CHAPTER ONE

The 8-Day BCA

1

We always have enough time, if we will but use it right.
Goethe (circa 1800)

Day 1—The Assignment

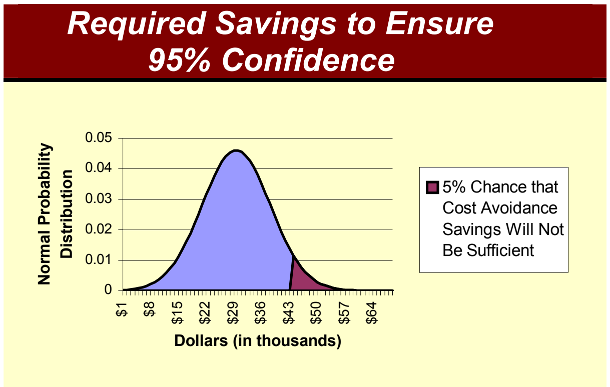
Jim was browsing his e-mails over coffee Wednesday morning when he noticed a message from his supervisor, Maria, who requested he meet with her at 9:00 concerning a special project.

At the nine o'clock meeting Maria indicated that a headquarters memo suggested that some end-of-year budget funds might be available. Office chiefs had been asked to submit budget requests for remaining office projects that still required funding. Additionally, headquarters requested a *Business Case Analysis* (BCA) accompany any project requests expected to cost more that $10,000.

Maria continued, "The office computer PC workstations are approaching five years of age. We have continual computer freeze-ups, and the quarterly repair and maintenance price tag for technician service calls is 'eating our lunch.'"

She then …asked Jim to prepare a convincing Business Case Analysis to support purchase of new computer workstations for the office. "One more thing," Maria said, as the meeting was about to come to acquisition for the *lease-to-own* option. *Exhibit 1-24* illustrates the concept.

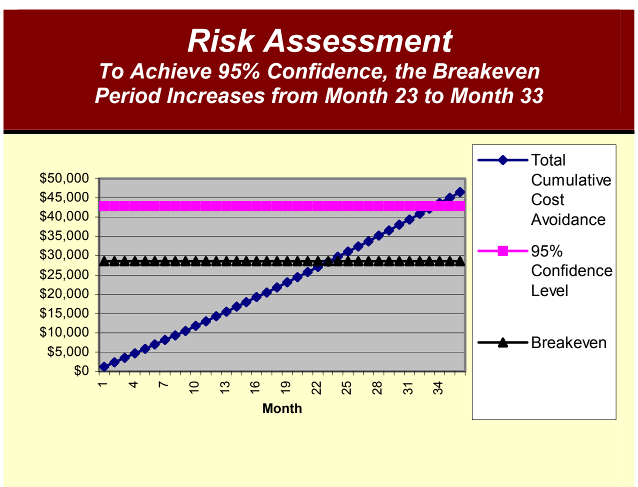
Exhibit 1-24



Shown is the 95% probability of having sufficient savings—the blue area (i.e., $28,677 assures 50% confidence, plus $13,952 additional to increase confidence to 95%).

The impact of this upon the breakeven point is to shift the time to achieve breakeven savings from approximately 23 months to 33 months for the lease-to-own alternative. This is illustrated in *Exhibit 1-25*.

Exhibit 1-25



CHAPTER TWO

The History

2

History gives us a kind of chart.

Sir John Buchan (circa 1935)

If no use is made of [history], the world must always remain in the infancy of knowledge.

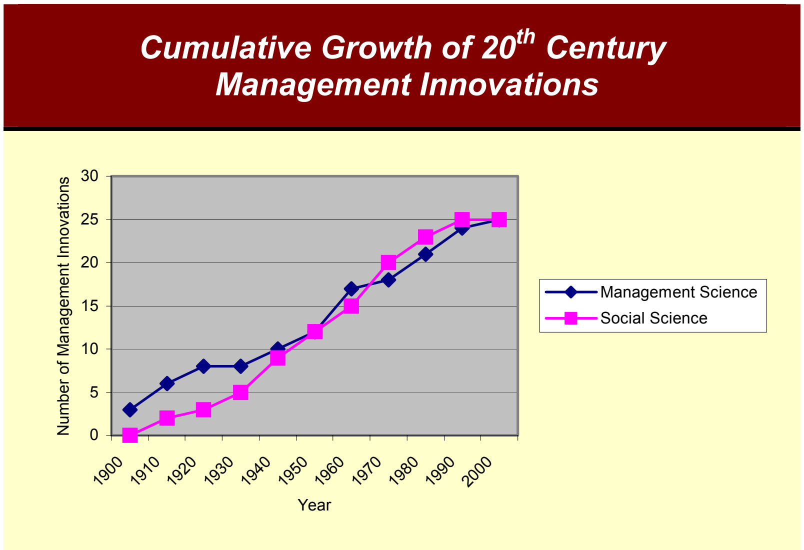
Cicero (circa 40 B.C.)

