Long-Range Forecasting.

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LONG-RANGE FORECASTING
From Crystal Ball to Computer

J. SCOTT ARMSTRONG
Wharton School
University of Pennsylvania

Second Edition

A WILEY-INTERSCIENCE PUBLICATION

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To
Murrl J. Anderson, my father-in-law,
who helped me to accept the future

PREFACE

Things are more like they are now than they ever were before.

Dwight David Eisenhower

Research on forecasting has been growing rapidly—more so than in most other areas of the social and management sciences. It seemed appropriate, then, to revise *Long-Range Forecasting*.

This second edition of *Long-Range Forecasting* improves upon the first edition in the following manner:

First, it indicates where *recent research* has made significant contributions, either supporting or refuting conclusions from the first edition. (This research is integrated into the text and described in the updated bibliography.)

Second, the updated bibliography compiles the most important research on forecasting since the first edition was published seven years ago. It includes over 350 books and papers. References to these works are easily found in the text as they are cross-referenced. The LAST NAMES OF THE AUTHORS have been capitalized to help the reader find the latest research.

Third, the *graphics* have been improved. Shaded areas set off descriptions of empirical research. Exhibits have been redrawn for better readability.

Fourth, while corrections had been made in each of the seven printings of the first edition, this edition makes extensive *revisions*. To ensure that my summaries of the research were accurate, I tried to contact all of the authors cited in *LRF* for old as well as new citations. Most authors were cooperative, so almost all interpretations of studies in *LRF* have met with the approval of their original authors. This effort not only led to corrections, but also informed me about the most recent work by these authors. Extensive revisions were also made to the People and Subject Indexes.

Fifth, additions were made. These include a more thorough discussion on the relationship between planning and forecasting, a synthesis of surprising findings on the use of scenarios, a quantitative review of all empirical studies examining sophisticated approaches to extrapolation, some benchmarks for assessing forecast accuracy, new results on the use of role playing to predict the outcome of conflicts, suggestions on how to present the forecast in an effective manner, and guidelines for auditing the forecasting process in an organization.

Philadelphia, Pennsylvania
April 1985

J. SCOTT ARMSTRONG

ACKNOWLEDGMENTS

Thanks to all those who helped with this second edition. Useful suggestions were provided on various chapters by Dennis A. Ahlburg, Colin Camerer, Jay Christensen-Szalanski, Gregory W. Fischer, Baruch Fischhoff, David Kasiarz, Hans Levenbach, Essam Mahmoud, Ruth Pagell, Asani Sarkar, Kranti Toraskar, Dick Torburg, by the students in my classes at the Wharton School, IMEDE, the University of Hawaii, and by many others. Particularly helpful was Everette Gardner, Jr. who made many excellent suggestions for the chapter on extrapolation methods. I owe a great debt to libraries; these include the University of Pennsylvania, Drexel University, IMEDE, and especially the University of Rochester. Stephen Kippur at John Wiley encouraged me to do this revision. Regina Loro typed most of the changes and managed to eliminate some of my new errors in the process. Martha Lightwood greatly expanded, reorganized, and clarified the subject index. Malcolm Davidson reviewed the page proofs and prevented many errors. I have gained much from my association

with my colleagues at the International Institute of Forecasters, Robert Fildes, Bob Carbone, and Spyros Makridakis. Finally, my wife, Kay, provided advice, emotional support, and, during times of crisis on the revision, helped with the details. Also helping during these crises were my sister, Bonnie, and my daughters, Kathy and Jennifer. (Why did the crises arise? Could it have been poor forecasting?)

J.S.A.

PREFACE TO FIRST EDITION

For one who has no objective, nothing is relevant.

Confucius

This is a book about forecasting methods. The emphasis is on methods for long-range forecasting. The methods are applicable to all areas of the social, behavioral, and management sciences.

Much is known about forecasting methods, but little is used. Why? Because what is known in one field is unknown in another. Because what is known frequently contradicts our common sense. Because what is known challenges our beliefs and our behavior.

