Getting It Right, Volume Two

How Managers Can Make Better Decisions by Using Observations and Anticipated Actions

Howard Flomberg

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Contents

Acknowledgments

People who are mathematically inclined are frequently semi-literate. With that in mind, I would like to thank my son, Dave Flomberg for his support and encouragement, and for his assistance in turning my feeble attempt at communication into acceptable English. Most of the editing for the first edition was squeezed into his unbelievably tight schedule. Thanks Dave!

We are all products of our education. I would like to include one of my teachers and mentors Dr. Joe Megeath for giving me an invaluable education on real values.

One of the ongoing lessons that I receive is that I frequently learn more from my students than I realize. A paper turned in by a student, Melanie Tyler, brought many of the points that I was trying to tie up into focus. For that I thank her. This is yet another reminder that a good teacher frequently learns from the student.

I'd also like to thank Brooke Pruter for her insightful feedback and perspective.

This second edition has given me a chance to improve the book. I was able to fix some arithmetic errors, tweak the text and add come content.

There is a new section Analytic Hierarchy. Some faculty from other schools requested this tool. I am also putting many of the tables into Excel© spreadsheets. The publisher will make these available to instructors.

I'd like to thank the folks at University Readers. Their enthusiasm and professional support made the project flow. I heartily recommend them to other professors, especially those neophyte writers out there.

Ethical Pragmatism: "Doing what works best" while mindful of the obligation one has to society.

Howard P. Flomberg
Denver, Colorado

SECTION 1

What's to Come

Author's Rules

1. There are no replacements for the ultimate managerial tool, "Common Sense." [1]
2. You can't make a decision if you don't define the problem.
3. Doing nothing is always a valid alternative.
4. Sometimes the best answer is, "It Depends."
5. Be very careful when quoting statistics. They can be very misleading.
6. The word "Accurate" is by definition a very inaccurate term.
7. Use the tool that makes the most sense.
8. If you do not have an effective organization, nothing will work well.

[1] com·mon sense (n)—Sound practical judgment derived from experience rather than study.

Introduction

Decision-making has been a black art for centuries. In the 20th Century, however, methods and procedures for decision-making have achieved some success, thanks to management science techniques. Making a decision is, by its very nature, a blend of qualitative and quantitative processes.

Qualitative analysis is built around scrutiny of observed or anticipated actions. This research technique demands an analyst who can maintain an objective view of the situation. However, when we discuss quantitative analysis, we think of numbers and quantities. The mind wanders to counting, statistics and probabilities, an uncomfortable place for many. This has been the standard domain for decision theory for decades.

Statisticians and the mathematically inclined consider qualitative analysis to be a stepchild. In contrast, a person who is involved in the decision making process often intuitively operates using qualitative analysis. Qualitative analysis makes use of that person's experience, expertise and professional opinions.

This study revolves around techniques that use both qualitative and quantitative approaches. Some of the tools that will be covered are: Bayes Theorem, Game Theory and The Delphi Method.

Bayes Theorem evaluates probabilities with the assumption that past events can affect future events. Bayes gives us a way of using history to predict the future. Bayes is frequently taught using mathematic notation. Most non-mathematicians are inexperienced or uncomfortable with this notation. Alternative methods include tree theory and table manipulation. In this text, Bayes will be presented for the less-mathematically oriented reader.

John Von Neumann, the great Hungarian-American mathematician, co-wrote the classic thesis on Game Theory, Theory of Games and Economic Behavior (1944). Another great Princeton University mathematician, John F. Nash[1], further advanced Game Theory. Game theory gives

[1]Nash was the subject of the recent book (1998, Sylvia Nasar, Simon and Schuster Publishing) and subsequent movie "A Beautiful Mind." (2001, Universal)

the ability to methodologically examine a decision and evaluate the optimal payoffs and penalties.[2]

The Delphi method is a formal way of gathering the appropriate people so that a decision can be made. The technique comes from work done at the Rand Corporation in the 1950s. The technique was used to model of the effects of nuclear war. It traces directly back to the operations research work done by the British during World War II. Military planners have used decision theory very successfully. In his recent book "blink[3]" Malcolm Gladwell makes a point of comparing the similarities between Wall Street types and military planners. The point being made is that the frenetic world of the stock market as well as the complexities of conducting a military campaign both shares the need for immediate and effective decisions. This text will also evaluate and capitalize on Mr. Gladwell's concepts.

Decision-making is enabled by sound management principles. A well-run organization is an environment where appropriate decisions will be made. A poorly run organization frequently forces poor decisions. This book is essentially a toolbox that provides both qualitative and quantitative tools that will aide in decision-making. However if the organization does not work, nothing else will.

Probably the first recorded instance in identifying a management methodology is in the Bible. Exodus 18:12–27 tells the story of Moses' being totally swamped settling the daily problems of the Israelites. The passage tells us that Jethro, Moses' father-in-law comes to the camp bringing Moses' wife and children.

Apparently Jethro is quite taken aback at the lack of organization and Exodus 18:21 Jethro tells Moses:

> *"…thou shalt select out of all of the people able men, such as fear G–d. Men of truth, hating bribes; and place these over them as officers over thousands, officers over hundreds, officers over fifties and officers over tens."*

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[2]At one point in time, Nash, Von Neumann and Einstein were all resident at Princeton University—WOW

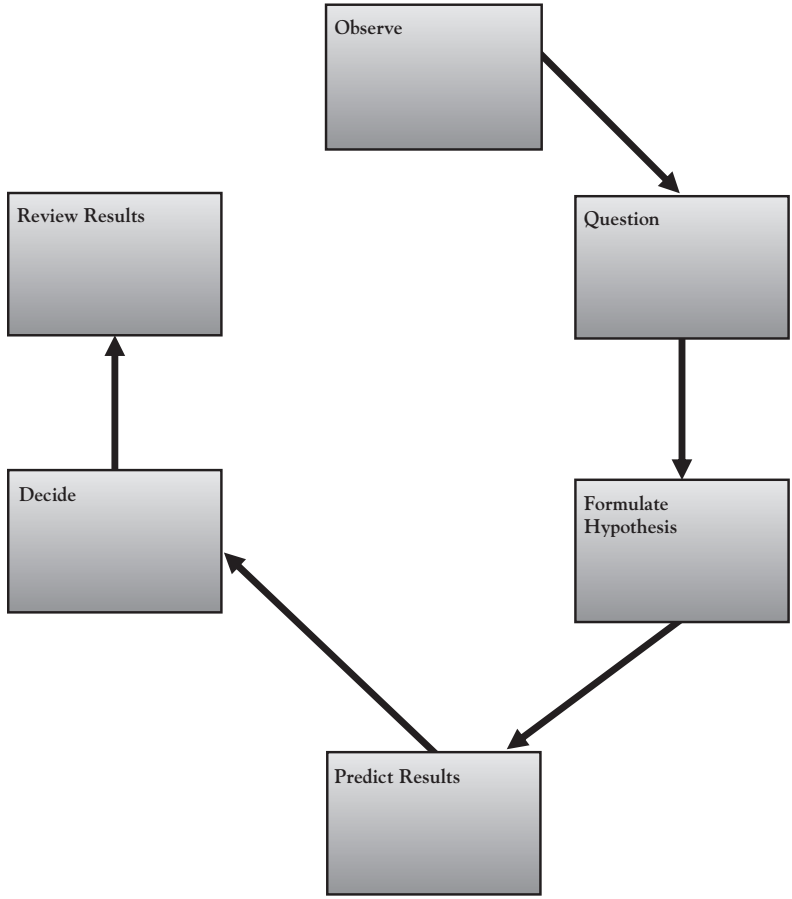
[3]Gladwell, Malcolm. Blink. New York: Little Brown and Company, 2005

Having given Moses this advice, like any good consultant, Jethro goes home to Midian. The key point is that Jethro tells Moses to establish a hierarchical organization. Identify leaders at the strategic, tactical and operational levels and have the decision made at the lowest possible level. This is good advice today. Note: I am quoting from the Bible as a historic reference only.