Most of what we know about analysis of business situations has been learned within the past century. There is, however, a brief, sketchy history of business and commerce as far back as 5,000 years when Sumerian priests invented a script to record inventory. Greeks recorded rudimentary finance, logistics and manufacturing activities as early as 400 B.C. This was followed by a gradual change in accounting and material control techniques through the next two millennia. Approximate origins of various business functions before the 20th century are as follows:

Exhibit 2-1 (a)

Business Functions in Antiquity		
3200 B.C.	*Egypt / Sumerians*	*Writing—tax / inventory records*
1100	*Babylonia*	*Money—½ oz silver ingots*
400	*Greeks*	*Management is an art*
350	*Plato*	*Specialization principle*
325	*Alexander the Great*	*Staff principle*
175	*Roman*	*Distribution logistics*

Exhibit 2-2



This historical view supports an integrated approach to management analysis, using an eclectic combination of elements from both management science and social science. One of the earliest integrated approaches originated in the 1950s with the early British studies in *sociotechnical systems theory* that focused on group behaviors in technical work situations. This concept was later mirrored by Robert Blake's and Jane Mouton's *Managerial Grid* (1966)—with focus on management and leadership styles. Blake and Mouton theorize that management consists of two primary forces: concern for production and concern for people. On a scale of 1 (low) to 9 (high) for each, a '9-9 manager' is considered best. Effective managers motivate through both high concerns for job performance and for workers' welfare. Best results are theorized to result from "Work accomplishment…from [socially] committed people [and

CHAPTER FOUR

The Social

4

No social system will bring us happiness, health, and prosperity unless it is inspired by something greater than materialism.

Clement Richard Atlee, circa 1950

The Nature of Organizations

Edgar Schein, a prominent organizational development consultant, illustrates the cultural complexity of two real organizations for which he consulted over a number of years, from the mid-1960s through the early 1990s. His pseudo-names for them were the *Action* and *Multi* corporations. The following narrative is adapted from his book, *Organizational Culture and Leadership (1992)*, and his Cape Cod Institute seminar on *Organizational Therapy* (summer 2002).

> **Action Company**
>
> *Action* was an early leader in the international race to invent, develop and market electronic equipment. Its founders prized, above all, a casual, confrontational atmosphere among its employees. Being 'right,' having a better idea, was valued above being a 'team player.' Also, mistakes were tolerated in the risky pursuit of the unknown, of new things that might work. Power and prestige evolved from successes; rank and 'corner office with a view' were not so important.

The working environment at Action was informal and egalitarian. Power and prestige were more tied to

3) *We assess chances of failure fairly accurately.*

Not so. We are overly optimistic. For example, most new businesses expect to succeed—and someone decides to take the risk. Yet, 70–90% of new businesses fail in the first few years.

1) *We know when to quit.*

Not so. Many projects are prolonged far too long because of the tremendous investment so far—rather than cutting losses for failed efforts and considering the past as sunk costs.

Obviously decisions made at one point in time will need to be adapted as the situation changes in task environment changes. This implies the need for a learning organization—by definition, one that monitors effectiveness of processes, makes mistakes, and adjusts current rules that are no longer useful. It also implies a need for stability and consistency, as long as current rules are appropriate. These dual influences, the need to adapt as the situation changes while simultaneously seeking consistency where possible can bias decisions if not properly recognized. A partial list of biases, some indicating too much faith in change, some too little, is shown in *Exhibit 4-1*.