Long-Range Forecasting is a book for "doers," the people who have done or who are doing forecasting. These doers may be in business, in government, in academia, or in consulting. Doers may also be students working on forecasting projects in courses such as finance, marketing, economics, or sociology, or in those increasingly popular courses dealing with the future.

Some of the doers have little expertise, and some have much. If you have a lot of expertise, you will find many things to disagree with in this book. That is how it should be; if there is nothing in a book that challenges your beliefs, then there is no opportunity to

learn. Of course, you will also find things to make you feel good about your current beliefs, but you will not learn much from these things. The way to learn is to find ideas that you disagree with—and then to suspend judgment and experiment with these ideas.

Long-Range Forecasting is a guide to forecasting methods. Although it is designed to be read, it can also be used as a reference book. The book:

1. Tells how to structure a forecasting problem so that alternative forecasting methods can be developed and evaluated effectively.
2. Discusses how to implement new forecasting methods.
3. Explains how to get forecasts accepted.
4. Describes a variety of forecasting methods, discusses their strengths and weaknesses, explains how to use them effectively, and tells where to find out more about the technical details. In keeping with my aim not to duplicate material already published, I have omitted technical details that are easily available from other sources. In effect, this book is more of a blueprint than a tool kit.
5. Helps you to select the most appropriate methods for a given forecasting problem.
6. Tells how to evaluate forecasting models. This is useful in selecting the most appropriate method for a particular problem, in trying to improve a given model, or in evaluating models developed by others.
7. Suggests what research on forecasting methods will have the greatest, and the least, payoff.
8. Summarizes and synthesizes research from a variety of areas. My review of this literature covered about 1300 books and articles primarily from the social and behavioral areas: economics, sociology, psychology, marketing, production, finance, demography, transportation, international business, politics, education, and social psychology. Occasional references are also made to work in medicine, meteorology, agriculture, and technology.

In addition, I think you will find the book enjoyable to read. The first draft was very technical and obscure. By this fifth and final draft, I was able to express my ideas in a form that is easier to understand and more precise. Most readers prefer this—and so do I. To my surprise, I found that many of the fancy ways of saying things were not necessary. Occasionally I had said something in a complex way because I did not know what I was talking about.

This book is readable. I checked it with the Flesch readability index (Flesch, 1956) and obtained a rating of 66 or "standard." This is about

the same as the readability of a newspaper such as the *Wall Street Journal*. Similar results were obtained with the Gunning Fog Index (Gunning, 1959); this yielded a score of 13, which corresponds roughly to the educational level in school needed to comprehend the writing. In short, the book is much more readable than other scientific works. (Science is not big words, despite what some people think.)

One of my original objectives was to write the world's first obscene technical book. It did not turn out obscene, but I think it is fun to read. Research tells us that humor does not add to or detract from learning (Markiewicz, 1974); so why not have a bit of fun?

I am optimistic about the current state of knowledge about forecasting. After you read this book, I think you will agree that it would be difficult to find a situation where forecasting could not be improved with existing methods.

Philadelphia, Pennsylvania
November 1977

J. SCOTT ARMSTRONG

ACKNOWLEDGMENTS FOR FIRST EDITION

Seventeen years: that's how long I spent on the preparation and writing of this book. The work was done as a staff analyst in industry, as an educator, and as a consultant in business and government. My experience included forecasting projects in many areas: photographic film processing, camera sales, steel production, production costs for a photographic manufacturer, political candidates and issues, construction contracts, finished goods inventory for duplicating machine parts, automobile sales, the selection of supermarkets by families, passenger travel by air, a proposed system for urban transportation, gasoline sales at various sites, steel drums, breakfast cereals, electrical components for military aircraft, job success for production workers, profits for automobile dealerships, choice of a brand of toothpaste, forest products, nonresponse bias in mail surveys, effects of educational experiments, lodging industry sales, and the health of "very important people" around the world.