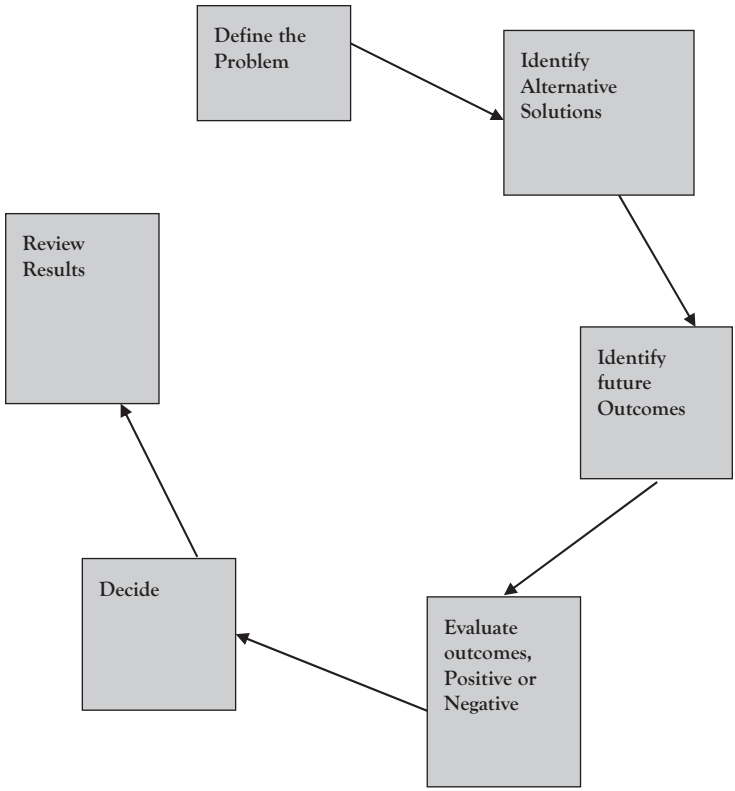
As I said, a good organization provides a bed for good decisions.

The Decision Model and Why It's Important

In high school, we learned the "Scientific Method."



Business has converted this process to what can we will be calling the Decision Analysis model. This is the model we will use for formal decision modeling:



What is Operations Research?

Operations Research can be considered the godfather of decision analysis. Its roots go back to World War II. Given the vastness of the logistics of running the war, British (and later, American) military management called upon the scientific community to produce a method to solve immense problems. The resulting method, operations research, involved gathering mixed teams from multiple disciplines to address these problems. The tools developed by this approach were primarily quantitative. The approach to decision making, however, was revolutionary, as the man said, "The Medium is the message.[4]"

Operations research has been adapted by business and science to solve many problematic situations. However, the technique of using mixed teams of professionals to attack a problem has become a major force.

Operations research places a heavy reliance on mathematic modeling. The methods include:

- Linear Programming
- Network Analysis—Pert, Gantt Charts, etc.
- Dynamic Programming
- Game Theory
- Queuing Theory

One final note: The techniques and methods discussed herein can be superb tools. However there are no replacements for the ultimate managerial tool, "Common Sense.[5]"

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[4]Marshal McLuhan, Understanding Media: The Extensions of Man, 1964.

[5]com·mon sense (n)—Sound practical judgment derived from experience rather than study; Encarta® World English Dictionary ©1999 Microsoft Corporation. All rights reserved. Developed for Microsoft by Bloomsbury Publishing Plc

Defining a Problem

Occam's Razor: one should not increase beyond what is necessary the number of entities required to explain anything[6].

In other words, the simplest solution is frequently the correct one.

You're driving along Interstate 25 north of the city of Cheyenne, Wyoming. Suddenly, you hear that annoying sound. It sounds like an airplane coming in for a landing. You get a sick feeling in the pit of your stomach. You have a flat tire. For those of you who have never been on Interstate 25 north of Cheyenne Wyoming, with the exception of a few antelope and scrub brush, there's no there, there. You pull over and check—yes, the tire is flat, and what do you do? What exactly is the problem that you have to solve? The obvious answer is:

"Hey stupid, I have a flat!" Let's examine the situation. We'll get back to our tire later.

Flomberg's Law #2: You can't make a decision if you don't identify the problem

Before the problem can be analyzed and a decision made, you must be aware that a problem exists. In the tire example above, your problem is that you're stuck on the side of the road with a flat tire, one hundred miles from anywhere. Or is that the problem?

Frequently the apparent problem is not the real problem but is problematic, or a *symptom.* A symptom indicates a problem exists, however it is not the problem. Solving the symptom might feel good for a while, however the problem still exists. The successful manager must distinguish between the problem and the symptoms. Treating a gunshot wound with pain medication only addresses a symptom of the situation—it might alleviate the pain. It does not heal the gunshot.

Another situation that the manager needs to deal with is the bias built into the word, problem. The dictionary definition of the word problem is: a question or puzzle that needs to be solved. A problem is not necessarily

[6]Occam's Razor is a logical principle attributed to the 14th Century philosopher William of Occam

a negative situation. A problem simply means that a decision must be made. If there is no decision to be made there, is no problem—only a course of action. Problems can be either positive or negative. An opportunity can present itself that has choices. The selection of the choice can affect the return. The flat tire situation only indicates that there might be a problem. In the flat tire situation, we can assume that the problem is a negative one. But is the flat a problem? It is not. The flat is a state of nature. It exists. Deal with it. *"I have been selected to three colleges."* Is that a problem? So, what is a problem? Is there a problem? The problem is, "Which College do I go to?" When identifying a problem, you must also deal with bias: "We've always done it that way!" This bias may take the form of the timeworn statements like: *"We have to live with that problem. It's not worth fixing."*

A Real Live Problem (Or Is It a Problem?)

Many years ago when I was a computer programmer, I was working on a customer's site, performing maintenance on the company's general ledger software. When I was looking for test data, my team leader, who was an employee of the company, pointed me to a file. As I was going through that file I realized that I was actually in the real corporate ledger. Did they want me poking around in there? Then when I started testing my software changes, I found that the books balanced to a $.23 difference. When I inquired, I was told that the, "problem had existed for a while, no one wanted to spend the time to resolve it."

Was there a problem? Were there two problems? Perhaps there were no problems? Management obviously felt there were no problems. Is bias a problem? Does the fact that I was representing a trusted consulting firm enter into the situation? If you were the auditor, what would you say about this situation? I'll come back to this in a moment.

We can list some of the properties of problem definition. The list might contain:

Who is the person who is making the decision (the Decision Maker)? At what level does the problem have to be solved? Can a team lead solve the problem or does it need to be escalated

to the CEO? Perhaps some level of authority between the two is adequate.

The Goal—What are you trying to do? What is the Big Picture? Do you want to maximize profit? Do you want to minimize cost?

Constraints—What are the constraints that influence the decision? They can be monetary, legal, geographical, ethical or even governmental.

Alternatives—What are the alternatives for you to consider? The alternatives are frequently mutually exclusive.

Payoffs or Penalties—Each alternative should have payoffs or penalties. What are they?

Probabilities—Review past situations. Can history present probabilities of success or failure?

SECTION 2

Using Observations and Anticipated Actions in Decision-Making

Using Observations and Anticipated Actions in Decision-Making

Up to this point we have been looking at Quantitative models. We have used statistics and probabilities to model the environment to provide information so that a manager can make a decision. Quantitative analysis is a superb way to gather information. In "Blink," Malcolm Gladwell discusses the concept of Adaptive Unconscious. This is the part of the mind that makes quick decisions. It has been fertilized by all of your years learning the industry in which you function. Numbers and statistics can aid this decision-making process but it cannot replace it. All of the tools in the world cannot replace your expertise. Let's keep this concept in the back of our minds as we proceed. Let's look at some of the qualitative-based modeling techniques that have become prominent.