Exhibit 4-1

Biases Found in Future Oriented Decisions	
Gambler's Fallacy ***(Jarvik, 1951)***	*Seeing five 'heads' tossed from a coin and betting a 'tail' is more likely next — wrong interpretation of the law of averages—odds are still 50-50.*
Hindsight Bias ***(Fischoff, 1975)***	*The 'I knew it all along' effect—tendency to exaggerate how accurate one's past predictions were or would have been.*

calibrate these three factors. This is really a question of what level of effectiveness is appropriate, and what level of efficiency is achievable. *Effectiveness* relates to 'doing the right things.' For example, are the products and outputs needed, and within the technical range of this organization? Efficiency deals with 'doing things right.' The objective is to calibrate the efficiency and effectiveness goals so that costs of production are minimized for the required level and quality of output.

Exhibit 7-4 illustrates a model relating organizational effectiveness and efficiency, given environmental demands.

Exhibit 7-4

A Model of Organizational Performance

	Internal	***External***
Efficiency ***Calibrate***	*Internal processes*	*Bargaining position: suppliers/customers*
Effectiveness ***Maximize***	*Member motivation*	*Societal satisfaction*

Using the interdependencies of organizational *structure* and *process* with task *complexity* (i.e., *Exhibits 7-1* and *7-2*), and the model of performance (i.e., *Exhibit 7-4*), it is possible to develop a model of potentially successful organizations for various levels of situational complexity. Sociotechnical principles can help develop scales to measure existing (as is) organizational conditions, and provide insights on potentially rewarding directions for change toward (to be) ideal states. *Exhibit 7-5*, using a theoretical budget. *Exhibit 8-4 (a)* shows a listing of several projects that have requested funding for the expected $80,000 budget:

Exhibit 8-4 (a)

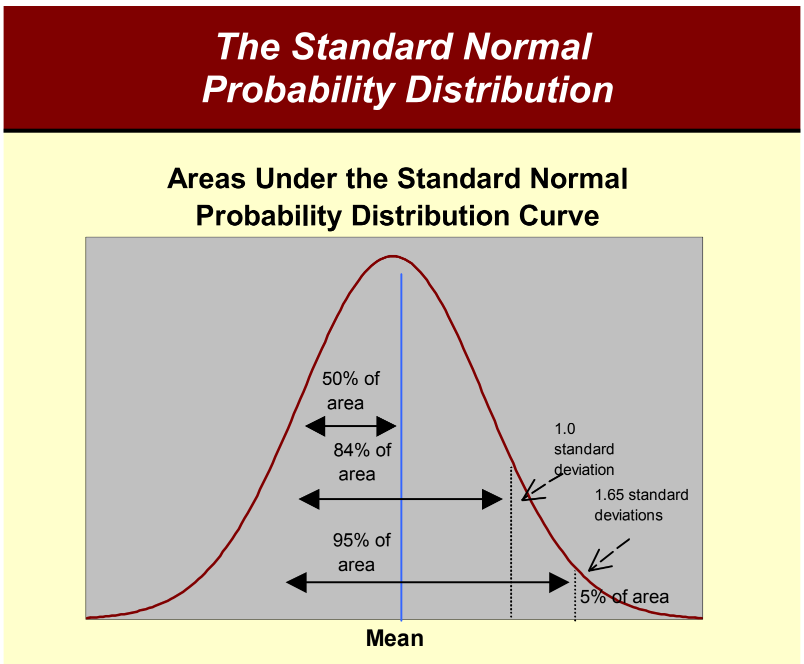
Competing Projects		
Project	***Annual Savings***	***Present Value of Investment***
A	*$ 16,622*	*$ 28,677*
B	*$ 3,230*	*$ 13,000*
C	*$ 1,912*	*$ 6,000*
D	*$ 20,288*	*$ 32,000*
E	*$ 1,600*	*$ 9,000*
Total Budget = $80,000		

As one indicator, the committee might favorably consider projects with shorter payback periods. This comparison can be made when the estimated savings are relatively constant throughout the economic life of the project. Dividing the present value of the investment by the estimate of annual savings approximates the relative payback periods. Projects can then be ranked based on the quickest payback using the appropriate present value (i.e., cumulative discount) factor.

