Aids do not purport to include everything a practitioner needs to know or do to undertake a specific type of service. Furthermore, engagement circumstances differ, and, therefore, the practitioner's professional judgment may cause him or her to conclude that an approach described in a particular Practice Aid is inappropriate.

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SCOPE OF THIS PRACTICE AID

.01 Practitioners often help their clients with advice and assistance in financial planning. A major financial planning assignment is to help prepare financial projections and forecasts. Financial models make developing these forecasts and projections easier. With the explosion of personal computing and related software packages, this process has become infinitely more accessible to all.

.02 A *model* can be defined as a tool that mimics relevant features of the situation being studied. A *mathematical model* mimics reality by using the language of mathematics. The mathematical model has been defined as "an abstract, simplified, mathematical construct related to a part of reality and created for a particular purpose."[1] More recent definitions of a model are "a representation of a system, process, or relationship in mathematical form in which equations are used to simulate the behavior of the system or process under study. The model usually consists of two parts: the mathematical structure itself and the particular constants or parameters associated with them."[2]

The following describes how a mathematical model may be used:

> Since the astronomer cannot manipulate the system he studies, he builds a *representation* of it. This he calls a "mathematical model." It represents the structure of the real system in quantitative terms. Models can be manipulated and analyzed more easily than the real system and hence permit the user to carry on vicarious experimentation. He can systematically vary some properties of the system, holding others constant, and in this way determine how the system as a whole would be affected if the changes actually did occur. In fact, he simulates the real-life alteration and experiments in abstract terms.[3]

The origins of modeling date back to the earliest understandings of planetary relationships and evolved to other modern sciences as well. In fact, space exploration was one of the earliest applications of computer-based modeling and remains one of the best examples of complex modeling applications today.

.03 This Practice Aid specifically addresses *financial models*. The purpose of financial modeling is to—

• Concentrate management planning on the most relevant aspects of a business and associated interrelationships.

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[1] Edward A. Bender, *An Introduction to Mathematical Modeling* (New York: John Wiley & Sons, 1978), p. 3.

[2] See the Web site www.racernm.com/reports/glossary.htm.

[3] Russell L. Ackoff and Patrick Riovett, *A Manager's Guide to Operations Research* (New York: John Wiley & Sons, 1963), p. 24.

- Evaluate the consequences of alternative decisions.

- Assess the impact of quantifiable outside forces.

- Provide a flexible structure for modification.

- Permit analysis and experimentation with complex situations to a degree that would be difficult or impossible within the framework of the actual system as a result, for instance, of time, legal, and operational constraints.

- Provide the ability to measure and track performance.

- Forecast and modify expectations.

- Provide a vehicle for improved communication among managers.

.04 Financial models can be applied across the entire spectrum of business and industry as well as in government and nonprofit organizations. Managers, directors, and lending officers are attracted to financial models because they establish a level of order from diverse variables relating to the future of a business and facilitate comprehensive planning. The models accomplish this by introducing statistical data about relationships and trends.

.05 Models can help answer specific questions about an organization, such as the following:

- Will the expansion of a plant be worth the cost, and can its financing be paid out of earnings?

- What will be the internal rate of return (IRR) from the cash flow of a project over what number of years?

- Given the data on operations for the year to date plus data on past seasonality, how are the company's results likely to perform at the end of a certain period?

- What new variables are affecting the pre-existing models that are altering previous estimates?

.06 The client and the practitioner need to realize that a large number of models are possible, and that a large number of sets of data and formulas could be used to develop a model of any situation. The initial task is to select one set or a small number of sets for actual trial and presentation to achieve the objectives of the business using the tools prescribed by enterprise management.

.07 Engagements involving the development of a financial model, for purposes other than personal financial planning, are the focus of this Practice Aid.[4] Such an engagement might include—

- Reviewing or developing planning concepts in the client organization.

- Selecting, gathering, compiling, validating, and assessing data required in the planning process.

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[4] The output of such an engagement is the financial model. The activities described in this Practice Aid are intended solely to facilitate development of the model. For additional information, refer to appropriate AICPA professional pronouncements or its Web site community at www.aicpa.org.

- Determining the relationships and interactions among the key factors in client operations and finances.

- Reviewing financial, planning, and operating assumptions with the client.

- Constructing a formal model of key factors, relationships, and interactions.

- Analyzing, testing, and presenting results produced by running the model using various combinations of assumptions, relationships, and activity levels.

- Revising or updating the output as time passes using amended or incremental inputs.

- Submitting the model to the client for future use and maintenance with appropriate documentation and training.

.08 A fully customized model may be unnecessary for a particular financial application because off-the-shelf software packages[5] may be available to accomplish the same purpose.

.09 This Practice Aid is intended to bridge the gap between the applicable AICPA pronouncements governing prospective financial information[6] and the capabilities, requirements, and limitations of the computer systems and software used to develop financial models. Neither the AICPA pronouncements nor the computer systems and software are discussed in any detail in this publication. It is assumed that the practitioner will be familiar with both the pronouncements and the software before undertaking any assignment involving financial modeling. This Practice Aid is concerned primarily with what the practitioner engaged in financial planning needs to think about before sitting down at the keyboard.

.10 This Practice Aid relies on the practitioner having a working knowledge of desktop software packages capable of developing financial models.[7] Today, the computer spreadsheet is considered the most widely applicable tool for developing a financial model because of its ability to:

- Control the format and content of inputs and outputs.

- Quickly recalculate the entire model if data or formulas are added or modified.

- Rapidly provide comparative output for alternative assumptions.

- Work backwards from targeted results to the assumptions required to achieve them.

- Provide supplementary information such as averages, ratios, trends, regression analyses, and correlations useful in formulating, evaluating, and revising assumptions or data.

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[5] PlanGuru (www.planguru.com) is one such example of off-the-shelf software that is functional in its own right and interacts seamlessly with Microsoft's Excel software.

[6] For detailed guidance on this subject, please refer to the AICPA Audit and Accounting Guide *Guide for Prospective Financial Information*, updated through May 2005, as of this writing.

[7] The most popular software product on the market today, by far, is Microsoft's Excel, but other software is available, including Quickbooks, ValuSource, and Profit Mentor, to name a few.

- Interact with users as they become more familiar with the client and other data.

- Promote a better understanding of cause-and-effect relationships.

.11 Other approaches to computerized model preparation include the use of a computer language especially designed for financial modeling, the use of a specialized simulation language, or the use of a general-purpose computer language. Most of this Practice Aid applies to these approaches as well. It rests with the practitioner to determine the approach that best suits the situation and the available software.

MODEL CLASSIFICATIONS

.01 Model types are classified as *deterministic, probabilistic* (also known as *stochastic*), or *optimization*. Whatever its classification, a model may become a component of a client's decision-support system. This Practice Aid is concerned primarily with deterministic models designed to produce prospective financial statements in their entirety or major segments thereof.[8]

Deterministic Models

.02 Deterministic *models* are those in which each value of each variable is determined completely from the given assumptions. Typical uses of deterministic models include:

- *Development (through accounting and statistical analysis) of the values and relationships among variables, and the construction of models for subsequent client use*. The practitioner provides the client with the model along with documentation and a user guide.

- *Statistical projections of single variables*. Typical examples are sales forecasts by product group, geographical area, or customer group. The primary deliverables may be the set of forecasts in a report, letter, or computer printout, with appropriate transmittal documents.