Let me briefly fall back into my own experience. Developing a computerized information system is basically an engineering process. Unfortunately, the software engineering discipline is only a few decades old while formal engineering goes back to the builders of the pyramids. We had to learn the processes the hard way. Eventually we came up with a standardized 6-step system:

1. Requirements
2. Analysis or Business Design
3. Design or Technical Design
4. Construction
5. Implementation
6. Acceptance

Requirements, analysis and design involve writing documents that frequently cross department boundaries. Many disciplines may be involved. All must sign off or the project is seriously impacted. The meetings were endless and the process of finalizing the documents became Herculean.

In the late 1970s IBM developed the concept of the Joint Application Design (JAD) Session. The concept is simple. You gather all the important people in a room off-site. Feed them and keep them there until the analysis or design document is complete. It sounds brutal, but it works. The participants generally include:

- Facilitator—a person trained in the JAD methodology that facilitates the discussion and enforces the rules.
- Technical Writer—A person who can transcribe the results in a timely manner.
- End Users—the people who have an actual piece of the pie. The people who will use the product that will eventually be produced.
- Developers—the technicians who will be building the product
- SME's—Subject Matter Experts.

The Facilitator does not have to be technically immersed in the topic; however the facilitator must be able to control the JAD Session and keep it on track. A trained and/or experienced facilitator can be crucial. The presence of a tech writer makes a major difference. If the participants can see the written word immediately there is a minimum of, "That wasn't what I said." If a CASE[1] Tool is being used, the tech writer can be especially effective.

With all the above and the unfettered support of management, a JAD session can be amazingly effective.

The strength of a JAD session is obvious; weeks of work can be compresses into days. A JAD session is effective in an environment where there is a defined development methodology. If there is no existing framework to apply the JAD against, the session degrades into "just another meeting."

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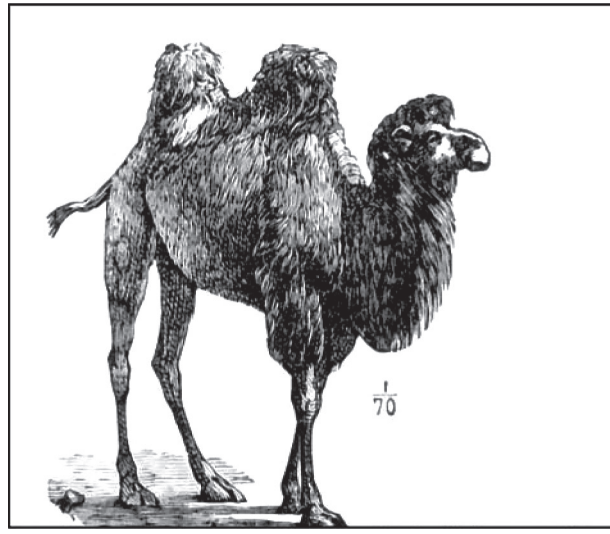
[1]CASE—Computer Aided Software Engineering

A (the?) major problem with any committee-based tool is that there is a short-lived group memory. After a day or so the participants will no longer agree with specificity those ideas that they were in agreement upon during the meeting. The addition of items: A technical writer and a graphics-based CASE tool allow the group to come to agreement. This agreement is based upon deliverable, fact-based documents. The result of this activity can be termed a Prototype.

Ok, you are now asking: how does all this pertain to my marketing problem? Bear with me for a while.

The Importance of Prototyping

Models take many forms. We have been playing with mathematic models. These models are non-graphic and can be hard for some to envision. A prototype is a physical model. In a software system it can be a screen graphic with a minimal amount of functional code behind it. While the prototype may not be fully functional it solves a serious problem. We now have something real. We have something that can be seen. The movement from a purely ephemeral model to one that can be seen, touched and almost tasted is a major step.



Source: Websiter's New International Dictionary of the English Language, 1911, G&C Miriam Co. (released into public domain)

People who live in a qualitative world tend to look for their version of reality. They are the most agreeable when they see this reality; if we are going to work in their world, then we need to be cognizant of this.

It is said that a camel is a horse designed by a committee. This tired old saying sums up the popular opinion of committees. The general consensus is that a committee can do nothing successfully. Let me rephrase that: an unorganized committee can do nothing successfully Most qualitative methodologies involve (evolve in?) meetings. In many, if not most, cases meetings become massive time wasters. In an uncontrolled environment, meetings can and frequently do become confrontational. People tend to go off in tangents and the reason for the meeting rapidly becomes lost. So, how does one control a meeting?

Why Preparing an Agenda Matters

Without a meaningful agenda you are wasting everyone's time. The agenda should spell out, in some real level of detail, the reason for the meeting as well as the topic to be discussed. For example:

Memorandum

To: H. Aardvark, C. Jones, L. Lopez, M Miles, P. J. Peterson, S. Sutra and Z. Zaplitney
From: H. Lee
Date: 07/04/76
Re: Corporate strategy, 07/07/76 Meeting Room A. at 10:00 a.m.

We will be meeting next Thursday to discuss the orientation of our new product, the American Revolution. The Specific Topics to be discussed are:

- Tactics—will we fight in an open plain or shall we be hiding behind trees?
- Uniforms—Mr. Washington has requested Buff and Blue, however Mr. Rogers-Clark insists that forest green would give us a decided advantage.

- Living quarters—shall we have the men supply their own tents or can we standardize? If we standardize, we need to appoint a subcommittee to recommend a supplier and pricing.
- Rank Structure—Mr. Washington insists on traditional military ranks; however our Boston contingent feels that the men should elect their own leaders.

How shall we decide these issues?

Please email your acceptance to the meeting. If you cannot make this meeting, please tell me who will be representing you.

—"Lighthorse" Harry Lee

Here's how you do it:

1. The names in the memorandum are in alphabetic order. Yes there are people who look at these things as an indication of political power. Head that one off.
2. Each topic has a brief description. If there is a decision, indicate the choices. Any more detail is not needed.
3. Topic, time, date and location are prominently placed at the top.
4. Ask for an RSVP. If you are emailing—generate a return receipt.
5. The memo must go out at least one full business day before the meeting. Two or three days would be even better. More than three days would invite people to conveniently forget. At the beginning of the meeting review the agenda.
6. Do not allow the meeting to go for more than one and a half hours. Schedule another session if there is a need.
7. Set up a "Parking Lot." Have a place to record topics that need resolution outside of the meeting. It should be either a black/white board or a large sheet of paper.
8. If at all possible, do not invite your manager (or your manager's manager for that matter). If you do, the meeting becomes his meeting. If you must invite him—establish privately the procedure that you are going to follow and get his support. If he refuses to follow your wishes—get your resume in shape.

9. If a topic is brought up that is not on the agenda—steer the conversation back to the agenda—reschedule a meeting to discuss that point or put it on the "parking lot." Ensure that every issue is either resolved or assigned to a person at the meeting for resolution.
10. After the meeting send out a memo promptly reviewing the decisions and any topics assigned to someone.

The Role of Brainstorming and the Straw Man in Decision-Making

A brainstorming session can be very successful, if the rules are followed. The rules are easy:

- Everyone takes turns proposing ideas.
- No ideas are ruled out for ANY reason.
- All of the ideas are recorded.

Once the brainstorming is done, the ideas are recorded and another smaller committee reviews them and moves forward. As we will see, the brainstorming session becomes the bedrock of many qualitative decision techniques. You come out of a brainstorming session with a set of solutions or actions. The set might be ponderous, however, it belongs to the entire committee. The ego has been removed. The next step is obvious: a small team reviews all of the suggestions, prioritizes them and evaluates them.

Another very powerful tool is a Straw Man. A committee is a poor way to develop a document. Committees tend to be populated by people waiting for "someone else" to get started. Therefore, to get the inertia going, have someone build a document as a starting point before the meeting. At the meeting, present this "Straw Man" document and let the group modify it. The person writing the document must be aware that his document is not going to survive in the form that it started.

Brainstorming and the Straw Man approach have one factor in common. They remove the EGO from the situation. People tend to take ownership of documents and ideas. If you criticize either one, you are criticizing the individual. Brainstorming opens to floor to all ideas equally. A Straw Man is written with the presupposition that the document will be a starting point.