For example, annual savings and investment costs for Project A in *Exhibit 8-4 (a)* are derived from the 8-Day BCA PC example. The average annual cost avoidance (i.e., savings) calculation is $49,865 ÷ 3 years = $16,622 (see *Exhibit 1-17*). The present value of acquisition cost is $28,677 (see *Exhibit 1-3*). The estimated payback period is

95% of the area under the curve. At two standard deviations, nearly 98% of the area is represented. At three standard deviations, nearly all (i.e., 99.9%) of the area is covered. It is easy to see, for example, how rare it is for someone to score in the 99th percentile of a standardized test (i.e., about 2.33 standard deviations above the average test taker).

Exhibit 9-3



Linear Regression

Linear regression is one of the most used statistical analysis techniques. Regression analysis has been around for over 100 years, and its origins are attributed to an Englishman

Exhibit 9-11 (b)

Policy Capturing Prediction

$$F = -2.64 + .66X_1 + .98X_2 + .65X_3 + .10X_4 + .00X_5 + .16X_6 - .57X_7 - .39X_8 + .01X_9 + e$$

$$F = -2.64 + .66(5) + .98(3) + .65(3) + .10(5) + .00(5) + .16(3) - .57(2) - .39(3) + .01(5)$$

$$F = -2.64 + 3.30 + 2.95 + 1.96 + .51 + .00 + .48 - 1.13 - 1.17 + .03 = 4.29$$

$F = 4$ (rounded)
(or 75% expected PC savings)

Where: **1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%**

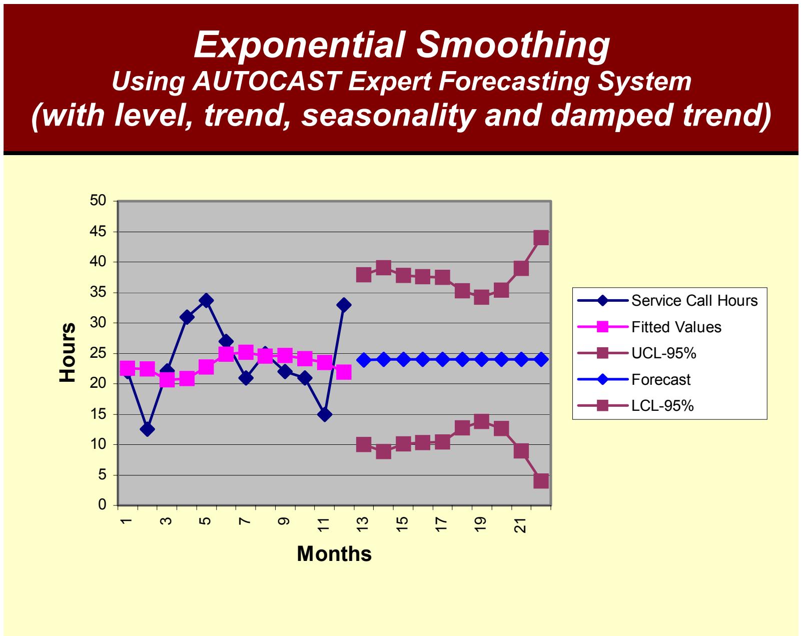
Forecasting

We now switch gears from prediction using general relationships to the more specific relationships of time related events and forecasting. All of the prediction models we have reviewed so far have been based on linear regression techniques. More specifically, we used time series regression to develop a model of historical events that could be used to forecast expected future events. We will now consider 'pure' time series forecasting.

True time series approaches simply attempt to capture patterns of the historical data over sequential observations, rather than attempting to relate them explicitly to some other variable (as did regression). Well-known approaches include moving averages, weighted moving averages and exponential smoothing.

The *AUTOCAST* software also calculated an estimated standard error of 6.8, very similar to the simple exponential model (i.e., 7.3) and the linear regression model (i.e., 6.9).