In the course of these efforts, I received much help. The help came from business firms, especially

Eastman Kodak, Xerox, and Polaroid. It came from philanthropic institutions, especially the Ford Foundation, which supported this work when I was at M.I.T.; the National Science Foundation, which provided support for a summer so that I could conduct a literature search on forecasting methods in the social sciences; and the U.S. Government Work Study Program, which allowed me to hire some good people, especially Bill Tamulonis, Steve Lanset, and John O'Gorman.

Certain consulting contracts provided me with problems and with time to work on forecasting methods; these were with the Management Science Center at the University of Pennsylvania, the University City Science Center (Philadelphia), the C.I.A., and the U.S. Department of Transportation.

Various educational institutions also helped. M.I.T. provided me with money, help, and freedom. The Stockholm School of Economics provided time and a beautiful environment. The University of Pennsylvania provided an opportunity to experiment with *Long-Range Forecasting* as a text over a 7-year period, as well as a sabbatical in 1977 so that I could complete the book.

Libraries played a big part in my work. Most of the work was done at the University of Pennsylvania library. It is a bureaucratic nightmare and requires far too much time to find anything; despite this, it has some very helpful people who rise above the situation. The University of Rochester library, where I spent many vacations, is wonderful; it has a large and well-organized collection. The Stockholm School of Economics was outstanding in its ability to track down articles and to save time for me. Help was also received from the libraries at M.I.T., Drexel University, Carnegie-Mellon University, and the University of Hawaii.

The computer centers at M.I.T. and at the University of Pennsylvania were helpful for many of the analyses that are summarized in this book.

My most valuable help came from individuals, especially from two individuals. Don Peters, Corporate Director of Information Systems at EG&G in Boston, spent much time in discussions with me and worked on two early drafts of *Long-Range Forecasting (LRF)*. Don was good at telling me what I was really trying to say—and when I was going beyond the data.* Carl Harrington, a marketing manager from General Foods, played a big part in making improvements in the final version. He did some of the analyses and greatly improved the writing.

*A special thanks to Don because he convinced me that footnotes are not needed if you work hard enough on your writing. Footnotes interfere with communication.

Fritz Dressler from the University City Science Center, Rusty Scheewe of the University of New Hampshire, Tom Tessier of Arthur Andersen, and Mike Grohman of IBM each commented on two versions of *LRF*.

Comments on versions of *LRF* were provided by Ralph Day from Campbell Soup; Al Davis from the U.S. Air Force; Rolf Ruhfus from McKinsey Consulting (Germany); Frank Husic from Donaldson, Lufkin, and Jenrette; John Ferguson, Doug Crocker, and Bill Mountain from Eastman Kodak; Robert Fildes from Manchester University in England; George Wehrlin from Loeb, Rhoades; Ed Lusk from the Wharton School; Jan-Erik Modig from the Stockholm School of Economics; Lester Sartorius from the University of Texas; Jim Utterback from M.I.T. and Harvard; Andrew Sage from the University of Virginia; and Justis Muller from the University of Hawaii.

Some people were especially helpful in providing advice and support in early stages of this book. These were John Little and Paul MacAvoy from M.I.T., Ezra Krendel from Wharton, and David Pyle from the University of California at Berkeley.

Many people commented on specific chapters. Paul Kleindorfer, Tom Robertson, Alan Shapiro, Jerry Wind, Paul Green, Ron Frank, Len Lodish, Hank Brown, David Hildebrand, Dick Clelland, Morris Hamburg, Jean Crockett, Randy Batsell, Neil Beckwith, Howard Kunreuther, Andy Van de Ven, and Lawrence Klein, all from Wharton, were helpful. So were Paul Slovic and Robyn Dawes from Decision Research; Jim Castellan from Scott Paper; Frank Wolek from the U.S. Department of Commerce; Rich Bartlett from Bell Labs; Dick Cryer from Scholastic, Inc.; Mel Hirst from the University of Warwick (England); Joel Huber from Purdue; Gerry Barrett from the University of Akron; Carter Franklin from the University of Houston; Johan Arndt from the Norwegian School of Economics; Jeff Miller from Harvard; Franz Ettlin from the Stockholm School of Economics; Bob Brienholt from the Center for Professional Studies (Philadelphia); Stelios Kourakis, industrialist from Athens, Greece; and Gordon Welty from the Brookings Institution.