- *Forecasts or projections of the principal financial statements: income statement, balance sheet, and statement of cash flow*. The deliverable is normally a report to management in compliance with AICPA pronouncements and guidelines.

- *Detailed budgets*. The practitioner develops an account-by-account, profit-center- by-profit-center model of a client organization, with a computerized calculation of the values for every item in each period. This model is structurally similar to the one used in making financial forecasts except for these important differences:

    — Shorter time span, typically a year

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[8] The "Bibliography," at the end of this Practice Aid includes reference to materials on probabilistic and optimization models that may be useful in some engagements.

— Shorter time periods within the time span, typically a month or a quarter instead of a year

— More detail, often at line-item level, for each department of the client organization

— More attention to seasonality

Probabilistic Models

.03 *Probabilistic*, or *stochastic models* include one or more random variables. The values of the variables are determined from a probability distribution. (The laws of chance govern each variable.)

.04 A typical probabilistic model would provide output in the form of histograms or tables of key output variables with their calculated probabilities of occurrence. The practitioner normally provides the client with a copy of the computer printout along with a user guide and letter of transmittal and comment.

Optimization Models

.05 *Optimization models* are designed to determine which of several possible solutions best meets a given criterion, such as least cost or greatest profit, subject to various constraints. These models are often developed to determine the optimum combination out of a list of items, such as marketing or product mixes or a blend of ingredients and components. Typical optimization models include linear programming and are designed to find the ideal outcome of a criterion and its associated input values.

TYPICAL ENGAGEMENT SITUATIONS

.01 The need for a financial model can arise under several circumstances. The following are examples of situations that may prompt a client to seek assistance:

• The client's lender has requested financial projections in connection with loan financing.

• A specific decision-making problem arises, such as an opportunity to purchase another business or enter another market; acquire new facilities or equipment; or change production, marketing, or financial policies.

• A department's budgeting process has been inadequate for several years.

• Management decides that a formal approach to strategic financial planning is desirable or it wishes to integrate existing unit plans into an overall financial plan.

• The client seeks a financial model that can be used as a "what if" management tool in determining new product markets, product deletions, pricing impacts, and sales mixes.

• The client wishes to quantify, analyze, or modify interrelationships among activities within the organization.

ENGAGEMENT CONSIDERATIONS

.01 Engagements involving the preparation and use of financial models can provide the practitioner with an opportunity to assist the client in the planning process. However, there are many pitfalls that can complicate or interfere with the full achievement of engagement objectives. The following are some of the most common of these pitfalls:

- Lack of knowledge about the specific industry and firm

- Inadequate definition of client needs and requirements

- Excessive complexity, as in the inclusion of too much detailed data or the use of overcomplicated computational equations

- Lack of client involvement, which can lead the practitioner to make assumptions inconsistent with the real situation

- Underestimation of the personnel and computer time and costs involved in testing, debugging, and producing alternative runs

- Failure to comply with current AICPA pronouncements on prospective financial statements

- Lack of consistently classified historical data

- Lack of knowledge about or access to a suitable financial modeling software package

- Insufficient attention to the behavior of fixed and variable elements of operational costs

- Too much or too little emphasis on the accuracy of accrued income and expense items in the financial model

- Insufficient attention to time-frame requirements

- Inadequate review of the model and results (because it is assumed that the model will generate correct solutions)

.02 Practitioners new to financial model preparation are warned that selecting a modeling package and learning its operating rules and capabilities require significant time and effort. The mastery of modeling languages, even those described as user friendly, requires considerable practice. The CPA embarking on his or her first effort should plan to devote sufficient time to selecting a suitable financial modeling software package, finding out how to write the formulae for the model, doing the actual writing, entering the model and data into the computer, and debugging the results until the output provides appropriate numbers supported by validated logic. The practitioner also needs to become adept at the cosmetic tasks of suppressing nonprinting variables and data sets, underlining, spacing, and other formatting items.

ENGAGEMENT OBJECTIVES AND CLIENT BENEFITS

.01 The objective of an engagement to develop a financial model is to produce prospective information that will assist the client in one or more of the following activities:

• Weighing the consequences of alternative courses of action (for example, whether to merge, acquire, or divest; buy or lease; expand, commit, build, or borrow; or change price)

• Planning activities over a specified time frame (typically three to five years)

• Monitoring actual results against plans and updating plans over time

• Formulating operational plans by division, department, market, or some other segment of the client's business

.02 The following are examples of how objectives might be stated in an engagement letter to a fictitious company called the Practical Machine Company:

• To assist in creating, testing, and operating a computerized financial model of the Practical Machine Company's operations, financial condition, and cash flow for the five years ending 20XX. The assumptions on which this model is to be based will be provided or approved by company management

• To test and validate the results of several alternative assumptions about corporate policies and environmental conditions

• To prepare a report to management containing projected financial statements based on the model together with underlying assumptions. The report will show results for the base case and depict the impact of various other alternatives

.03 Practitioners often describe potential benefits in the proposal or engagement letter. *Client benefits* that might result from an engagement involving development of a financial model include:

• Achievement of the principal engagement objective

• New insights into relationships, priorities, limitations, and goals that the client had been unable to quantify

• Identification of areas in which better planning, measurement, monitoring, and control are desirable

• Increased coordination of planning activities and resolution of inherent conflicts between various functional areas

• Determination of which customers, product lines, and geographical distribution areas will be profitable or unprofitable in situations in which costs vary

• Improved planning techniques

• Enhanced staff communication

.04 The practitioner should make sure not to overstate or misrepresent in the engagement letter the potential benefits to the client. He or she should use precise, realistic, and cautious language, pointing out that the achievement of benefits depends heavily on the client's future actions, on the quality of client-supplied data and assumptions, and on other controllable and uncontrollable events.

ENGAGEMENT SCOPE

.01 The practitioner needs to reach an understanding with the client about the financial model requirements. The following matters are especially recommended for discussion with the client:

- The intended use of the model and the type of sensitivity analysis to be performed

- The amount of assistance that client personnel will provide in gathering, analyzing, and summarizing data

- The degree of detail of the model (for example, product line, product group, geographical divisions, plant work centers)

- The requirements for output graphs, charts, and reports, including variables of major interest, format and level of detail, and documentation for subsequent client or lender use

- The amount of computer time needed for initial model development, data entry, testing, debugging, production runs, subsequent refinement, and reruns

- The time horizons (i.e., the quantity and type of periods, namely, weeks, months, or years, to be projected)

- The engagement ending statement, including the criteria for completion of the engagement

.02 The following statement illustrates how the scope might be described for one type of financial modeling engagement:

> The scope of this assignment will be the development of a financial model for the purpose of producing projected annual financial statements for a three-year period.

.03 If prospective financial statements are the engagement objective, the engagement outputs might be described in the engagement letter as follows:[9]

- A management report presents the financial forecasts for the period(s) under consideration and the projections' underlying assumptions. The report will show results for the base case and will depict the impact of various other alternatives and sensitivity analyses.

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[9] For engagements involving the reporting of prospective financial information, see appropriate AICPA professional pronouncements which can be found at www.aicpa.org. As pronouncements are updated from time to time, practitioners are reminded to visit the Web site to ensure that they are applying the most current version available.

• A listing of the computer model input, including the variables (accounts or categories) used, the data supplied, the calculation equations, and a listing of the resulting output, consisting of the three principal forecasted financial statements for each set of assumptions.

See Appendix B, "Sample Engagement Letter." The unique tasks and output requirements that may be appropriate for a specific engagement are listed in Appendix C, "Tasks and Outputs Associated With Financial Model Development."