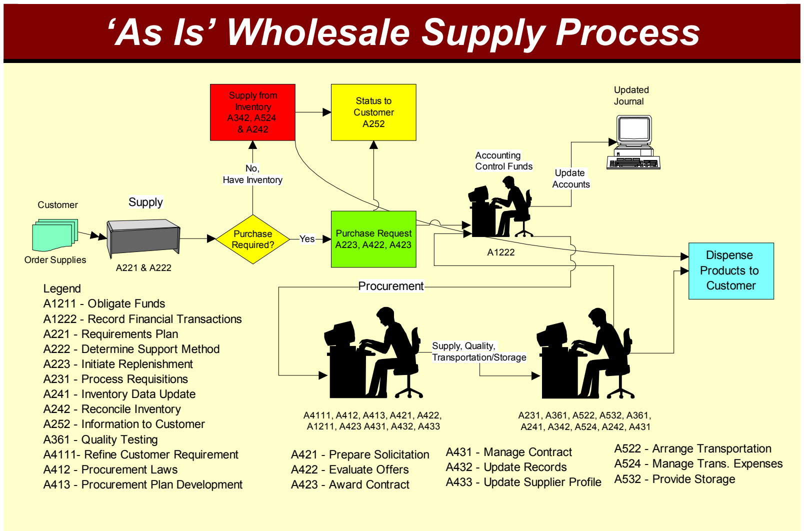
Exhibit 9-14



So, which of the three, or for that matter, any other forecasting method is best? There are many kinds of forecasting techniques, ranging from nearly totally judgmental (e.g., the Delphi technique), to totally mechanical, such as extrapolation (time series) and relational (regression) models. However, more sophisticated models (e.g., Box-Jenkins (ARIMA) and neural networks) have not generally performed better than simple models, such as those we have reviewed herein.

In practice, if data are limited or difficult to come by, as is often the case, you must use what you have the

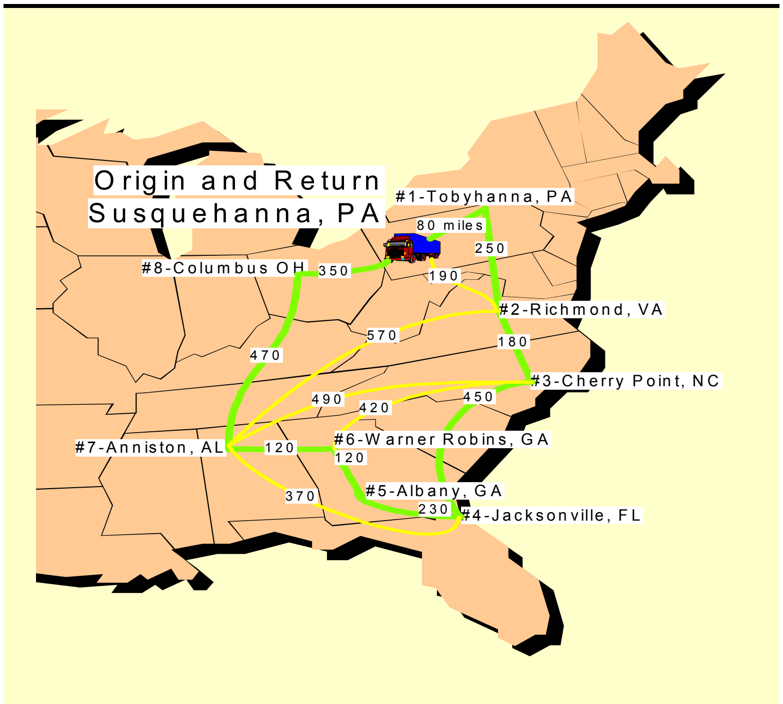
Exhibit 10-4



Note that many of the activities from the node tree were used in the process, and that the activities came from whatever level of indenture required. Also, activities were partially used for different processes, as established by interviews with workers who performed them. For example, duties of an administrative assistant were spread out over many processes. The total time of use for any resource was controlled to avoid exceeding the total available time for a given activity. This is where queuing theory and simulation software were essential to ensure integrity of resource use.

This approach demonstrates the 'cookbook' concept—the manager (i.e., master chef) chooses the scope and intensity of the activities. First, total process output requirements had to be determined. Then resources necessary to provide proper performance of operations for the desired end results were provided. Finally, the sequencing of processes necessary for efficient throughput was arranged

Exhibit 11-2 (a)

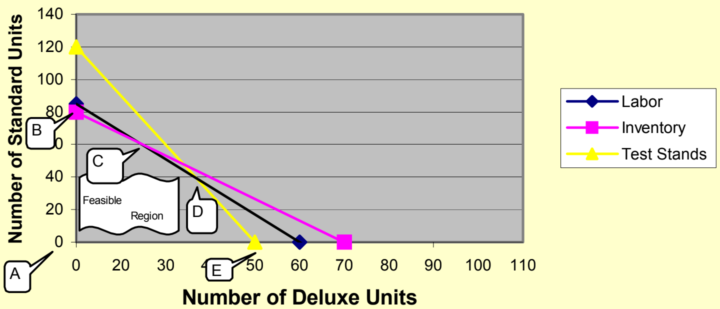


The following illustrates the traveling salesman procedure:

1) On the first pass, the traveler leaves Susquehanna, PA, and proceeds to the nearest location, Tobyhanna, PA, 80 miles away.