Executive Opinion and Consensus Decisions

The Jury of Executive Opinion has become the catch phrase for a number of modeling techniques. The definition of this technique is that it is:

> "…A method of forecasting using a composite forecast prepared by a number of individual experts. The experts form their own opinions initially from the data given, and revise their opinions according to the others' opinions. Finally, the individuals' final opinions are combined[2]"

In other words:

- A group of "Executives" are gathered into the jury and presented with a problem (or most likely a problematic situation).
- Members of the jury form their own opinion as to the solution to the problem.
- The Jury reviews all of the solutions and develops a consensus.
- With a group of executives, a consensus may be impossible. Tying up a group of executives can be a very expensive affair.
- Scheduling becomes a nightmare—communication is nearly impossible.

While traditionally used as a forecasting tool, the jury is being applied to many forms of decision analysis. A JAD session is a form of this process. The thrust of this procedure is using multiple people's expertise to solve a specific problem. The disadvantages are many in this raw form. A JAD session works around this by placing the focus in a trained facilitator.

The Delphi Method Demonstrated

In the early 1950s, the RAND Corporation did a study for the United States Air Force. The study was aimed at forecasting future Department of Defense technology needs in the face of a nuclear attack by the Soviet

[2]http://www.bankofbaku.com/utilities/glossary/jj.htm

Union. This study, "Project Delphi," laid the groundwork for effectively using teams of experts for decision-making. The Delphi Method is a method of obtaining and refining group judgments. The Delphi Method is based upon three features:

- Anonymous response
- Iteration and controlled feedback
- Statistical analysis of the response

These procedures are aimed at removing the "ego" problems often associated with strong-minded individuals. While the Delphi Method is usually applied to forecasting, the model lends itself to any complex decision making situation. It has been used in industry with increasing frequency. In 1969 a RAND study was conducted comparing the Delphi Method to face-to-face interaction:

"The results indicated that, more often than not, face-to face discussion tended to make the group estimates less accurate, whereas, more often than not the anonymous controlled feedback feature made the group estimates more accurate.[3]"

A JAD session involves a group of users and technology-based people looking at resolving a set of specifications. The Delphi Method is aimed at higher-level decision makers.

One notable problem with the Delphi Method is its application to education. Accusations have been made that the technique is a method of forcing people to bend to the will of the administrators. Obviously, any tool can be used improperly. I will not pursue that topic.

- Traditionally, group consensus is reached through face-to-face meetings. These meetings tend to have certain obstacles:
- Certain dominant individuals can sway the group simply through their presence.
- A chief executive or simply a person who talks a lot can easily sway the group.

[3]Dalkey, Norman C. The Delphi Method: An Experimental study of Group Opinion, Santa Monica CA: The RAND Corporation, 1969, page vi.

- Keeping a group on track is frequently a major problem. People bring their own interests into a meeting. You can depend on the meeting veering away from problem solving easily.
- Peer pressure will discourage an individual from disagreeing with a popular opinion.
- Arranging a meeting imposes scheduling restriction. Finding a time and place that can suit multiple people is frequently extremely hard.
- The cost of getting people in that room can be high. Their time is dedicated to the purpose of the meeting, exclusively.
- Meetings must be documented to be effective. This frequently does not happen.

While the Delphi method is not a panacea, it is a good workable remedy for many of these problems. Delphi provides the benefits of pooling and exchanging opinions amongst participants in the consensus group so that they can each learn from each other without the inherent problems of face-to-face meetings.

The Delphi Method reigns supreme in long term analysis. It optimally uses both the qualitative and quantitative knowledge of a group of selected experts. It is a procedure that can be used to identify concepts that are relative to long range planning. It attempts to solidify complexities to single statements that can be analyzed.

> "The . . . Delphi method's unique strength is that it incorporates education and consensus building into the multistage process of data collection, thus enabling description of agreement about specific.options among key players.[4]"

The Delphi method will not predict the future; it will aid in being prepared for it. As with any tool of this type, there are no firm laws governing the implementation of the tool. The steps that I provide are a suggestion drawn from experience and expertise of the literature of the field.

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[4]Rayens, Hahn / Consensus Via Policy Delphi Method

First Step: Assemble a Panel of Experts

Since a Delphi is conducted by correspondence as opposed to gathering people in a single room, there are fewer limitations on the size of the panel. Putting more than seven or eight people in a room for a committee meeting seems to be the limit of effectiveness. Size is not nearly as much of a hindrance in a Delphi. A large group of experts lends credibility to statistical analysis as well as the results.

If you send out specific number of invitations, there will be a fewer number of responses. One might assume that the person, or office, sending out the invitation will have a definite influence on the number choosing to respond. A CEO, for instance, will generate more response than a supervisor.

- You want a blend of backgrounds. If you only contact accountants, or restrict invitations to marketing types, you will slant the results of the Delphi.
- Subject Matter Experts (SME's) come at all levels and hide in the most innocuous places. Some time might be spent informally discussing the Delphi with some "Old Hands" to root out the SME's
- You don't want to use invitations as a status symbol. Remind those participating that their responses will be handled anonymously.

How many? Select a number somewhere between 10 and 1000. This ambiguity is intended. The topic and environment will be the deciding factor.

Second Step: Develop an Initial Questionnaire

The first questionnaire is, by intent, fairly general. The purpose of this questionnaire is to establish the direction of the Delphi. For example[5], in

[5]http://instruction.bus.wisc.edu/readings/delphi.htm

one situation in a medical clinic, a Delphi was constructed to answer the following question:

"What action could be taken to provide faster response to patient inquiries between visits?"

Questionnaire #1 could be constructed as follows:

The purpose of this questionnaire is to elicit your ideas regarding the following issue:

What action could be taken to provide faster response to patient inquiries between visits?

Please engage in individual brainstorming so as to generate as many Ideas as possible for dealing with this issue. Please list each idea in a brief, concise manner. Your ideas do not need to be fully developed. If fact, it is preferable to have each idea expressed in one brief sentence or phrase. Your ideas will be anonymously included in the next questionnaire.

Idea # 1:

Idea # 2:

Idea # 3:

Idea # 4:

Idea # 5:

Do you notice a familiarity between the Delphi and brainstorming?

Third Step: Compile Initial Questionnaire Results and Issue a Follow-up Questionnaire

Once the questionnaires have been returned, they are collated. Identify which suggestions are most frequently made, comb nine them if possible. You might have to reword the results, however, be careful not to change

the meaning. Publish the list, asking the respondents to evaluate each suggestion according to the following criteria:

1. Reliability—
   a. Very Reliable
   b. Reliable
   c. Unreliable
   d. Very Unreliable
2. Desirability
   a. Very Desirable
   b. Desirable
   c. Undesirable
   d. Very Undesirable
3. Feasibility
   a. Very Feasible
   b. Feasible
   c. Unfeasible
   d. Very Unfeasible

Publish and distribute the list to your panel of experts with the ideas from the first questionnaire. When you publish the list, ensure that all ideas are presented with no attribution or any indication as to the popularity of the idea.

When the questionnaires are returned, you have a list of ideas that can be evaluated quantifiably. Evaluate the list and the results and compute the ideas that score the highest. Eliminate the ideas that perform the poorest and reformat the second questionnaire. If you assign a point value in the range of 4 (Very Positive) through 1 (Very Negative), a statistical analysis of the results can be taken. The poorest responses are eliminated and the step is repeated. One caution: have an even number of options for the panel to select from. If there is an odd number—you usually will find a predominant number have chosen the middles response. An even number forces some thought. Review this questionnaire when it is returned and repeat the process

After two or three iterations you should have the list down to a small number of workable solutions.

Fourth Step: Evaluate the Results

Now that you have a smaller number of workable solutions, keep in mind: this has been a Consensus Building exercise. The remaining solutions are those wherein there is a consensus of the respondents as to a workable solution. Which of them is best? You might:

- Redo the Delphi with a smaller group of experts starting with the results that have been gathered.
- Bring in a select group of SME's and ask them to come up with the final solution
- **Make a Decision**.

In the last chapter of "Blink," Gladwell discusses an extremely talented female trombonist who tried out for a prominent European orchestra. The European tradition was that a trombone was a "man's instrument." The idea of a woman being able to play this horn was unthinkable. She was turned down in audition after audition, however, in a blind audition where the player was behind a curtain, the woman repeatedly demonstrated her abilities.