ENGAGEMENT APPROACH

.01 The term *approach* is generally used to describe the overall plan for a specific consulting services engagement. The practitioner outlines the approach in the proposal or engagement letter after reaching an understanding with the client about how the engagement objectives will be accomplished. The following illustrates a typical approach to a financial model development engagement:

a. Determine the questions the model is to address and the problems that are to be solved.

b. Review the data available. If the client has previously been a client for other engagements, the CPA firm's other work has made its representatives generally familiar with the client's accounting records. However, other useful data, such as hours worked, units produced, miles run, square feet constructed, and patient days, are not in the chart of accounts and need to be incorporated among the variables in the model. This is because many revenues and costs depend partially or fully on physical activity rather than on the passage of time.

c. Select, gather, compile, and assess specific data.

d. Analyze and test data to determine relations, interactions, causes, and effects. Such an analysis should balance automated statistical methods with manual methods, plotting variables against one another. This will help to ensure that relationships derived through statistical analysis do, in fact, make good sense to both client and practitioner.

e. Lay out a tentative model structure including variables and their relationships.

f. Review the tentative structure with client management and amend it as appropriate.

g. Write, code, debug, run, and validate the definitive model. Include such documentation as detailed flow charts, narrative equation discussions, data source definitions, and descriptions of gathering/validation processes, as appropriate. At this stage, sufficient allowance needs to be made for variable, rather than fixed, quantities in the model's equations.

h. Review the first results with the client and agree on alternative assumptions.

i. Rerun the model.

j. Repeat steps *g*, *h*, and *i* as required.

k. Analyze the results and present conclusions.

l. Prepare explanatory detail and operating instructions as required by the terms of the engagement.

An example of how the approach section might appear in an engagement letter is provided in the sample engagement letter in Appendix B.

Considerations in Model Preparation

.02 The practitioner considers many factors in developing an approach to an engagement to prepare a financial model. These factors may include some that are typical of any financial model preparation and some that are unique to a specific situation. The following section discusses several factors that the practitioner needs to consider when preparing a financial model.

.03 In the typical modeling situation, practitioners need to draw on a variety of concepts and skills. Practitioners who know how and when to apply this knowledge will develop more effective, concise, and sensitive models when they encounter real-world applications. Financial models usually incorporate knowledge from several disciplines, such as:

- *Economics*, especially price-demand relationships in the marketplace

- *Statistics*, including probability and statistical inference; curve-fitting and linear regression, both single and multiple; and time-series forecasting methodologies, from simple linear trends to growth curves to more sophisticated techniques[10]

- *Mathematics*, including linear algebra, matrix notation, and solution of simultaneous equations

- *Cost accounting*, especially the relationships between cost, volume, and profit

- *Finance*, especially formulas for present values, debt repayment, and return on investment

- *Presentation graphics*, including those using logarithmic and probability scales

- *Financial accounting*, to ensure compatibility of client accounting policies and practices with the financial statements to be issued in the future

- *Tax law*, for taking into account current tax consequences, such as capital equipment depreciation and amortization, cash flow, and anticipated tax payment dates

.04 In a large organization, the client may have staff members who can gather and analyze the data, producing inputs and formulas for the model. Otherwise, the practitioner or the practitioner's staff will identify the essential model relationship. The identification is based on data provided by the client's marketing, production, engineering, financial, and personnel

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[10] Box-Jenkins is one such technique that could be applied. The most general Box-Jenkins model includes difference operators, autoregressive terms, moving average terms, seasonal difference operators, seasonal autoregressive terms, and seasonal moving average terms. More detail on this methodology can be found on the internet at http://www.itl.nist.gov/div898/handbook/pmc/section4/pmc445.htm.

managers. The practitioner and the client will need to think of trends, averages, patterns, and planning factors that may not have appeared in previous financial statements.

Identifying Variables and Their Relationships

.05 The general approach to a financial modeling engagement will usually differ from the approach to engagements involving a client's financial history. When engaged in work addressing the past, the practitioner is concerned about gathering and placing data within *classifications*. Usually, these classifications are associated with the following elements:

- Types of costs and expenses

- Organizational divisions or departments

- Capital expenditures versus current expense

- Taxable versus nontaxable and deductible versus nondeductible components

- Direct versus indirect expenditures

- Current period versus another period

.06 In financial modeling, classifications cannot be ignored. The primary focus, however, is on determining the variable *relationships* among classifications or among items within them. This can be accomplished by answering the following questions:

- What items affect the action of other items?

- What items drive other items (i.e., dependent variables)?

- What items move in the same direction as other items (i.e., correlative items)?

- What time lags occur in these relationships?

.07 A good model, then, does more than perform the calculations for a set of prospective financial statements. It also reveals the relationships between the company's activities and its accounts. The financial factors that are used in planning are embodied in the model. These factors include:

- Rates of change in costs, profitability, growth, and decline

- Limits (upper or lower) imposed by physical capacity, market factors, contractual arrangements, and management policy

- Fixed and variable components of costs, revenues, and balance-sheet items

.08 Some relationships of financial modeling variables address expenses. These expenses include those related to sales or revenues, those unrelated to sales or revenues, and those associated with other variables.

.09 *Expenses related to sales or revenues*. Traditionally, accountants have expressed income statement items as percentages of net sales. Certain items that have a clear but variable relationship to net sales are commissions and royalties.

.10 *Expenses unrelated to sales or revenues*. Other costs have little to do with net sales. These include interest costs, rents (except for some retail leases in which rent is based on a percentage of sales), and many general and administrative expense items.

.11 *Expenses related to other variables.* A third group of expenses presents some interesting problems. These expenses may vary according to sales volume but also are more directly related to other variables. In many manufacturing operations, for example, direct labor hours worked may be the best basis for determining all payroll-related costs as well as many manufacturing expenses. In such instances, *direct labor hours worked* is a variable that should be included in the model.

Selecting Variables

.12 The practitioner will probably change the variables to be used several times before coming to a conclusion as to which provides the best representation. A small number of variables will probably result if the practitioner strives to develop a concise, reasonably flexible, and cost-effective model. A larger number of variables usually results if the practitioner yields to the temptation to tell the whole story, however, it may be difficult to maintain, articulate, and present elegantly or concisely.

.13 The purpose of the engagement, the users of the model, and the materiality of the items considered have a significant bearing on whether variables are considered separately or are grouped together. There are three general sources of variables:

a. Ledger accounts. To tell the whole financial story, every dollar that appears in the accounts must be included in the model, although not necessarily in the same degree of detail. Some accounts may be separate variables but others may be grouped into one variable. Ratios and trends derived from the ledger accounts may also be significant as separate variables. Examples are the sales-growth rate, the receivables-collection period, and the gross-profit ratio.

b. Vital statistics of the company. Various company statistics may be key variables with respect to a specific client situation. These might include pay rates, growth rates, tax rates, labor hours, pounds of material used, units produced, kilowatt hours or gallons used, and number of employees (including office employees), trucks operated, miles run, and customers. Not all of these statistics may be included in the computer reports.

c. External variables. Forces outside the company may affect its profitability. Therefore, in determining model relationships, the practitioner considers the significance of industry statistics; state and federal government statistics, such as the inflation rate or the gross domes-

tic product (GDP) growth rate; and local economic indicators. These may provide insight into whether the client's experience is unique to the firm or more widespread with the industry or sector.