Thanks are due also to the many people who answered my letters for information, to Larry Robbins, who worked to improve my writing style, and to students at Wharton who provided comments, especially Kevin O'Keefe and Chuck Neul.

Typing on the first drafts of *LRF* was supervised by Anna-May Busch; this was truly fine service. The final draft was done by two of the best typists I know—Gwen Shannon and Aileen Cummings. The copy editor, Ruth Flohn, was outstanding; she found thousands of ways to improve the writing in *LRF*.

I am grateful to Ron Brennan of Wiley-Interscience for having faith and for allowing me to apply my strange style to this book.

My wife, Kay, provided comments on the book and helped me to live through the tough times that arise when one spends so many years writing a book.

Many others also helped. In all, well over 100 people provided criticisms and suggestions. The book owes a great deal to these people. Without their help the book would have been finished 5 years ago—but it wouldn't have been very good.

I learned (I think it was in 1958) that not everything written in books is true. This was a big discovery for me. This book is no exception. I have tried hard, and so did the people mentioned here. Still, the book contains mistakes. I will feel bad when they are found—but not as bad as I would have felt had I not warned you. I could have spend another 10 years on the book, but as my friend John Cronin told me, "If God had waited until he got everything right, we wouldn't be here."

J.S.A.

INSTRUCTIONS TO THE READER

1. Although much time and effort went into putting the pages in the order you find them, readers who have not had much experience with forecasting problems may want to read Part III, "Evaluation," before reading Part II, "Forecasting Methods."
2. The book can be used as a reference book (preferably after you have read it). A detailed table of contents is provided at the start of each chapter to help you. Also, annotated references, a list of exhibits, a glossary and indexes for people and subjects are included.
3. The book summarizes the existing empirical evidence. Descriptions of these studies are enclosed within the shaded boxes. You may skip the shaded material and still retain the train of thought. It is most important to read the shaded material when you disagree with the conclusions. (The conclusions will be stated before the shaded text).

4. Many of the technical details are easily found in previously published papers. If a source was difficult to obtain, I did discuss the details.
5. Good stopping places are at the ends of chapters except for Chapters 6 and 8, where intermissions are provided.
6. A glossary is provided because terminology varies among fields. The glossary also defines the symbols and abbreviations used in the book. (These terms are presented in boldface with a superscript "G" when they first appear in the text.)
7. The best way to learn from the book is to be considering a forecasting problem while you are reading the book.
8. Sometimes my humor is built around tongue-in-cheek comments where I overstate my case. This should cause no problem because the evidence behind the statement is presented in the book and you can reach your own conclusion. In fact, this humor has an advantage; it informs you of my opinions and biases. I have avoided the use of irony, so the meaning is never the opposite of that which is stated (except as noted in the book).
9. Tell all your friends about the good book you are reading.

CONTENTS

PART IV COMPARING METHODS

PART V COMMENCEMENT

EXHIBITS

This list will help you to use *LRF* as a reference book. It will be of most value to you after you have read the book. The exhibits include all cartoons, figures, photographs, and major tables.

LONG-RANGE FORECASTING
From Crystal Ball to Computer

Part I
GETTING STARTED

An overview of the book and a discussion of key concepts are provided in Part I. It includes four chapters. Chapter 1 defines the scope of the book and provides a brief overview. The systems approach is described in Chapter 2, along with a discussion of how it may be applied to forecasting problems. Chapter 3 discusses the most important aspects of forecasting—how to get people to adopt new methods and how to gain acceptance of forecasts. Finally, some general research strategies for model building and evaluation are discussed in Chapter 4.