The Delphi is that curtain. The process of evaluating the input is handled "behind a curtain" so that the individual who is submitting the information cannot influence the value of the information.

Example: An Extended College Campus

Flomberg State College is an urban institution in a major city. The school has opened two external campuses to facilitate those who cannot easily get to the main, downtown campus. One campus is north of downtown; the other campus is south of downtown. Each is located next to a major freeway exit. They are both easy to get to and parking, which is a major problem at the main campus, is excellent. Facilities have recently been expanded. Unfortunately registration has been disappointing. Classes have been cancelled due to poor enrollment. I have asked five of my students to use the class as a sample for analyzing the registration difficulties and come up with solutions.

The first memorandum follows:

Memorandum

To: Distribution
From: Dale Boughton
Cristopher Baur
Callie Hodge
Chris Morgan
Patrick Maher
Date: March 6, 2006
Re: Flomberg State College Extension facilities

You have been selected to assist us in improving attendance at both FSC North and FSC South. Your selection has been based upon your obvious expertise in the area.
Please review the following questions:

- What action could FSC take to get you to take classes at FSC North/South?
- What factors do you consider when choosing classes?
- How can the perception of FSC North and South be improved?

Please engage in individual brainstorming so as to generate as many ideas as possible for dealing with these questions.

Please list each idea in a brief, concise manner. Your ideas do not need to be fully developed. If fact, it is preferable to have each idea expressed in one brief sentence or phrase. Your ideas will be anonymously included in the next questionnaire. Please use the back of this page if needed, or attach as many sheets as you need

The first memorandum resulted in seven responses:

1. Better Advertising signage and communications to improve the awareness of the extended campuses
2. Better scheduling, times, days and selection of classes
3. Better college oriented environment and perception of the extended campuses
4. Better variety of core classes
5. Costs
6. Include course searches of all campuses into one screen \Include quality food and beverages at affordable prices.

These questions were keyed into the second survey. Each question was ranked 1 to 4, with 1 being best, according to the Reliability, Desirability and Feasibility.

The results of the survey were:

Enrollment at FSC Extended Campuses

Question	Description	Mean	SD	from	to
2	Better Scheduling, times, days, selection of classes	5.5	1.2	4.3	4.7
5	Costs	5.6	2.52	3.08	8.12
4	Better Variety of Core Classes	5.8	2.01	3.79	7.81
1	Advertising, Signage and communication	6.3	1.72	4.58	8.02
6	Include course search of ALL campuses on one screen	6.3	2.5	3.8	8.8
7	Quality of food and drink	6.95	2.62	4.33	9.57
3	Environment and perception	7.05	1.94	5.11	8.99

Note:
1) The scores on the questions ranged from 1 (Best) 4 (Least) and combined per question.
2) The "From and To columns reflect 68% (One Standard Deviation)

Question: What assumptions can you make from this Delphi survey? What recommendations can you deliver to your client?

Out of curiosity—what is the difference between assumptions and recommendations as they are used above?

Constraint Management[6]

The Theory of Constraints (TOC) is a management philosophy developed by Eliyahu M. Goldratt. TOC is a systems approach based on the assumption that every company has at least one process that causes a bottleneck, reducing the company's ability to meet its goals. TOC allows maximizing profit by assuring that the factor that limits production (The Constraint) is used most efficiently.

Both eastern and western forms of self-defense or Martial Arts have one thing in common—balance. However, in many western forms of self-defense such as boxing, the combatants use their own strength to destroy their opponent. In many Eastern forms of self-defense, the combatants seek to use their opponent's strength against them.

The Essence of Toc

"Find the essence of each situation, like a logger clearing a logjam. The pro climbs a tall tree and locates the key log, and blows it, and lets the stream do the rest. An amateur would start at the edge of the jam and move all the logs, eventually moving the key log. Both approaches work, but the essence concept saves time and effort. Almost all problems have a key log if we learn to find it."

—Fred Smith, *Information Systems theoretician and programmer*

Implementing Constraint Management

The original Goldratt "process of ongoing improvement" can be stated as:

1. Identify the system's constraint(s)
2. Decide how to exploit the constraint(s)
3. Subordinate everything else to the above decision
4. Elevate the constraint
5. If, in any of the above steps, the constraint has been broken, go back to Step 1

[6]Goldratt, The Goal

Obviously this becomes iterative. As we identify and control a constraint, another constraint might become critical. If you do this more than three times, chances are, there's a deeper problem. Therefore, what do we change?

- Locate the Constraint—the bottleneck. Define the Problem.
- As we control the constraint, we control the process
- We must be aware of erroneous perceptions, assumptions and paradigms
- What do we change to?
- Focus on global performance, rather than local performance
- If "What to change" are the existing but erroneous perceptions, paradigms, and assumptions, then to what to change to must start with their replacement.

Applying Constraint Management

TOC has a strong relationship to classical Critical Path Method (CPM). CPM allows us to examine all possible relationships within the process and identify the path that takes the most resource. This path is the critical path. TOC similarly identifies the system constraint that is crucial—the "weakest link." This constraint is the place on which to concentrate our efforts. Once these constraints are managed, other constraints must be observed else they become critical. As we address a constraint we eventually get it under control. At that point, we locate the next constraint that affects the system and repeat the analysis and improvement process.

TOC differs from classical cost accounting in that the effort places emphasis on variable expenses rather than fixed expenses. Fixed expenses are not adjustable; the variable expenses can be directly related to production, or the lack thereof.

A fundamental principle of this process can be illustrated by the example of liquid pouring out of a bottle. Intuitively we realize that the width of the bottle opening constrains the amount of liquid pouring out. However, if we do some classical problem analysis we realize that the one constraint is the air coming into the bottle to replace the liquid. Every freshman high school science course addresses this one. By shaking the

bottle in a circular manner, we get a mini-whirlpool that allows air to enter more rapidly and allows the liquid to exit more rapidly as well.

While the first analysis indicated the major constraint was the size of the opening, with further analysis we realized that the primary constraint (the actual problem, perhaps?) was getting air into the bottle. The limiting factors which affect the ability of a factory to produce a product over a period of time is similar to getting the water out of the bottle.

While this is a gross simplification, there is a running commonality through the topic of Decision Theory on identifying and addressing the problem, not the symptoms.

In my Undergrad days I took a programming course called Advanced Fortran. This obviously was a course covering the finer points of the programming language FORTRAN. FORTRAN, An acronym for Formula Translation, was the one of the first high-level computer languages and a direct predecessor of BASIC.

One of the principle structures in FORTRAN is a Do Loop. A Do Loop is a set of commands that allow the program to iteratively repeat a series of instructions until some condition is complete. An example might be:

```
sum = 0
do 10 i = 1, n
   sum = sum + i
   write(*,*) •sum =•, sum
10 continue
```

This chunk of code will print the numbers from one to ten. Don't worry if this seems like a Serbo-Croatian love-poem. I just wanted to make a point.

FORTRAN also has a structure called an "Implied Do Loop". This structure provides some additional functionality:

1) The use of an Implied Do Loop allows you to combine multiple, complex statements into one incredibly cumbersome statement.

2) The use of an Implied Do Loop provides job security. It is nearly impossible to decipher another's code, especially while solving a production problem at 2:00 in the morning.

I was taking a test in the above-mentioned class one day. The test involved writing a program that would print a checkerboard pattern on the printer. This is a common test question for this subject. It forces the student to think through the use of Loops. While I was digging through the code that I was writing I realized that I could write the entire program with one three-line long implied do-loop. I have no idea how it really worked; I just knew that it would. I turned in my test with this statement. About a week later I had my test returned with full credit. Written on it was this comment:

Howard,
If you ever do this to me again,
I will kill you.
—*Professor Brown*

Apparently Professor Brown had to travel into the computer lab (This was before PCs and Online access) and type in the code that I had written in order to test it. The code worked. I don't know how or why, but I knew it would work.