.14 To develop most financial models, the practitioner can use significantly fewer variables than are usually required for financial statements or management reports. Indeed, limiting the number of variables helps the user see the overall picture and simplifies data gathering, verification, and analysis. It also keeps the time and costs of model preparation within reasonable bounds. Therefore, instead of attempting to forecast the behavior of individual accounts, it is frequently preferable to analyze the history of the aggregate of a related group.

.15 A model also attempts to distinguish between significant changes and unimportant fluctuations. It, therefore, uses averages or the central tendency over time. For example, each of a dozen factory expense accounts or general and administrative expense accounts may display wide, unexplained fluctuations from month to month. In total, however, the fluctuations may be fairly narrow, say between 9.1 and 10.3 percent of sales volume over the course of a 12- or 24-month cycle. Depending on the purpose of the model, it may well suffice to use the average (9.7 percent of sales) as a planning factor for the group.

.16 For practitioners new to the modeling process, it is preferable to keep the initial number of variables small and add to them as necessary over time. For example, in a client organization with revenues of $50 million or less, the practitioner will find that the appropriate variables include perhaps 20 income statement items, 25 balance-sheet items, 20 cash-flow items, 20 rates and ratios (internal, industry, or general economy), and 10 physical volume measures. These variables will probably be sufficient to model the many relationships and interactions that occur over 12 months, 24 months, or 20 quarters. Even if the chart of accounts contains 500 accounts, the practitioner will usually find that a fraction of those are ample to reflect the key aspects of the client organization's activities. This is where materiality gains importance over an absolute level of precision.

Grouping Information Into Variables

.17 Before deciding whether an account should be represented by a variable or included in a group represented by a variable, the practitioner determines first whether it is relevant. The next step is to analyze the account's behavior by asking these questions:

- What affects it?

- What interacts with it?

- How can the relationship be described?

- Does it change according to its own performance over time?

- Is the change linked to volume, a schedule or to some other variable in the model?

.18 Another consideration is how the information is classified, grouped, or aggregated. For example, a company may have 10 inventory categories and 10 purchase accounts for these categories. If, however, usage or purchases for each are inaccurate, there is little point in trying to predict interim inventory levels for each of the 10 categories. A single inventory variable called *total inventory* would probably suffice. Conversely, if information about levels, stock turns, and buying policies for the several categories is accurate, and if inventory management is the focus of the engagement, 10 separate variables for inventory may be required. Even in these circumstances, however, the number of meaningful categories probably can be condensed.

.19 A final consideration is how closely related, for planning purposes, the account is to other accounts. It is customary, for example, to carry a separate ledger account for each type of payroll tax and fringe benefit. For general corporate planning, such as that envisioned in a model, it is more important to know that the total of taxes, pension costs, and other payroll-related costs is currently 22 percent of payroll than to know which items constitute the 22 percent. Therefore, one variable may suffice but due care must be exercised to ensure that this kind of presentation is sufficiently meaningful.

Developing Assumptions

.20 In developing the assumptions to be used in the model, practitioners may draw on the client's definitive plans, its history, management's judgment, and their own judgment. The following describes the considerations associated with each of these sources, which are listed in the order of their probable usefulness:

a. Client's definitive plans. For example, if a five-year capital budget has been developed already, this can become the logical starting point for modeling plant or equipment additions and replacements.

b. Client history. An analysis or a graphic plotting of a variable may indicate a consistent rate of growth or relationship to another variable. It would then be logical, in the absence of conflicting information, to select the historical pattern as an indicator of future behavior. However, the pattern may be somewhat erratic and a regression analysis may be required to smooth the pattern into a straight line or curve. A good check on the assumption is to predict a variable from a point in the past (for example, 12 months earlier) to the current period and validate the statistical significance of the relationship. There is no guarantee that past history is a reliable indicator of the future but history does provide a basis for discussion with the client how this variable may behave during the projected period(s).

c. Client judgment. In the absence of a marketing plan and in view of erratic recent history, a client manager may feel, for example, that volume is hard to predict and suggest using an average annual volume growth of 12 percent. The practitioner may believe that 10 percent is safer and may have heard that a local competitor is targeting 15 percent. In this case, the practitioner could consider capacity constraints, pricing levels, marketing expenditures, and general eco-

nomic conditions in evaluating the client's expectations. The practitioner may research appropriate external data to assist the client in developing assumptions if data are unavailable.

d. *Practitioner's judgment.* Clients have been known to mistrust past history as an accurate indication of trends, such as interest rates. Consequently, they will often ask for the practitioner's guidance. The practitioner may have to base their suggestion on discussions with colleagues and lenders, and a consideration of current or projected trends.

Other Aspects of Modeling

.21 In designing the model and specifying the relationships among the variables, the practitioner considers the capabilities of the available software in handling the data and the formulas. These capabilities may include:

• Database function

• Macros

• Graphics

• The ability to draw historical data directly from the client's database and use this in regression and trend-line analyses

• "What if" tests of various alternative sets of assumptions

• "Work backwards" calculations to determine the input values (assumptions) needed to obtain a target (for example, $3 million by 20XX)

.22 None of these capabilities is essential to the development of an effective model. The form and content of the model, however, can be strongly influenced by their availability and imaginative use.

.23 The mechanics of turning assumptions into equations is generally, but not entirely, independent of the software used. Most spreadsheet software has the capability to reach forward or backward into one or more time periods to select a value or a variable. For example, the sales volume in December, January, and February may be used to project the cash collections in March. Some spreadsheet packages also have built-in statistical routines. Awareness of such capabilities and their use can lead to wiser decisions about the best bases on which to project values.

.24 To better simulate the real conditions involved in most business planning, the practitioner would do well to master the *logical* capabilities of the spreadsheet package or programming language to be used. The basic portion of a formula involving logical capability is the "if-then-else" portion. This capability, in combination with one or more "and" or "or" clauses, often provides a powerful tool with which to address complex decision rules for certain variables.

These variables are independent because their values do not depend on an assumed growth rate, nor do they depend directly on the values of other variables. These independent variables include inventory levels, acquisition of new property and equipment, new debt, timing and amounts of optional prepayments of debt, bonus and profit-sharing expenses, and tax expenses.

.25 The more experience practitioners have in the application of these logical capabilities, the greater their skill in enhancing the model's ability to track closely with the decision-making processes of client management. In addition, developing portions of the model to use logical capabilities will help the practitioner to assist the client in gaining a clear understanding of how the decision-making processes operate as conditions vary, as time passes, and as particular choices are made.

.26 Another consideration in model development is whether to supply certain values as given data or to let the model calculate them. For example, a model for projecting long-term indebtedness and payments can be structured in one of the following three ways:

a. The initial balance, amount of periodic payment, and interest rate are given as data. The equations of the model include calculations of interest, periodic interest deductions from each payment, and reductions of principal by the remaining portion of the payment.

b. The remaining balances due are calculated separately from the model (by table or calculator). Then the string of debt balances is supplied to the model as data along with the periodic payments. The model arithmetic only involves applying the periodic difference in balances to the total payment and assigning the remaining portion to interest expense.

c. Probably the most cumbersome approach is to input all of the pertinent dollar values from a debt amortization schedule into the model as data, using no equations relating to debt in the model itself.