Part I is more general than the rest of the book. Although the ideas in it may seem simple, to use them requires ingenuity. Part I is also less empirical than the rest of the book. I was inspired in this by Tukey (1962), who wrote, "Far better an approximate answer to the right question, which is often vague, than an exact answer to the wrong question, which can always be made precise."

It is hoped that the right questions have been addressed in Part I. Certainly the answers are approximate.

One

INTRODUCTION

Contents

If a man gives no thought about what is distant, he will find sorrow near at hand.

Confucius

I could begin by telling you that times are becoming more turbulent and, as a result, our forecasts are becoming poorer. Hence, we need to put more emphasis on forecasting. *But that would be wrong.* From the evidence that I have been able to find (e.g., DAUB and PETERSON [1981]*), times have not become more turbulent and our forecasts have not become less accurate. So here is the new beginning: Think about the wonderful advances in management and social sciences. . . . How long did that take you? James LEE spent much time thinking about this issue in his book, *The Gold and the Garbage in Management Theories and Prescriptions.* He reached some dismal conclusions: Most of the important techniques have been known for many decades or even centuries, while many of the recent "advances" have proven to be of little value.

However, the situation in forecasting is different. Almost all significant research in the field has been done since 1960, and the results of this research have been remarkable. That is what this book is about. We can now make better forecasts and we also know more about how to convince people to act on these forecasts.

Chapter 1 is short. It relates forecasting to planning and decision making, and it also outlines what the rest of the book is about.

THE SCOPE OF THIS BOOK

To study long-range forecasting, we need to know where we are starting from and to be able to forecast for the short and intermediate terms. I could have called the book *Measurement and Forecasting Up to and Including Long-Range Forecasting,* but that is not a catchy title, to say the least. In any event, the book considers forecasting methods in general, but it has a bias toward long-range forecasting because research in this area has been especially useful.

Long-Range Forecasting (LRF) describes methods that can be used

*The references in capitals are in the UPDATED BIBLIOGRAPHY. The lower case references are from the original edition and they are located in the References. (The year of publication is indicated in the parentheses).

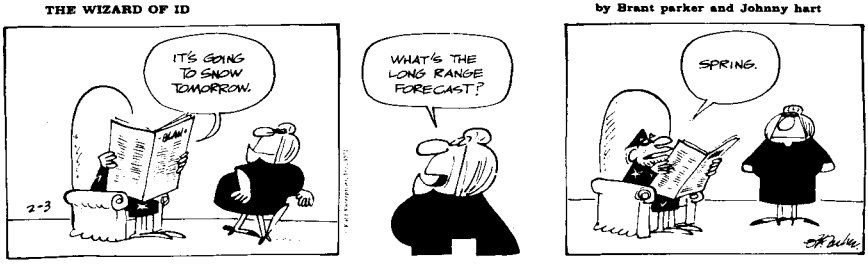
to forecast anything in the social, behavioral, or management sciences. Although the language differs greatly among fields, the techniques are similar. Forecasting sales of photographic goods draws upon many of the same techniques as forecasting the health of certain Very Important People around the world or forecasting gasoline sales at various sites.

How long is long range? That depends upon the situation; for example, a time period that is short range for the lumber industry is long range for the personal computer industry. I have struggled with various definitions—for example, "long range" is the length of time required for all parts of the system to react to given stimuli (in economics, this would be stated as the length of time it takes for supply to adjust to changes in demand); it is anything over 2 years in the future; it is the length of time over which large changes in the environment may be expected to occur. The last one is my favorite and I will use the terms "large changes in the environment" and "long range" interchangeably.

The definition of long range is not as clear as I would like it to be. You probably have your own idea of what long range means, but if you don't, the Wizard of Id certainly does, as shown in Exhibit 1-1.