How often have you met someone and instantly formed a dislike or, for that matter, an instant like for that person? You don't know why, but you do. Our minds constantly gather information and provide it to us. Malcolm Gladwell describes this rapid cognition in his book Blink. He calls this process Thin Slicing. Thin slicing is the act of relegating the decision-making process to, what Gladwell calls, the adaptive unconscious by focusing on a small set of key variables, as opposed to consciously considering the situation as a whole over as much longer period of time.

Thin slicing can also be done consciously. The main characteristic of thin slicing is that only a few key factors are considered in the decision process. Even if more information is available, it is classified as irrelevant and discarded. The success of thin slicing in several situations is described in Blink. The idea of thin slicing challenges the commonly held belief that "more information is better" when making good decisions.

Hopefully you got to the point where you have to make key decisions the hard way. You worked your way up the proverbial ladder, rung by rung[7]. On your way to management you learned many lessons. You

[7]I love a good cliche

absorbed the "feel" of the job. A large amount of knowledge is with you, intuitively, whenever you are at work. Gladwell defines this adaptive unconscious[8] as the part of our brain that leaps to conclusions. He describes this adaptive unconscious as a "kind of giant computer that quickly and quietly processes a lot of the data we need in order to keep functioning as human beings." Gladwell cites the example of a person walking across a street. When he sees a truck bearing down upon him, he does not have time to ponder all of the options available. If he is to survive, he jumps out of the way. This is the essence of thin slicing.

As a manager you are asked to evaluate a series of options to solve a particular problem. You review the options critically and decide which option is optimal for the solution. You instinctively know that the optimal solution is wrong. You cannot explain it, however your gut tells you that to follow the numbers is wrong. What do you do? Time and time again, when I did not follow my gut instinct I made the wrong decision."

An article in *Federal Computer Weekly,* "Exploring intuitive decision-making[9]" discusses the topic, referring to it as Intuitive Decision Making:

> "…Instead of trying to deliver a perfect picture of the battlefield, we need to shift from that because the battlefield is chaotic and commanders are trained early on in their careers to make decisions based on their experience, intelligence and intuition," McAbee told Federal Computer Weekly… "One shoe doesn't fit all," McAbee said. "We need to tailor that stimulus. I think it will be incremental and we may never [fully] develop the system, but we need to start down that road and start developing the system in some areas to assist commanders in intuitive decision making."

Thin Slicing, Intuitive Decision Making and Gut Instinct; they are all terms that relate quite closely. One of the dangers in decision-making is, as discussed above, excessive information. Thin slicing is an alternative—weigh your gut against the available options.

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[8]Blink, pg. 11

[9]http://www.fcw.com/article78285

Scenario: An Extended College Campus

You have been retained as a consultant for F & L University. The school is looking at updating their methodology for updating and disseminating their content management system. You have been given the following case study. Stellent's website[10] says:

> "Stellent is a global provider of content management software solutions that drive rapid success for customers by enabling fast implementations and generating quick, broad user adoption. Stellent Universal Content Management enables customers to rapidly deploy line-of- business applications as well as content management solutions for enterprise initiatives such as enterprise portals and business commerce applications."

For the case study in question, do not consider the financial situation. Answer the following questions:

1. The Goal—What are you trying to do? What is the Big Picture? What problem are you addressing?
2. Constraints—Other than money, what are the constraints that influence the decision?
3. How does the University of Alberta compare to F & L University. Assume that F&L is much like your current school.
4. Alternatives— What are the alternatives for you to consider.
5. Payoffs or Penalties— Each alternative should have payoffs or penalties. What are they?
6. Probabilities—review past situations. Can history present probabilities of success or failure?

[10]http://www.stellent.com

SECTION 3

Selecting and Using the Right Decision-Making Tools for the Appropriate Situation

Selecting and Using the Right Decision-Making Tools for the Appropriate Situation

"Punishing honest mistakes stifles creativity. I want people moving and shaking the earth, and they're going to make mistakes."

—H. Ross Perot, Founder, EDS

So far we've been concentrating on the tools, both qualitative and quantitative. If the corporate environment does not foster clear exchange of information, decisions will not be made. In Up the Organization, Townsend says that you've got to play "You Bet Your Job" occasionally. How do you establish an organization that allows people to make decisions, knowing that some of them will be wrong?

Making the Final Decision

Once upon a time, back in the European Middle Ages, the small city-states were involved in constant wars. The Gosdorks[1] were especially adept at strategy and tactics. In a war with a small Blogrod army, the Gosdorks had the Blogrod positioned so that they were attacking uphill on a hot day with the sun directly in their eyes. Normally, in this situation, the Blogrod general would surrender honorably and they all would go home for cocktails, having saved their honor.

[1]I don't remember the names of the actual combatants, so I made these up.

However, this Blogrod general decided to fight, and fight they did. Blogrodistan won the day, as the Gosdorks had never been up against such an uncivilized general, one that refused to follow the civilized rules.

I may have the story wrong, or it just might be a nice fairy tale, however the message is quite clear. You did not get into the position where you have to make this decision by accident. You have worked your way up through the ranks and are now expected to do your job, and you job is to make decisions.

While writing this book, I frequently turned to the Internet for references. I brought up Google and keyed in the words Information Overload. Google returned 5,060,000 references. If I spend 30 seconds looking at each reference— that's 42,166.7 hours; or almost five years, working 24 hours a day, 7 days a week to check each reference. That is a meaningless statistic; however it does prove a point. There is a common phrase in the Information Technology field: "The Paralysis of Analysis." An excessive amount of information frequently strikes the analyst and leaves him unable to make a decision. This is the primary danger of quantitative information. The analyst feels that, "we need just one more study, just one more set of data." If enough analysis is done, then we hope the problem will disappear of its own volition. Unfortunately…

For example, over the last three years there has been a 300 percent increase in the rate of leprosy in the USA. That is an impressive statistic. However when you examine the number—we come up with the probability of getting Leprosy has climbed to .23%. That's 23 cases in a population of 10,000 people of a disease that's easily treated with antibiotics[2]. The disease is commonly spread by exposure to armadillos. One source that I found refers to the, "shocking rise in incidence of Leprosy." Sound like we have an infestation of armadillos in this country?

In his classic management book, *Up the Organization,* Robert Townsend defines and discusses the word decision:

> *"All decisions should be made as low as possible in the organization. The Charge of the Light Brigade was ordered by an officer who wasn't there looking at the territory. There are two types of decisions: those*

[2]http://100777.com/node/501

that are expensive to change and those that are not. A decision to build the Edsel or Mustang (or locate your factory in Orlando or Yakima) shouldn't be made hastily; nor without plenty of inputs from operating people or specialists. "But the common garden-variety decision—like when to have the cafeteria open for lunch or what brand of pencils to buy—should be made fast. No point in taking three weeks to make a decision that can be made in three seconds—and corrected inexpensively later if wrong. The whole organization may be out of business while you oscillate between baby blue and buffalo-brown coffee cups."

"The Huns at the Battle of Chalons." Illustration by A. De Neuville (1836–1885). *This image is in the public domain.*

Another point of view towards decision-making can be gathered from the fascinating book on leadership *Leadership Secrets of Attila the Hun*[3] (NO, I'm not kidding!). Dr. Roberts lists the "Attilaisms" for Decision Making:

- Every decision involves some risk.
- Time does not always improve a situation for a king or his Huns
- Fundamental errors are inescapable when the unqualified are allowed to exercise judgment and make decisions.
- Quick decisions are not always the best decisions. On the other hand, unhurried decisions are not always the best decisions.
- Chieftains should never rush into confrontation.
- A chieftain's confidence in his decision making preempts name-dropping to his Huns
- It is unfortunate when final decisions are made by chieftains headquartered miles away from the front, where they can only guess at conditions and potentialities known only to the captain on the battlefield
- When victory will not be sweet, the chieftain keeps his Huns from war.
- The ability to make difficult decisions separates chieftains from Huns.