Sequence of Model Development

.27 Model development generally involves the following three steps:

a. Select the variables (accounts) and time periods. Electronic spreadsheets have different means of supplying the numerical data for calculations. The typical spreadsheet allows the user to construct a worksheet in which the columns are the time periods and the rows are the variables or accounts to be used. The computer screen displays a table consisting of the columns and rows so defined with all of the table values set to zero until otherwise instructed.

b. Define the initial variable values. The data to be set into the table initially are the givens of the assumptions and may consist of dollar values, rates, quantities, ratios, or any other numbers, including beginning balance sheet figures. The model may also include one or more periods of operating history for comparison or as the basis for computation.

c. *Define the logical relationships between variables and time periods*. The equations may contain numeric values or names of variables or constants. Whether these values should be embodied in the equations or given variable names with the values supplied as data is a matter of judgment. An item should be set up as a variable if its value may change on subsequent runs of the model. This approach provides greater flexibility. In short, the practitioner needs to learn as much as possible about what makes the numbers fluctuate and which numbers depend on others. Fixed items such as rent, which are expected to continue from period to period in the same dollar amount, tend to be the exception.

Validation of the Model

.28 In the final analysis, the ultimate validation of the model comes only with the passage of time, by which it can be determined whether or not the financial statements for the period projected come reasonably close to the predicted results.

.29 Before releasing the final version of the model to the client, the practitioner takes measures to enhance the model's validity. Some suggested techniques are to:

a. Review working papers related to the analysis of client history to verify any new insights into assumptions or variables produced by model development and testing.

b. Input historical data to the model and determine the accuracy of projections compared with actual results.

c. Compare various interim runs of the model to see whether significant changes, particularly bottom-line changes, make sense in light of the varying inputs. Do the runs make sense when compared with one another?

d. Perform sensitivity analyses on the computer to verify the way outputs behave as inputs vary. In doing this, the practitioner and the client may find the following concepts useful:

(1) *Marginal profitability or the profitability derived from sales that exceed planned levels*— For example, if each additional dollar of sales above the planned level can be expected to produce a net income of 16 cents, even though the overall average net after tax is 10 cents.

(2) *Marginal cost or the costs involved in producing products or providing services above projected levels*—For example, if the cost to make each additional unit of output beyond the levels projected is $82, the client may ask for how much an additional unit could be sold.

(3) *Tax effects*—For example, if an additional dollar of plant investment in 20XX will affect after-tax interest costs in 20XY by 7 cents, considering interest rates and tax rates.

e. Consider the reasonableness of the model. Can management truly achieve this kind of growth rate considering the past performance of the company and the present state of the industry? What would be the effects of a growth rate of 2 percent less? Would it be more reasonable?

f. Consider the repercussions. For example, client management sometimes optimistically plans for rapid growth, high turnover of assets, and high profitability. If these goals are not reached, it may be difficult to explain the reasons to a loan officer.

g. Consider new information. Has historical data for a more recent period become available during the course of model development? Do they change anyone's thinking? Do they change any of the historical relationships?

Ultimately, having a well-constructed and achievable model requires the critical resources (financial capital, management team) to execute it.

Engagement Output

.30 The output of a financial modeling engagement may or may not be the model itself and the appropriate documentation and operating instructions. This depends on whether the client is planning to use the model on a continuing basis. In general, the engagement produces multiple runs of the model, each based on different assumptions and documentation and related to a corresponding output report.[11] In many cases, the assumptions are contained in the listing of spreadsheet formulas, often with a separate listing of the spreadsheet cell contents. These assumptions will usually be translated for reporting purposes into a plain English version, which includes:

- Initial data, such as the beginning balance sheet (often incorporated by reference)

- Rates of growth or change

- Relationships, such as an explanation of which variables are affected by others

- Timing or an indication of when changes begin and end

- Conditional or "if," statements; for example, in the statement, "If A is less than 25 percent of B, then C is this; otherwise, C is that" (C could be a number, a variable, or an entire set of equations.)

.31 Additional engagement output may include copies of working-paper analyses and graphic presentations of the relationships between costs, volume, and profits. Sometimes copies of the condensed and summarized data and graphs used in developing regression analyses or time-series forecasts can be helpful to a client whose own records of the same data are too detailed or too far-flung to be useful in pattern recognition. The practitioner's analysis of the data may well present a view of the forest to a client whose records are in the form of trees. At the end of the engagement, the practitioner may also provide the client with copies of worksheets that show the statistical derivations of the trends, ratios, and planning equations.

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[11] This Practice Aid does not encompass the use of the output in meeting engagement objectives when model preparation is only part of a broader engagement.

APPENDIX A: STATEMENT ON STANDARDS FOR CONSULTING SERVICES AND RELATED MATERIALS[1]

SELECTED DEFINITIONS AND STANDARDS

Introduction

1. Consulting services that CPAs provide to their clients have evolved from advice on accounting-related matters to a wide range of services involving diverse technical disciplines, industry knowledge, and consulting skills. Most practitioners, including those who provide audit and tax services, also provide business and management consulting services to their clients.[2]

2. Consulting services differ fundamentally from the CPA's function of attesting to the assertions of other parties. In an attest service, the practitioner expresses a conclusion about the reliability of a written assertion that is the responsibility of another party, the asserter. In a consulting service, the practitioner develops the findings, conclusions, and recommendations presented. The nature and scope of work is determined solely by the agreement between the practitioner and the client. Generally, the work is performed only for the use and benefit of the client.

3. Historically, CPA consulting services have been commonly referred to as management consulting services, management advisory services, business advisory services, or management services. A series of Statements on Standards for Management Advisory Services (SSMASs), previously issued by the AICPA, contained guidance on certain types of consulting services provided by members. This Statement on Standards for Consulting Services (SSCS) supersedes the SSMASs and provides standards of practice for a broader range of professional services, as described in paragraph 5.

4. This SSCS and any subsequent SSCSs apply to any AICPA member holding out as a CPA while providing Consulting Services as defined herein.

Definitions

5. Terms established for the purpose of the SSCSs are as follows:

Consulting Services Practitioner

Any AICPA member holding out as a CPA while engaged in the performance of a Consulting Service for a client, or any other individual who is carrying out a consulting service for a client on behalf of any Institute member or member's firm holding out as a CPA.

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[1] Specific text relating to AICPA Standards can be obtained at http://www.aicpa.org/dues/code/sec200.htm.

[2] With the implementation of the Sarbanes-Oxley Act of 2002 (H.R. 3763), there are prescribed limitations on the provision of multiple services to clients. Practitioners need to be cognizant of these limitations.

Consulting Process

The analytical approach and process applied in a Consulting Service. It typically involves some combination of activities relating to determination of client objectives, fact-finding, definition of the problems or opportunities, evaluation of alternatives, formulation of proposed action, communication of results, implementation, and follow-up.

Consulting Services

Professional services that employ the practitioner's technical skills, education, observations, experiences, and knowledge of the consulting process.[3] Consulting Services may include one or more of the following:

a. *Consultations*, in which the practitioner's function is to provide counsel in a short time frame, based mostly, if not entirely, on existing personal knowledge about the client, the circumstances, the technical matters involved, client representations, and the mutual intent of the parties. Examples of consultations are reviewing and commenting on a client-prepared business plan and suggesting computer software for further client investigation.

b. *Advisory services*, in which the practitioner's function is to develop findings, conclusions, and recommendations for client consideration and decision making. Examples of advisory services are an operational review and improvement study, analysis of an accounting system, assistance with strategic planning, and definition of requirements for an information system.

c. *Implementation services*, in which the practitioner's function is to put an action plan into effect. Client personnel and resources may be pooled with those of the practitioner to accomplish the implementation objectives. The practitioner is responsible to the client for the conduct and management of engagement activities. Examples of implementation services are providing computer system installation and support, executing steps to improve productivity, and assisting with the merger of organizations.

d. *Transaction services*, in which the practitioner's function is to provide services related to a specific client transaction, generally with a third party. Examples of transaction services are insolvency services, valuation services, preparation of information for obtaining financing, analysis of a potential merger or acquisition, and litigation services.