The terms forecasting and prediction are used interchangeably in this book. Some writers make a big fuss over the differences between these terms. Neither Webster nor I see a difference that makes much difference. "Forecasting" seems to have a narrower meaning, connoting a statement about a future event, whereas "prediction" can refer to any unknown situation, past or future. But this is not an important point.

Exhibit 1-1 THE MEANING OF LONG-RANGE FORECASTING



Source. "The Wizard Of Id," by permission of Johnny Hart and Field Enterprises, Inc.

Forecasting vs. Planning

Forecasting is often confused with planning. When the leader of an organization says that he would like a forecast, he often means that he wants a plan. He wants to make something happen, and he uses this plan to provide a target for people in his organization. This book is about forecasting, not planning.

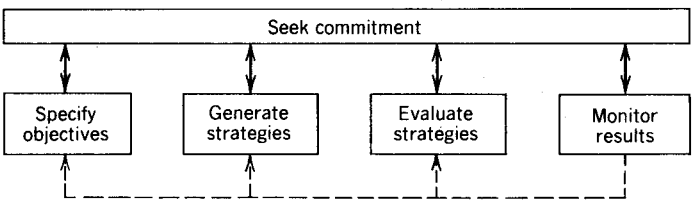
Although *LRF* is not about planning, it is useful to consider how forecasting relates to planning. Forecasting is concerned with determining what the future *will* look like, rather than what it *should* look like. The latter is the job of planning. The forecast is an input to the planning model. A forecasting model can be used in an attempt to find out what the world will look like if you leave it alone . . . or if you make different assumptions about the future . . . or if you make changes.

The key steps in the planning process, illustrated in Exhibit 1-2, are to gain commitment to the process, to specify objectives, to generate strategies, to evaluate strategies, and to monitor results.

The argument is sometimes raised that planning is of prime importance while forecasting is of minor importance. As long as a reasonable forecast can be made, the argument goes, there is little gain from improved accuracy. The major benefits come from the development of a better and a more consistent plan and from a comparison of alternative plans under a given set of assumptions about the future. In my opinion, this argument has little merit. Even if forecasting were less important than planning, it would not follow that forecasting is unimportant in an absolute sense. It may be worthwhile to spend money on both planning and forecasting.

Don't get me wrong. I am also an advocate of formal planning. So, apparently, are many others, as this has been a rapidly growing activity in organizations. Also, I have reviewed the empirical evidence

Exhibit 1-2 STEPS IN THE PLANNING PROCESS



and have concluded that firms using explicit approaches to long-range planning do better than those that do not (ARMSTRONG [1982c], SHRADER, TAYLOR, and DALTON [1984].) Firms also do better after they start using explicit approaches to long-range planning than before using them. So planning is useful as well as popular.

The interest in long-range planning and its apparent success should lead to an increased interest in long-range forecasting. This appears to be the case. For example, there has been a marked increase in the number of firms that claim to engage in long-range forecasting. Jantsch (1967, p. 27) refers to a survey by the McGraw-Hill Economics Department that estimated that in 1947 approximately 20% of all firms attempted forecasts over time spans of 3 years or longer while about 90% did so in 1966. This growth led to the formation of the International Institute of Forecasters in 1982.

