

Second Edition

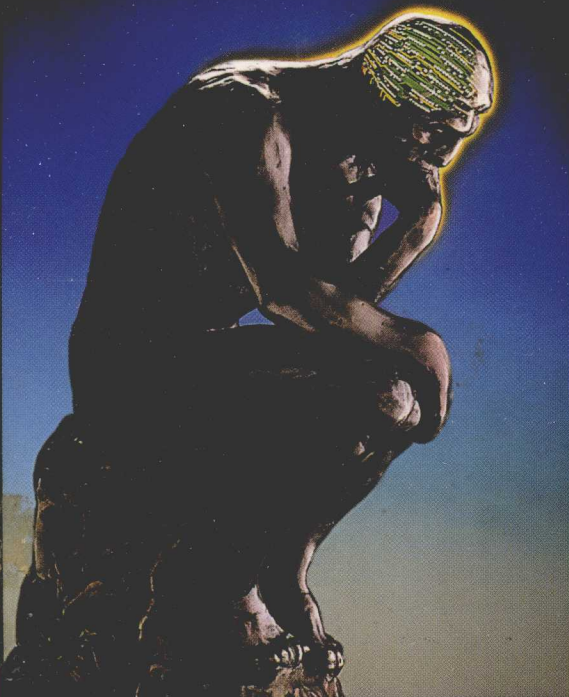
E_XPERT SYSTEMS FOR BUSINESS

Concepts and Applications

D.V. PIGFORD

GREG BAUR

*featuring
VP-Expert
Version 3.1*



MS-DOS
3 1/2" DISK

*Featuring
Lay-Flat
Binding*

EXPERT SYSTEMS FOR BUSINESS

Concepts and Applications

Second Edition

Featuring VP-Expert®
Version 3.1

D. V. Pigford
Greg Baur

Western Kentucky University



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MAIN MENU

1	Help	2	Induce	3	Edit	4	Consult	5	Tree	6	FileName	7	Path	8	Quit
---	------	---	--------	---	------	---	---------	---	------	---	----------	---	------	---	------

INDUCE MENU

1	Help	2	Create	3	Database	4	Text	5	Worksht	6	Quit
---	------	---	--------	---	----------	---	------	---	---------	---	------

TREE MENU

1	Help	2	Text	3	Graphics	4	Quit
---	------	---	------	---	----------	---	------

CONSULT MENU

1	Help	2	Go	3	Whatlf	4	Variable	5	Rule	6	Set	7	Edit	8	Quit
---	------	---	----	---	--------	---	----------	---	------	---	-----	---	------	---	------

GO MENU

1	Help	2	How?	3	Why?	4	Slow	5	Fast	6	Quit
---	------	---	------	---	------	---	------	---	------	---	------

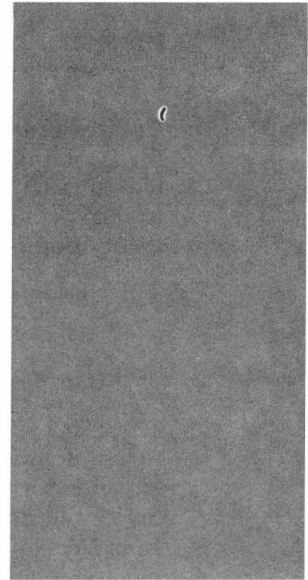
SET MENU

	Help		Trace	3	Slow	4	Fast	5	Windows	6	Quit
--	------	--	-------	---	------	---	------	---	---------	---	------

WINDOWS MENU

1	Help	2	Consult	3	Rules	4	Values	5	Save	6	Quit
---	------	---	---------	---	-------	---	--------	---	------	---	------

Preface



About This Book

Expert Systems for Business: Concepts and Applications, Second Edition is a blend of theory and practice. The primary goal of this book is to give users a basic understanding of expert systems and how they are developed. The first part of the text (the chapters) presents theory and gives users a broad exposure to expert systems, a branch of applied artificial intelligence. The second part of the book (the modules) features a practical, hands-on approach to using an expert system development tool. VP-Expert Version 3.1, a product of Wordtech Systems, Inc., is featured in the applications portion of this text. VP-Expert was chosen because of its user friendliness, power, ease of use, cost, and interface with spreadsheets and databases.

We believe that the theory/practice approach is most practical. With a combined total of over fifty years of teaching experience in a variety of disciplines, we have found that a person who is actively involved in learning has a more successful experience than someone who is not.

Who Should Use This Book

Expert Systems for Business: Concepts and Applications, Second Edition is written for students enrolled in an introductory course on expert systems or artificial intelligence at the undergraduate or two-year college level. We assume that users have some experience with IBM-compatible microcomputers, but we do not assume any prior

knowledge or experience with expert systems or expert system development tools. However, users with a background in these areas will be able to pursue the topics presented in greater depth.

Users with little or no background in expert systems will find that the first part of the book prepares them to deal with the process of expert system development. On the other hand, users with some background in expert systems can proceed directly to the second part of the book to begin hands-on work with VP-Expert, using the theory portion of the text as a reference, if necessary.

Changes in the Second Edition

There are several major changes in the second edition of this text. Additional features include an improved graphical trace, coverage of string functions, and expanded use of commands to enhance the graphical user interface (menus, form-fields, buttons, and gauges). The featured version of VP-Expert has been updated from Version 3.0 to Version 3.1. There is a marked increase in the number of exercises in every chapter and module and a corresponding increase in the size of the test bank in the Instructor's Manual.