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[3] The definition of Consulting Services excludes the following:

a. Services subject to other AICPA Technical Standards such as Statements on Auditing Standards (SASs), Statements on Standards for Attestation Engagements (SSAEs), or Statements on Standards for Accounting and Review Services (SSARSs). These excluded services may be performed in conjunction with Consulting Services, but only the Consulting Services are subject to the SSCS.

b. Engagements specifically to perform tax return preparation, tax planning/advice, tax representation, personal financial planning or bookkeeping services; or situations involving the preparation of written reports or the provision of oral advice on the application of accounting principles to specified transactions or events, either completed or proposed, and the reporting thereof.

c. Recommendations and comments prepared during the same engagement as a direct result of observations made while performing the excluded services.

e. *Staff and other support services*, in which the practitioner's function is to provide appropriate staff and possibly other support to perform tasks specified by the client. The staff provided will be directed by the client as circumstances require. Examples of staff and other support services are data processing facilities management, computer programming, bankruptcy trusteeship, and controllership activities.

f. *Product services*, in which the practitioner's function is to provide the client with a product and associated professional services in support of the installation, use, or maintenance of the product. Examples of product services are the sale and delivery of packaged training programs, the sale and implementation of computer software, and the sale and installation of systems development methodologies.

Standards for Consulting Services

6. The general standards of the profession are contained in rule 201 of the AICPA Code of Professional Conduct (AICPA, *Professional Standards*, vol. 2, ET sec. 201.01) and apply to all services performed by members. They are as follows:

- *Professional competence*. Undertake only those professional services that the member or the member's firm can reasonably expect to be completed with professional competence.

- *Due professional care*. Exercise due professional care in the performance of professional services.

- *Planning and supervision*. Adequately plan and supervise the performance of professional services.

- *Sufficient relevant data*. Obtain sufficient relevant data to afford a reasonable basis for conclusions or recommendations in relation to any professional services performed.

7. The following additional general standards for all Consulting Services are promulgated to address the distinctive nature of Consulting Services in which the understanding with the client may establish valid limitations on the practitioner's performance of services.

- *Client interest*. Serve the client interest by seeking to accomplish the objectives established by the understanding with the client while maintaining integrity and objectivity.[4]

- *Understanding with client*. Establish with the client a written or oral understanding about the responsibilities of the parties and the nature, scope, and limitations of services to be performed, and modify the understanding if circumstances require a significant change during the engagement.

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[4] The Code of Professional Conduct (Rule 102) describes *integrity* and *objectivity* as follows: In the performance of any professional service, a member shall maintain objectivity and integrity, shall be free of conflicts of interest, and shall not knowingly misrepresent facts or subordinate his or her judgment to others.

- *Communication with client.* Inform the client of (*a*) conflicts of interest that may occur pursuant to interpretations of Rule 202 of the Code of Professional Conduct,[5] (*b*) significant reservations concerning the scope or benefits of the engagement, and (*c*) significant engagement findings or events.

8. Professional judgment must be used in applying Statements on Standards for Consulting Services in a specific instance since the oral or written understanding with the client may establish constraints within which services are to be provided. For example, the understanding with the client may limit the practitioner's effort with regard to gathering relevant data. The practitioner is not required to decline or withdraw from a consulting engagement when the agreed-upon scope of services includes such limitations.

Consulting Services for Attest Clients

9. The performance of Consulting Services for an attest client does not, in and of itself, impair independence.[6] However, members and their firms performing attest services for a client should comply with applicable independence standards, rules and regulations issued by the AICPA, the state boards of accountancy, state CPA societies, and other regulatory agencies.

Effective Date

10. This Statement is effective for engagements accepted on or after January 1, 1992, and as has been subsequently updated as outlined below:[7]

> *Council Resolution Designating Bodies to Promulgate Technical Standards*
>
> *[As amended January 12, 1988; Revised April 1992, October 1999, and May 2004.]*
>
> *Federal Accounting Standards Advisory Board*
>
> *RESOLVED: That the Federal Accounting Standards Advisory Board, with respect to its statements of federal accounting standards and concepts adopted and issued in March of 1993 and subsequently, in accordance with its rules of procedure, the memorandum of understanding and public notice designating the FASAB's standards and concepts as having substantial authoritative support, be, and hereby is, designated by the Council of the American Institute of Certified Public Accountants as the body to establish financial accounting principles for federal governmental entities pursuant to rule 203 [ET section 203.01].*
>
> *[Added by Council, October 1999.]*

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[5] Refer to the Code of Professional Conduct for more details. These can be found on the internet at the AICPA's website: http://bvfls.aicpa.org/Resources/Laws+Rules+Standards+and+Other+Related+Guidance/

[6] AICPA independence standards relate only to the performance of attestation services; objectivity standards apply to all services. See footnote 2.

[7] As maintained and updated at the AICPA Web site (www.aicpa.org).

Financial Accounting Standards Board

WHEREAS: In 1959 the Council designated the Accounting Principles Board to establish accounting principles, and

WHEREAS: The Council is advised that the Financial Accounting Standards Board (FASB) has become operational, it is

RESOLVED: That as of the date hereof the FASB, in respect of statements of financial accounting standards finally adopted by such board in accordance with its rules of procedure and the by-laws of the Financial Accounting Foundation, be, and hereby is, designated by this Council as the body to establish accounting principles pursuant to rule 203 [ET section 203.01] and standards on disclosure of financial information for such entities outside financial statements in published financial reports containing financial statements under rule 202 [ET section 202.01] of the Rules of the Code of Professional Conduct of the American Institute of Certified Public Accountants provided, however, any accounting research bulletins, or opinions of the accounting principles board issued or approved for exposure by the Accounting Principles Board prior to April 1, 1973, and finally adopted by such board on or before June 30, 1973, shall constitute statements of accounting principles promulgated by a body designated by Council as contemplated in rule 203 [ET section 203.01] of the Rules of the Code of Professional Conduct unless and until such time as they are expressly superseded by action of the FASB.

Governmental Accounting Standards Board

WHEREAS: The Governmental Accounting Standards Board (GASB) has been established by the board of trustees of the Financial Accounting Foundation (FAF) to issue standards of financial accounting and reporting with respect to activities and transactions of state and local governmental entities, and

WHEREAS: The American Institute of Certified Public Accountants is a signatory to the agreement creating the GASB as an arm of the FAF and has supported the GASB professionally and financially, it is

RESOLVED: That as of the date hereof, the GASB, with respect to statements of governmental accounting standards adopted and issued in July 1984 and subsequently in accordance with its rules of procedure and the bylaws of the FAF, be, and hereby is, designated by the Council of the American Institute of Certified Public Accountants as the body to establish financial accounting principles for state and local governmental entities pursuant to rule 203 [ET section 203.01], and standards on disclosure of financial information for such entities outside financial statements in published financial reports containing financial statements under rule 202 [ET section 202.01].