Exhibit 13-3

Graphical Linear Programming Solution

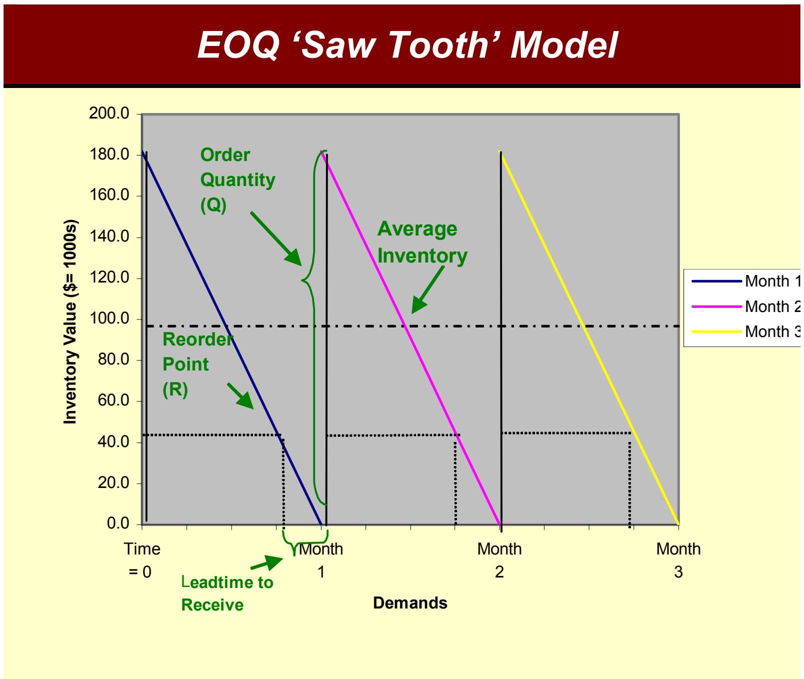


Point	*Basic Constraints*	*Equations*	*Production Units*	*Profit*
A		Deluxe Units (DU) = 0 Standard Units (SU) = 0		$ 0
B	Inventory	Inventory Constraint $600 * DU + $525 * SU = $42,000 600 (0) + 525 * SU = 42,000 SU = 42,000 ÷ 525 = 80	DU (deluxe units) = 0 SU (standard units) = 80 (solutions by standard algebra)	80 (standard units) * $200 = $16,000
C	Inventory and Labor	Inventory $600 * DU + $525 * SU = $42,000 Labor 8 hours * DU + 5.67 hours * SU = 480	DU (deluxe units) = 17 SU (standard units) = 60	17 * $300 + 60 * $200 = $17,100
D	Labor and Test Stands	Labor 8 hours * DU + 5.67 hours * SU = 480 Test Stands 4.8 hours * DU + 2 hours * SU = 240	DU (deluxe units) = 35 SU (standard units) = 34	35 * $300 + 34 * $200 <u>= $17,300</u>
E	Test Stands	Deluxe Units (DU) = 0 Standard Units (SU) = 0	DU (deluxe units) = 50 SU (standard units) = 0	50 (deluxe units) * $300 = $15,000

Inventory Reorder Points and Quantities

Exhibit 14-3 depicts graphically the well-known 'saw tooth' graph of inventory system reorder behavior.