[3]Roberts, Wess, PhD. L

Managing Projects: an Overview

A Construction Project: The Plan

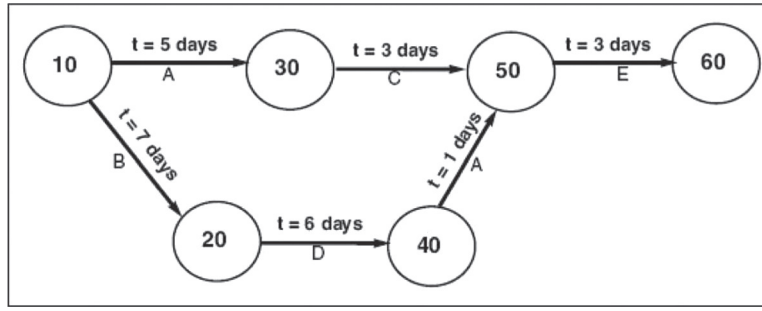
Frequently when asked to make a decision, a few questions arise:

- How much will it cost?
- How many people will be needed?
- How long will it take?

Interesting questions. How do you answer them? One excellent method is to go back into your project file, find a similar project and use the information to estimate the outlay of assets that can be expected. The most common way is to have all involved sit around a table and take guesses.

Industry has realized, finally, the importance and value of data. Many (most?) major corporations have added a position to the executive suite, CIO, or Chief Information Officer. Data Processing has become information technology. That file of past project has become a valuable asset. However, how do we build that file? Three tools have become commonplace. They all have a similar background.

One of them is called PERT charting. PERT stands for "Program Evaluation Review Technique". This technique was developed by the U.S. Navy in the 1950s to manage complex projects. An industrial version of a Pert Chart is a CPM Chart (Critical Path Method).



This pert shows two distinct processes:

1. A, C, E for 11 days
2. B, D, F, E for 17 days

Path 2, which is the longer of the two is the "Critical Path". This path defines the length of the project. If this tasks slips, the entire project slips.

A Pert/CPM Chart shows tasks, their relationship and both estimated and actual start and finish times. The leading Project Management software is Microsoft Project®. MS Project provides an all-encompassing tool that allows presentation of a PERT chart (called a Network Diagram in Project) as well as a Gantt chart. The Gantt chart has become an industry standard. Henry Laurence Gantt (1861–1919) was a mechanical engineer who developed Gantt charts around the turn of the 20th century. Gantt charts are used as a visual tool to show scheduled and actual progress of projects. Today's Gantt chart software also allows tracking labor and costs.

Gantt charts are frequently used on large construction projects like the Hoover Dam, started in 1931, and the interstate highway network started in 1956. However a Gantt chart is also quite useful for smaller project. Microsoft Project® is the tool most frequently used for the development of Gantt charts.

In this example, a Project Phase (Analysis) is shown with seven subordinate tasks. The estimated start and stop times are shown as well as the dependencies. Note that the tasks "Document Processes" and "Document Process Flow" cannot start until the task "Identify Processes" is complete. Both tasks can be done simultaneously.

MS Project, and many other available tools, allows a manager to track:

1. Phases
2. Tasks
3. Sub Tasks
4. Estimated Start and Finish

5. Actual Start and Finish
6. Dependencies
7. Labor
8. Calendar
9. Expenses

A project management tool models[4] the project. It allows management to create a repository of projects and use them as a tool for planning future projects. This repository also allows management to answer those annoying questions:

1. How much will it cost?
2. How many people will be needed?
3. How long will it take?
4. How will I know when it's done?

By the way, answering that fourth question often spells the difference between the project's success and failure. The prevailing method of project planning is a top-down, iterative process. The procedure can be explained as:

1. Identify the primary tasks.
2. Parse the tasks to its subordinate sub-tasks
3. Have I totally defined the project, or subordinate task at the current level?
4. Ask yourself: Have I totally defined the project at the level that I can work from. If the answer is "Yes"—you're done.
5. Can I parse each subordinate task to its next level? If the answer is "No"—you're done.
6. Go back to number 2 and proceed for each "leg" identified by a subordinate task.

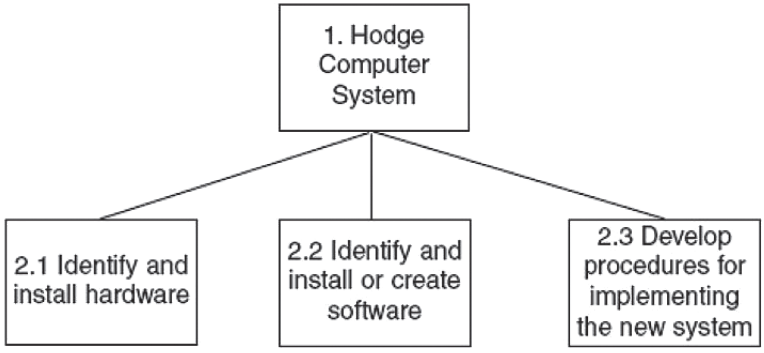
[4]Model: A representation of reality that can be used to aid in construction of the actual object

Factoring in the Human Element

Ms. Amy Hodge of Hodge Construction wishes to set up a computer system for tracking construction projects. Using the six-step procedure we start:

Level 0

Has she totally defined the project, or subordinate task at the current level? While this is obviously not anywhere near the level that she can work from, at this highest level the project is completely defined. Questions four and five are not satisfied so she goes back to step 2 and parse:

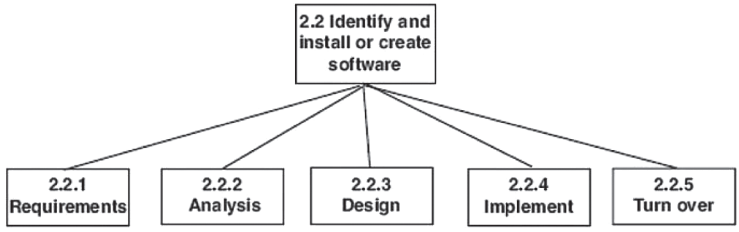


Level 2

She is now starting to build her hierarchy. Ms. Hodge can make a couple of observations. She has essentially created three sub-projects: hardware, software and integration. She has also started a numbering system. This numbering system allows her to track and place any task within the

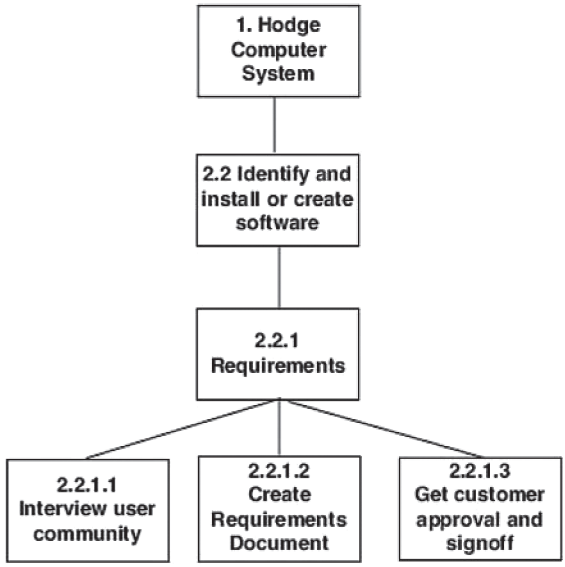
hierarchy. So let's go back to the questions. Obviously Ms. Hodge hasn't resolved question 5 ("Can I parse each subordinate task to its next level? If the answer is 'No'— we continue parsing.") Let's look at box 2.2 (above) Traditionally; developing software is done in a series of phases:

- Requirements—Scoping out the project and identifying completion criteria. In other words asking: How big is it? How much is it going to cost? What will the deliverables be?
- Analysis—Defining the project from the business point of view. This phase identifies and defines all of the processes and how they relate to each other.
- Design—Deciding how to accomplish the task technically. Looking at hardware and software requirements happens now. Programming specifications are now written. Implementation—This step involves assembling the system. Programs are now written and tested. The system is now constructed.
- Turnover—This is the final step. The customer reviews all of the test results and makes the decision to accept the system.