Public Company Accounting Oversight Board

WHEREAS: The Public Company Accounting Oversight Board (PCAOB) has been established pursuant to the Sarbanes-Oxley Act of 2002 (the Act), and

WHEREAS: The PCAOB has authority under the Act to establish or adopt, or both, by PCAOB rule, auditing and related attestation standards, quality control, ethics, independence, and other standards relating to the preparation and issuance of audit reports for issuers as defined in the Act.

RESOLVED: That the PCAOB be, and hereby is, designated by the Council of the American Institute of Certified Public Accountants as the body to establish standards relating to the preparation and issuance of audit reports for entities within its jurisdiction as defined by the Act pursuant to rules 201 [ET section 201.01] and 202 [ET section 202.01].

[Added by Council, May 2004.]

AICPA COMMITTEES AND BOARDS

WHEREAS: The membership of the Institute has adopted rules 201 [ET section 201.01] and 202 [ET section 202.01] of the Rules of the Code of Professional Conduct, which authorizes the Council to designate bodies to promulgate technical standards with which members must comply, and therefore it is

Accounting and Review Services Committee

RESOLVED: That the AICPA accounting and review services committee is hereby designated to promulgate standards under rules 201 [ET section 201.01] and 202 [ET section 202.01] with respect to unaudited financial statements or other unaudited financial information of an entity that is not required to file financial statements with a regulatory agency in connection with the sale or trading of its securities in a public market.

Auditing Standards Board

RESOLVED: That with respect to standards relating to the preparation and issuance of audit reports not included within the resolution on the Public Company Accounting Oversight Board, the AICPA auditing standards board is hereby designated as the body authorized under rules 201 [ET section 201.01] and 202 [ET section 202.01] to promulgate auditing, attestation, and quality control standards and procedures.

RESOLVED: That the Auditing Standards Board shall establish under statements on auditing standards the responsibilities of members with respect to standards for disclosure of financial information outside of the financial statements in published financial reports containing financial statements.

[Revised May 2004.]

Management Consulting Services Executive Committee

RESOLVED: That the AICPA management consulting services executive committee is hereby designated to promulgate standards under rules 201 [ET section 201.01] and 202 [ET section 202.01] with respect to the offering of management consulting services, provided, however, that such standards do not deal with the broad question of what, if any, services should be proscribed.

AND FURTHER RESOLVED: That any Institute committee or board now or in the future authorized by the Council to issue enforceable standards under rules 201 [ET section 201.01] and 202 [ET section 202.01] must observe an exposure process seeking comment from other affected committees and boards, as well as the general membership.

[Revised April 1992.]

Attestation Standards

RESOLVED: That the AICPA accounting and review services committee, auditing standards board, and management consulting services executive committee are hereby designated as bodies authorized under rules 201 [ET section 201.01] and 202 [ET section 202.01] to promulgate attestation standards in their respective areas of responsibility.

[Added by Council, May 1988; revised April 1992.]

Tax Executive Committee

RESOLVED: That the Tax Executive Committee is hereby designated as the body authorized under AICPA Rules 201 [ET section 201.01] and 202 [ET section 202.01] to promulgate professional practice standards with respect to tax services.

[*Added by Council, October 1999.*]

APPENDIX B: SAMPLE ENGAGEMENT LETTER

CPA & Company
Ourtown, USA 00000

October 12, 20XX

Mr. James R. Broadview
Vice President, Finance
The Practical Machine Company, Inc.
1234 West Fifth Street
Ourtown, USA 00000

Dear Jim:

It was good to discuss your company's financial planning needs with you and your associates during our meeting last Monday. You expressed a desire to integrate several departmental planning documents into an overall financial planning model.

This letter defines the scope and objectives of an engagement to develop such a model and describes our approach to accomplishing the work we discussed in accordance with applicable standards.

Engagement Objectives

The objectives of the engagement will be:

1. To develop and run a computerized financial model of the Practical Machine Company's operations, financial condition, and cash flow for the five years ending 20XX, using assumptions provided by company management.

2. To test the results of several alternative assumptions about corporate policies and environmental conditions.

3. To provide sufficient documentation and training to enable company personnel to update the model annually, or more frequently as warranted, in the light of subsequent experience and planning.

Engagement Scope

We will develop a financial model for the Practical Machine Company using the approach outlined in the following section. During the engagement, we will consider all company operations and finances, based on the current accounting system and policies. In addition, we will examine appropriate statistical data, classified into a useful but manageable set of categories. At the conclusion of the engagement, we will provide you with a user guide and other documentation for the model and a listing of the model input and output.

Engagement Approach

Our approach to meeting the objectives of the engagement will be:

1. To analyze the trends, ratios, and volumes in major company activities, as reflected in the accounts and statistics for recent years.

2. To select the appropriate categories and relationships to be included in the model.

3. To construct and test the model a sufficient number of times to ensure that it meets established criteria.

4. To run the model a sufficient number of times to permit management to select definitive planning assumptions.

5. To train Practical Machine Company personnel in locating the sources of planning data, using the model, and making changes to reflect subsequent experience and incorporate revisions.

Engagement Output

At the conclusion of this engagement, we will provide you with:

1. A user guide and other software documentation for the model.

2. A listing of the computer model input, consisting of the categories (variables) used, the data used, and the calculation equations, and a listing of the resulting output, consisting of the three principal forecasted financial statements.

In addition, we will give you copies of worksheets showing the statistical derivations of the trends, ratios, and planning equations.

Benefits

As a result of this engagement, the Practical Machine Company will have the ability to prepare financial plans that will serve as the basis for developing detailed budgets and for advising its board of directors and its bank of the outcome of management's broad financial planning. The company will also have a vehicle for updating its intermediate plans.

Project Staffing and Schedule

We expect to complete the project in approximately six weeks from the start of fieldwork. This will permit management to review, discuss, and modify intermediate results. During the engagement, we will need the assistance of your people as much as possible, especially Joe Jackson (about 40 percent of his time) and you (to a lesser extent). The more your people learn about the model's components and operations, the more useful it will be to your company.

Paul Partner will supervise the consulting engagement, and Sam Senior will be in charge of the fieldwork. Sam has personally conducted similar projects for clients in a variety of industries. We will assign qualified consultants from our staff in the technical aspects of the work. As we discussed with you, we plan to begin the engagement on November 30, 20XX.

Fees and Billings Arrangements

We estimate the fees for our services will be between $X,XXX and $Y,YYY. In addition, the out-of-pocket costs for information technology resources time are estimated at $X,XXX to $Y,YYY. This estimate is based on the assumption that you, Joe Jackson, and other employees will be reasonably available to work with us. If, for any reason, more time and expenditures are required, we will confer with you before proceeding further. If less time is required than anticipated, the charges for our services will be lower. We bill monthly for our consulting services at our standard monthly rates and for out-of-pocket expenses at actual cost.

Please let me know if you have any questions. Your signature on one copy of this letter will serve as our authorization to begin the engagement.

Very truly yours,

_____

CPA & Company

Accepted by

_____

For the Practical Machine Company, Inc.

_____

Date

APPENDIX C: TASKS AND OUTPUTS ASSOCIATED WITH FINANCIAL MODEL DEVELOPMENT

The tasks and outputs in the following chart are not intended to establish engagement requirements. Because each engagement is different, the chart serves only to illustrate the unique task and output requirements that may be appropriate for a specific engagement.