Organization of This Book

Part I: The Concepts

Chapter 1 describes artificial intelligence (AI) and how it compares with human intelligence. The term *intelligent computer* is defined, and the nature of applied AI and its advantages and limitations are discussed.

Chapter 2 presents an overview of expert systems technology. It includes definitions of expert systems and knowledge and a brief historical perspective. Also discussed are the components and features of expert systems and a brief description of expert systems development tools. Finally, a discussion of expert system applications and their advantages and limitations completes this chapter. Many of these topics are described in greater depth in subsequent chapters.

Chapter 3 deals with knowledge representation and knowledge characteristics. Several knowledge representation models, including production rules, frames, semantic nets, and predicate calculus, are introduced.

Chapter 4 begins with a discussion of various reasoning methods. The concept of heuristics, an integral part of expert systems, and the problems of search are discussed. Inference strategies, such as deduction, induction, and abduction, are explained. The chapter describes uncertainty and how expert systems deal with it.

Finally, forward and backward chaining, which are the primary reasoning control structures used in expert systems, are defined.

Chapter 5 presents the activities involved in creating and updating the knowledge base. The choices of an appropriate problem for expert systems development and the right development tool are the first topics of discussion. The processes of acquiring and organizing the knowledge are then examined. The final discussion in the chapter centers on updating and maintaining the knowledge base.

Chapter 6 describes activities performed by the inference engine. The inference engine's ability to deal with uncertainty and its associated problems, such as rule conflict resolution, is explained.

Chapter 7 examines the value of the third major component of the expert system, the user interface. Human factors are compared to the relative aspects of the user interface.

Chapter 8 focuses on the relationship of software engineering to expert systems development, final system development, and integrating that system into the organization. Topics of discussion include the software life cycle, the expert systems life cycle, and the software engineering life cycle. The stages of prototyping and full system development are examined. A number of difficulties that occur in expert systems development are resolved. Finally, the chapter examines how the expert system should be integrated into the organization.

Chapter 9 examines the future of expert systems and expert systems development. Future trends in knowledge representation, knowledge acquisition, system development tools, and user interfaces are interpreted. Future availability and cost of expert systems technology are examined. Finally, the chapter presents the concept of intelligent systems.

Part II: The Applications

Module 1 contains a brief introduction and discusses examples of expert systems. The module's primary purpose is getting users started with VP-Expert. System requirements and initial software installation procedures are introduced.

Module 2 presents an overview of the main components of VP-Expert. The structure of the Main Menu, using expert system consultation, and obtaining help from VP-Expert are the focus of this module.

Module 3 details forming rules with VP-Expert. An expert system is created from a table, and the complete creation cycle is overviewed.

Module 4 discusses how VP-Expert deals with reasoning and uncertainty. Utilities such as TRACE and SET are discussed along with forward and backward chaining.

Module 5 emphasizes how VP-Expert links to peripheral software packages. Details of its linkage to database and spreadsheet software are discussed.

Module 6 describes how VP-Expert deals with uncertainty by means of confidence factors. Procedures for calculating confidence factors and their use with various rule forms are examined.

Module 7 discusses the VP-Expert user interface. Formatting the screen, controlling the printer, improving the run-time environment, and using a mouse are the main thrust of this module. String commands and their applications are also included, and commands to enhance the graphical user interface (menus, formfields, buttons, and gauges) are explained.

Finally, Module 8 contains a summary of VP-Expert commands and their use. It also includes a discussion of some of VP-Expert's advanced programming features.

The Appendices: Technical Information

The appendices start with a visual Hierarchy Chart of VP-Expert commands, which also appears on the inside front cover of the text. Appendix B is a table of ASCII characters and values. Appendix C contains answers to the odd-numbered chapter and module exercises. Appendix D contains a classification of all VP-Expert commands by functionality: database, graphics, logic, printing, and so on. A complete reference list follows Appendix E. It contains all text/sources referenced in the text.

How to Use the Text

The text may be used in a variety of ways, depending on the user's needs. The material can be presented in the following ways: Chapters 1 through 9 alone, Modules 1 through 8 alone, Chapters 1 through 9 followed by Modules 1 through 8, or integrating the chapters and modules (e.g., Chapter 1 followed by Module 1, Chapter 2 followed by Module 2, and so on).

For classroom use, we suggest integrating chapters and modules. We have attempted to write the chapters and modules in parallel. This way, students can study theory and follow immediately with implementation.

Ancillaries

The Instructor's Manual to accompany *Expert Systems for Business: Concepts and Applications, Second Edition* contains the following:

- A brief summary of each chapter and module

- A detailed teaching outline for each chapter and module
- Transparency masters
- A test bank with true/false, multiple-choice, and short answer questions and answers for each chapter and module
- Answers to even-numbered exercises for each chapter and module
- Answers to selected assignments

Student Data Disk

A Student Data Disk containing the Sample Files required in the text is available for use with the book.

VP-Expert Educational Software

Special packages of this book containing an educational version of VP-Expert Version 3.1 are available.

Technical Support

Technical support for VP-Expert is available from Wordtech Systems, Inc., 1590 Solano Way, Unit C, Concord, CA 94520-9300 at (510)689-1200.

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We wish to acknowledge Wordtech Systems, Inc., manufacturers of VP-Expert, for their technical assistance. Their cooperation has been very valuable to our efforts.

Finally, we are especially grateful to Patty Stephan, our Production Coordinator, for her patience, cooperation, guidance, and support in the preparation of this second edition.

We sincerely hope that you find this text enjoyable and beneficial. We have enjoyed preparing it.

D.V. Pigford
Greg Baur
August 1994

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