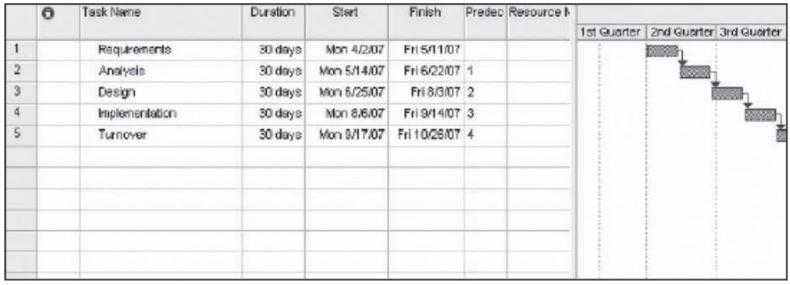


Again, a few observations: As we go down the hierarchy, the span increases drastically. At level one we had one task. At level two we had three tasks. At level three we have five tasks, and we've only parsed one third of

the level. So potentially, we might have in excess of fifteen tasks at level five. Let's just follow one of our identified legs:



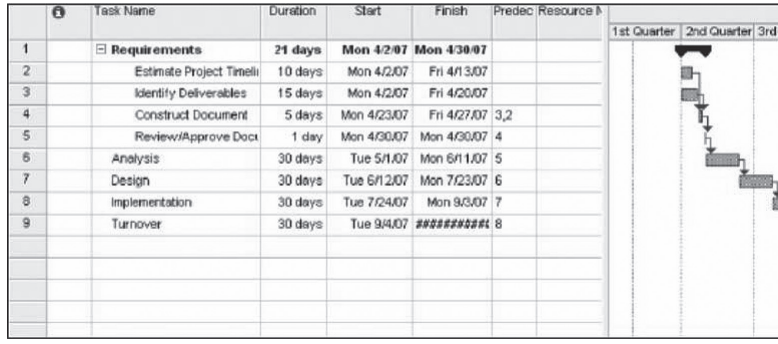
Next:
Setting up a Gantt chart
Building the base project plan



The five phases have been loaded in as tasks. Each task has been set to thirty days and a base linkage has been established. Please note that there are many books available to learn the essentials of manipulating MS Project. Next, the Requirements phase is parsed into the subordinate tasks. For this example, the following tasks have been identified and the following detail information:

	Task	Time in days	Predecessor tasks
1	Estimate Project timeline	10	
2	Identify Deliverables	15	
3	Construct document	5	1,2
4	Review and approve document	1	3

This information is now transferred to the Gantt chart.



As the detailed tasks are entered, the total duration for the phase is constructed. As predecessors are identified, the start and finish dates are computed. Ms. Hodge finds that the requirements phase will take 21 days to complete if started on April 2. The program also allows her to modify the calendar to allow for vacation time and holidays. Also, the actual Gantt chart will be cleaned up and formatted later. OK, Let's look at the

next phase, Analysis. The Analysis phase has been parsed down to the task level. I'll discuss the WHO column soon!

	Task	Days	Who	Predecessor tasks
1	Identify Processes	15	All	
2	Document Processes	10	NW, DB. DG, JN	
3	Construct relationships and dependencies	5	All	
4	Define process flow	3	NW. DB. DG, JN	
5	Document process flow	4	NW, DB. DG, JN	
6	Construct analysis document	3	TT, TG NW. DB, DG. JN	
7	Review and approve document	1	TG, DG, TT	

As a result of the preliminary analysis, three distinct sets of deliverables (programs, screens, reports, etc) have been identified. The Requirements document and the Analysis document identified the information needed for these deliverables. The Design document provides the detailed specifications for these tasks and deliverables.

	Sub-system	Task	Days	Who	Predecessor Tasks
1	1	1	12	NW	
2	1	2	9	DB	
3	1	3	3	DB	2
4	2	4	2	DG	
5	2	5	4	DG	4
6	3	6	8	JN	
7	3	7	7	JN	6
8	3	8	2	JN	7
9	3	9	9	JN	8

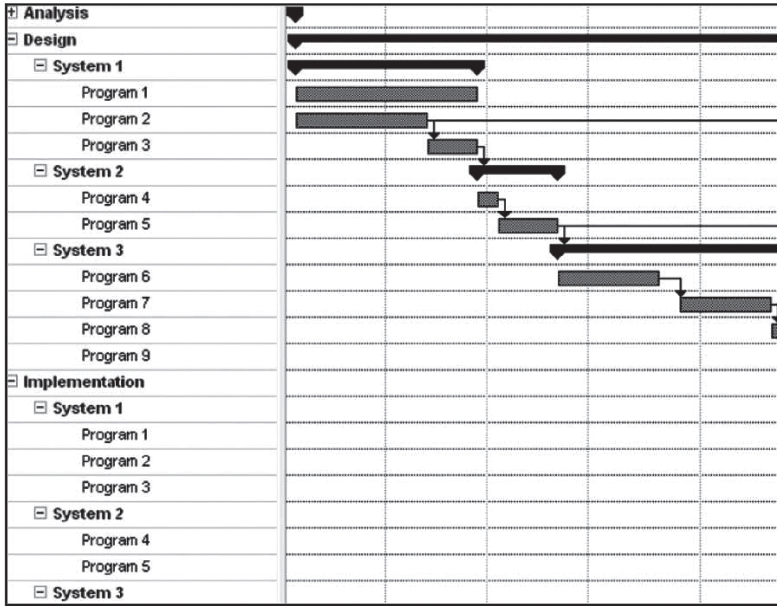
After completing this portion of the project plan, we now have all of the tasks and dependencies entered. A summary view is:

	Task Name	Duration	Start	Finish	Prede
1	⊞ Requirements	21 days	Mon 4/2/07	Mon 4/30/07	
6	⊞ Analysis	38 days?	Tue 5/1/07	Thu 6/21/07	5
14	⊞ Design	44 days	Fri 6/22/07	Wed 8/22/07	13
27	⊞ Implementation	45 days	Thu 8/23/07	Wed 10/24/07	26
40	⊞ Turnover	3 days	Thu 10/25/07	Mon 10/29/07	

Clicking on any plus (+) sign expands any tasks to reveal its subordinate tasks.

	Task Name	Duration	Start	Finish
1	⊞ Requirements	21 days	Mon 4/2/07	Mon 4/30
6	⊞ Analysis	38 days?	Tue 5/1/07	Thu 6/21
14	⊟ Design	44 days	Fri 6/22/07	Wed 8/22
15	⊟ System 1	12 days	Fri 6/22/07	Mon 7/9
16	Program 1	12 days	Fri 6/22/07	Mon 7/9
17	Program 2	9 days	Fri 6/22/07	Wed 7/4
18	Program 3	3 days	Thu 7/5/07	Mon 7/9
19	⊟ System 2	6 days	Tue 7/10/07	Tue 7/17
20	Program 4	2 days	Tue 7/10/07	Wed 7/11
21	Program 5	4 days	Thu 7/12/07	Tue 7/17
22	⊟ System 3	26 days	Wed 7/18/07	Wed 8/22
23	Program 6	8 days	Wed 7/18/07	Fri 7/27
24	Program 7	7 days	Mon 7/30/07	Tue 8/7
25	Program 8	2 days	Wed 8/8/07	Thu 8/9
26	Program 9	9 days	Fri 8/10/07	Wed 8/22
27	⊞ Implementation	45 days	Thu 8/23/07	Wed 10/24
40	⊞ Turnover	3 days	Thu 10/25/07	Mon 10/29

However a Detailed Gantt chart tells the entire story



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Getting It Right, Volume Two

How Managers Can Make Better Decisions by Using Observations and Anticipated Actions

Howard Flomberg

Howard Flomberg has been an adjunct professor and lecturer of computer information systems at Metropolitan State College of Denver since 1978. His course load has included systems analysis and design, business statistics, COBOL, visual basic, and computer architecture. Currently Mr. Flomberg is concentrating on teaching business statistics and advanced business statistics.

With more than 30 years of experience in the information technology industry consulting for many fortune 100 and 500 companies, Mr. Flomberg has garnered a national reputation for his exceptional system development and database design credits.

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