Task	*Purpose*	*Output*
Determine what questions are to be answered and the problems to be solved by the model.	To provide a formal means of defining the scope of the project and a document for continuing reference.	Initial statement of requirements.
	To provide and document the plan for the project.	Work program.
Determine the planning range, number of time periods, and length of each period.	To fix the number of time periods and to identify problems or questions relating to the time span selected.	Memorandum on planning range.
Determine the tentative variables, both internal and external.	To identify the variables to be included in the model, subject to continuing revision during the model development process. Variables may include certain ledger accounts, or aggregates of their rates, ratios, physical measures, and other statistics indicating averages and trends.	Variables list.
Obtain historical data on the variables.	To develop values, totals, averages, patterns, and trends for use in the model.	Data worksheets.
Determine the relationships among variables by reviewing analyses and planning documents, analyzing statistics and discussing them with the client, and using professional judgment.	To define the equations by which each variable will be projected over the time span chosen.	Tentative calculation rules.
Decide on the initial model parameters.	To quantify the formulas developed.	Data list.
Lay out the output formats.	To determine the physical layout of the model output.	Output layout.
Select the means of implementation.	To select and describe the spreadsheet package, computer equipment, storage media, file names, and locations.	Implementation notes.

(continued)

Task	Purpose	Output
Write the model and enter the output formatting instructions into computer files.	To provide a means of running the model on spreadsheet software. Variables, data, and calculation rules are adapted to the structural and syntactical rules of the software selected. Formatting specifications for editing, spacing, underlining, titling, and so forth are also shown.	Spreadsheet formula listing and trail of the data and formulas in use.
Conduct an initial run-review, modify the model, and repeat the run as required.	To ensure that the model runs as intended and provides appropriate results.	Printer output-model results.
Review the initial results with the client.	To document changes in assumptions or planning factors to produce feasible and acceptable financial planning projections.*	Memo of client discussion.
Validate the model and develop details of alternative assumptions: enter changes and run, documenting the parameters used and the structural changes made in each run.	To document details of the changes agreed to by the client.	Model change notes.
Present appropriate output and accompanying assumptions to the client; in some instances, train client personnel to maintain and update the model.	To report the engagement results in a meaningful form (e.g., financial forecasts).	Report.
	To report the progress of client personnel in accepting and using the model.	Training notes.

* For engagements involving the reporting of prospective financial information, the practitioner needs to consult appropriate AICPA professional pronouncements.

Conditional statement—A statement of the rule for calculating a variable as other variables change. It always contains one or more instances of the word *if*. The following are examples of conditional statements:

- If current-month sales are less than $100,000, rent is $5,000. If current-month sales are greater than $100,000 but less than $250,000, rent is $5,000 plus 6 percent of sales in excess of $100,000. If current-month sales are greater than $250,000, rent is $14,000 plus 7 percent of sales in excess of $250,000.

- If year is earlier than 20XX, executive payroll is $287,000. If year is 20XX or later, executive payroll is $300,000 plus 5 percent of sales over $3 million.

- If long-term debt is greater than zero, and if cash is greater than $150,000, long-term debt payment this month is equal to the lesser of regular payment plus $5,000 or regular payment plus debt balance.

Constraint—A limitation, upper or lower, on the value of a variable or group of variables. Constraints may be imposed by physical capacities, legal or contractual restrictions, or management policies. The following statements are examples of constraints:

- Cash is to have a minimum value of $10,000, below which short-term borrowing will take place, and a maximum value of $100,000, above which there will be short-term investment.

- Department B cannot schedule more than 2,250 hours per year.

Dependent variable—A quantitative measure whose value depends on the assigned values of other measures on which the estimate is based. For example, the gross margin may depend on revenues and costs of production or operations.

Equation—In the financial model, an equation is one of the specified relationships; for example: General and Administrative Expense = $7,400 monthly + 2.7 percent of sales. (See also *Inequality*.)

Forecast (or **Financial Forecast**)—Prospective financial statements that present, to the best of the responsible party's knowledge and belief, given one or more hypothetical assumptions, an entity's expected financial position, results of operations, and cash flows. A financial projection is sometimes prepared to present one or more hypothetical courses of action for evaluation, as in response to a question that begins for instance, "What would happen if…?" A financial projection is based on the responsible party's assumptions reflecting conditions it expects would exist and the course of action it expects would be taken, given one or more hypothetical assumptions. A projection, like a forecast, may contain a range and cover one or more future periods. Minimum presentation guidelines for a financial projection are set forth

in paragraph 8.06 of the AICPA Audit and Accounting Guide *Guide for Prospective Financial Information* (as of this writing the latest version of the Guide includes changes through May 1, 2005).

Formula—An equation written in a syntax that is understood by the software being used.

Independent Variable—A quantitative measure whose value can vary, somewhat arbitrarily. In financial model preparation, the value of this variable is assigned, and the value of the dependent variable results, at least in part, from this assignment.

Inequality—Any relationship specifying a limited but undefined quantity, such as *greater than, less than, greater than or equal to*, and *less than or equal to*. The following statements are examples of inequalities:

• Production level is to be more than 1,500 units monthly.

• Minimum advertising expenditures will be $2,500 monthly.

• Storage costs will be at least $1,000 monthly.

Modeling Language—A computer software language designed specifically for modeling applications such as Microsoft Excel.

Parameter—A constant in the equations or inequalities in a model. Often, a parameter will be varied arbitrarily during "what if" runs of the model. Variables often used as parameters include sales growth rate, prime interest rate, and cost inflation rate.

Pro Forma—A set of historical financial information adjusted to demonstrate the effect of proposed or possible transactions or events, such as a reorganization, merger, acquisition, major refinancing, or sale of significant assets. Presentations of pro forma financial information are not financial statements. For more specifics regarding pro forma financial information as of this writing, please consult Statement on Standards for Accounting and Review Services (SSARS) No. 14 and the latest version of the AICPA *Professional Standards*, as periodically issued.

Projection—An estimate of financial results based on assumptions that are not necessarily the most probable (in contrast to a forecast).

Regression Analysis—A technique for predicting the relationship between two or more correlated variables that are often empirically determined from data. The technique is used especially to predict the value of a related variable. Regression analyses are often calculated by using the straight-line or least squares method ($Y = a + bx$) to predict value: Y is the predicted (dependent) variable, a is the fixed portion, and b is the multiplier or coefficient of the input variable x. The value of x may be dollars, a quantity of items, or a time period.

Simulation—A modeling technique for generating a series of events or transactions similar to those expected in a real situation, and for calculating their impact on costs, profitability, or time. Simulation models are useful for predicting the personnel, time, and other elements in-

volved in serving people at teller windows, port facilities, checkout counters, toll booths, emergency rooms, and operating rooms. They are also helpful in forecasting job-shop workloads or equipment failures in production, transportation, and communications.

In simulation, the computer's random processing is roughly analogous to rolling a die or selecting a card from a shuffled deck to decide what event happens next. With a simulation routine, years of daily or weekly experience can be imitated in a few minutes.

Simultaneous Equations—Two or more equations whose solutions depend on each other. The classic example in a business situation is the tax-bonus problem, in which the amount of the bonus is some percentage of after-tax income, but the bonus is deductible in calculating income taxes. Some modeling software has the capability to detect, isolate, and solve simultaneous equations in a model; others merely use zero as the value of any variable not assigned another value by the time it is used in the second equation. In such cases, the iteration capability of the software can help to solve the simultaneous equation. The iteration capability is used to reach the solution by rapidly obtaining successively better answers and stopping when the remaining error is less than a prescribed amount, typically $1.

Spreadsheet—A computer software package specifically constructed to allow the user to input data in rows and columns, perform arithmetic calculations with the data, and define relationships among the data.

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