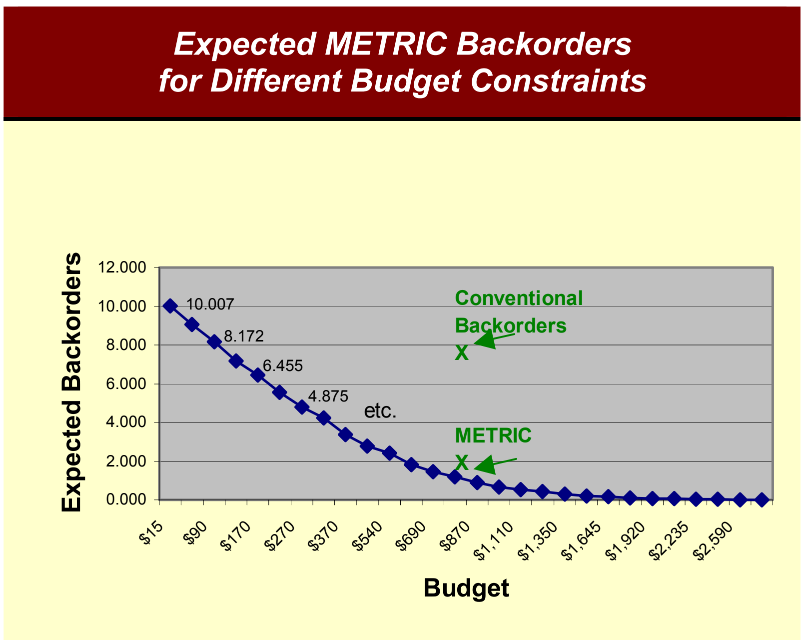
Exhibit 14-3



The implicit assumptions are that we have perfect knowledge about consumption during a given period of time, that the optimal reorder quantity is the Wilson Q, and that the reorder is made at the exact lead time required to ensure replenishment stocks will arrive at the instant just after the last of the existing stocks are consumed. The beginning of the month begins fully resupplied, followed by a

METRIC enabled use of the marginal approach to estimate optimal stocks of a given item among *multiple locations*. This is done by first computing an expected depot delay time (DDT). These depot backorders are not important in themselves, but only for their contribution to backorders at the operating location (due to added delays). These calculations involve an elaboration of the Base Stockage Model to explicitly calculate optimal allocation of centralized depot serviceable outputs, similar to previous methods for one location at a time, as was shown in *Exhibit 14-9 (b)*. *Exhibit 14-11* illustrates the relationship of expected backorders to a given budget constraint by using METRIC calculations.

Exhibit 14-11



included in either a *draft task order* (for management to review), or for a *draft study plan* (often unsolicited) to provide essential information for potential sponsors.

The Golden Rule

When competing for BCA study funds, follow the *Golden Rule: "Them what's got the gold, makes the rules."* Take time to learn why the proposed project that will be examined is important. Try to get the big picture of how and where this project fits into bigger strategic programs. Then adapt the words of the statement of work in the draft task order (or study plan if there is no preceding task order) toward these 'higher' goals. If you can communicate the need and potential study benefits in a clear, understandable and creditable way, chances for funding will improve. Also, by successfully competing for the study funds, those managers who buy in will have a vested interest in the business case analysis findings.

Six Critical Steps

Six major steps are involved in performing professional business case analysis. They include the following:

1) **Task Order—**the study sponsor's description of what the BCA is to analyze;
2) **Study Plan—**the proposed analysis approach that will be used in the BCA;
3) **Kickoff Meeting**—to calibrate differences between the task order and study plan;
4) **The Study**—performance of the actual BCA study;

Slide 2

"As shown, the study timeframe was only a week —to correspond with year-end budget obligations."

Business Case Analysis
Workstation PCs

Project	**Workstation PCs**
Starting Date	17-Sep
Completion Date	26-Sep
Present Date	26-Sep

Task Description	Starting Date	Ending Date	% Comp.	No. of Days	Sep
Business Case Analysis (BCA)					
Initiate BCA	17-Sep	17-Sep	1	1	
Develop Study Plan	18-Sep	18-Sep	1	1	
Define Alternatives	19-Sep	19-Sep	1	1	
Evaluate Costs	22-Sep	22-Sep	1	1	
Evaluate Benefits	23-Sep	23-Sep	1	1	
Benefits-Cost Analysis	24-Sep	24-Sep	1	1	
Draft Report and Briefing	25-Sep	25-Sep	1	1	
Final Report	26-Sep	26-Sep	1	1	

2

Slide 3

"The basic problem is aging PCs, resulting in lost worker productivity and expensive maintenance and repairs."

Problem Statement

• A need exists to replace desktop computers in the contracts management office.

- Existing computers lack storage and speed capacity to support the new software required for many of the daily work situations.
- Workstations are frequently 'down,' causing costly work delays and maintenance costs.

3