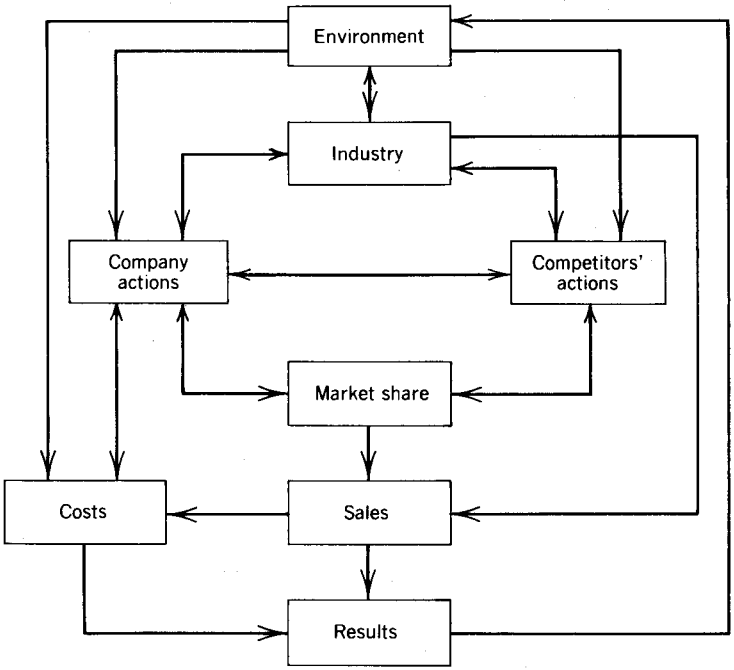
Forecasting and Decision Making

A forecast is often required whenever a decision is made. This is especially true for decisions that have long term consequences. Organizations must make decisions involving the location of facilities, the hiring of key personnel, the types of products to provide, contracts with suppliers and unions, and financing. Individuals must make decisions involving expenditures for college, the choice of a career, health treatments, marriage, running for public office, buying a house, writing a book on long-range forecasting, and so on. Because such decisions must be made, it is desirable to forecast their consequences.

Exhibit 1-3 summarizes the various types of forecasts needed within the firm. For example, General Motors would need forecasts of the environment (e.g., GNP and tariffs), the industry (total auto sales), their own actions (possible marketing strategies and likelihood of successful implementation), competitors' actions (reactions to GM strategies), market share (relative prices of competitors' products), sales (calculated from preceding forecasts), costs, and results (e.g., profits, recalls, law suits, customer satisfaction, and employee layoffs). A more complete discussion of this framework is provided in ARMSTRONG [1983a].

Of course, it is often possible to avoid forecasting. ACKOFF [1983, p. 6] points out that if we can control the future, we do not need to forecast (just as we do not need to forecast the weather inside our houses). To the extent that we can respond rapidly, we need no forecasts (as in driving an automobile). FILDES [1982] discusses other ways to

Exhibit 1-3 NEED FOR FORECASTS IN A FIRM



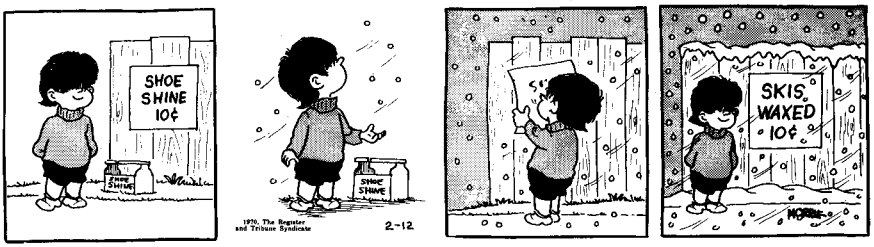
avoid forecasts, such as buying insurance, diversifying one's strategy, and hedging one's bets. Contingency planning, illustrated by Wee Pals in Exhibit 1-4, provides still another way.

THE APPROACH USED IN *LRF*

I draw upon my experience in this book. Although experience is a great motivator of learning, it is an inefficient way to learn, and I, like others, tend to see what I want to see. So when I draw *only* upon my experience in *LRF*, I will let you know. In this manner you will at least be aware of my biases.

Much of what is reported in this book goes beyond my experience to report on research. I have done some of the research, but most of it has been done by others. This research is examined, summarized, and occasionally reanalyzed in an attempt to draw conclusions about forecasting methods. For some critical areas, I hired research assistants to code independently the empirical studies to determine how the con-

Exhibit 1-4 CONTINGENCY PLANNING AS A SUBSTITUTE FOR FORECASTING



Source. "Wee Pals" comic strip, by permission of Morrie Turner. © 1970, The Register and Tribune Syndicate.

clusions related to certain hypotheses. I also asked the original authors whether my interpretation was correct. In addition, I received critiques from about 100 people who read early drafts of *LRF*, from 40 reviews of the first edition, and from many who reviewed the second edition.

The most useful type of research for *LRF* was that which used **multiple hypotheses**[G] and empirical research. For example, studies that compared the effectiveness of two or more forecasting methods in an actual forecasting situation were of immense value. These studies and others are described in the annotated references at the end of *LRF* and in the UPDATED BIBLIOGRAPHY.

AN OVERVIEW OF THE BOOK

This book is divided into five parts—"Getting Started," "Forecasting Methods," "Evaluation," "Comparing Methods," and "Commencement." The relationships among these sections are illustrated in Exhibit 1-5. Note that Parts II and III may be read in either order.

Part I, "GETTING STARTED," presents a short introduction to the book, a description of how to implement different methods of long-range forecasting, and a discussion of the systems approach and its relevance to long-range forecasting. Some general research strategies are then described.

[G] Boldface type with the superscript G is used in *LRF* to indicate some of the terms defined in the glossary. It is used only when it is felt that different readers may have different definitions and then only for the *first appearance of the term* in *LRF*.

Part II, "FORECASTING METHODS," examines methods one might use in long-range forecasting. Consideration is given to the most effective way to use judgmental, extrapolation, econometric, and segmentation methods, as well as combinations of these methods. The use of combined forecasts is also examined.

Part III, "EVALUATION," discusses how to evaluate forecasting models and processes. This includes how to analyze inputs to a model, as well as how to analyze the outputs from it. The section on evaluating outputs may be used to select the best method for a given problem. It also describes how to conduct an audit on the forecasting process used by an organization.

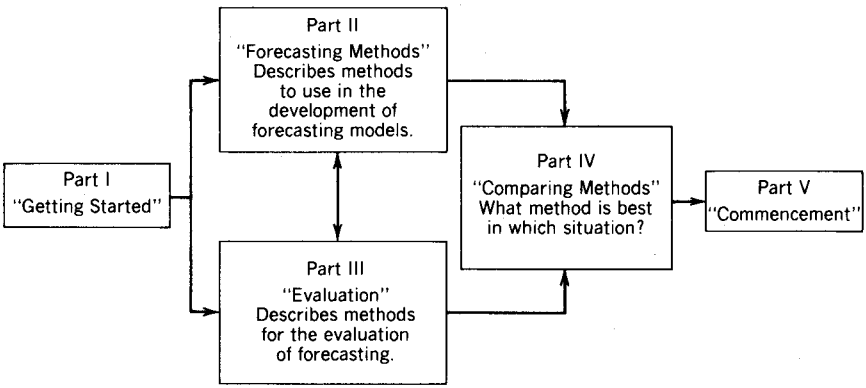
Part IV, "COMPARING METHODS," examines the relative advantages of each of the forecasting methods. I have presented evidence to identify the methods that are best in each situation. A guide is constructed to help you to select the methods most appropriate for your problem.

Part V, "COMMENCEMENT," discusses which forecasting methods will prove to be more popular and more useful in the future. It also suggests areas where further research on forecasting methods will be most valuable—and what research areas will have the smallest payoffs.

SUMMARY

There were few surprises in Chapter 1. The primary objective was to tell you what the book will cover. It covers forecasting methods . . .

Exhibit 1-5 PLAN FOR THIS BOOK



and evaluation . . . from short- to long-range, with the emphasis on the latter . . . in the social, behavioral, and management areas. It does not cover planning or decision making, although it is closely related to both.

The approach used in this book is primarily to test hypotheses by examining all relevant empirical evidence. This evidence is fully disclosed.

An overview of the book appears in Exhibit 1-5.