A BOOK

STRATEGY FOR DISTRIBUTED DATA PROCESSING

JAMES MARTIN

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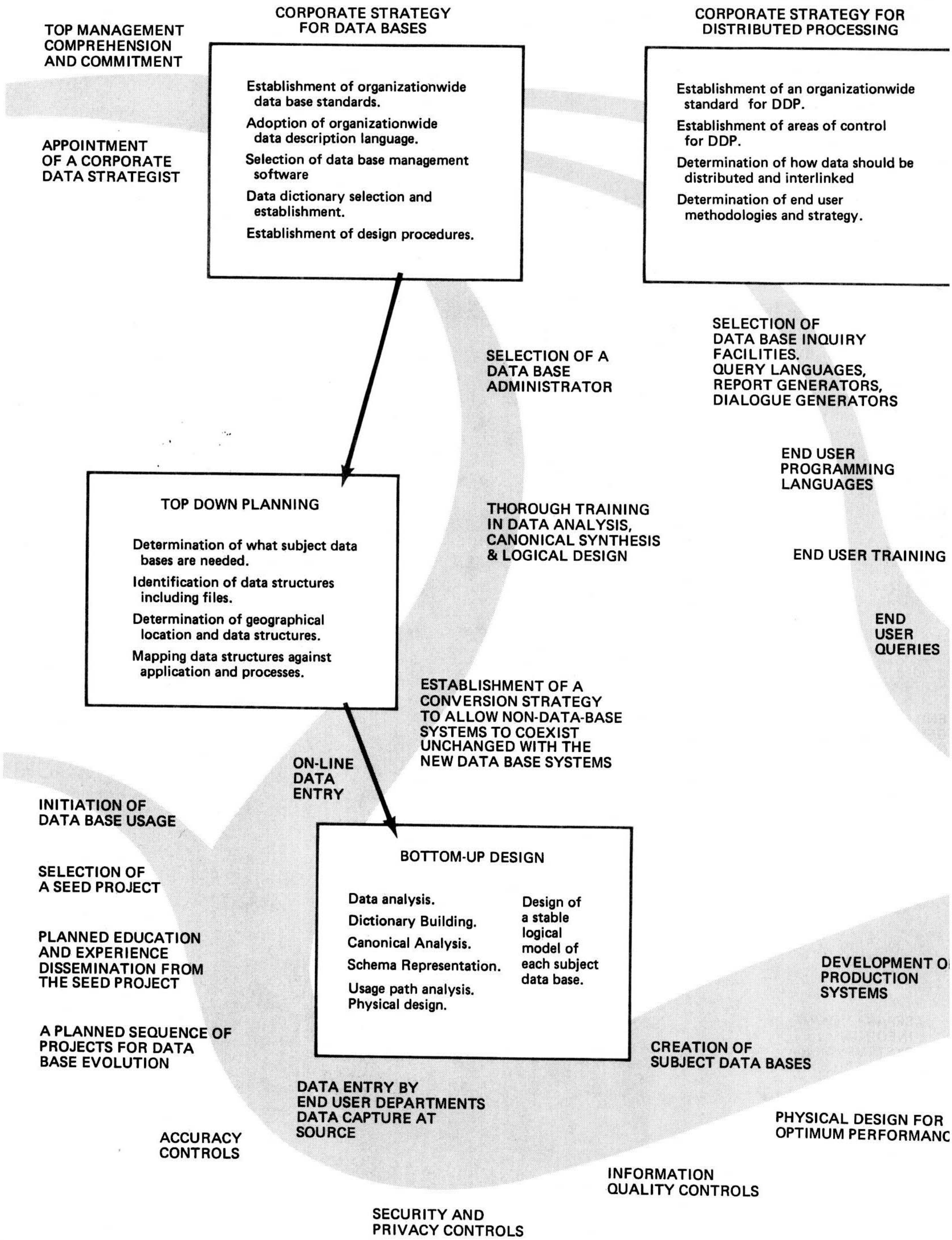
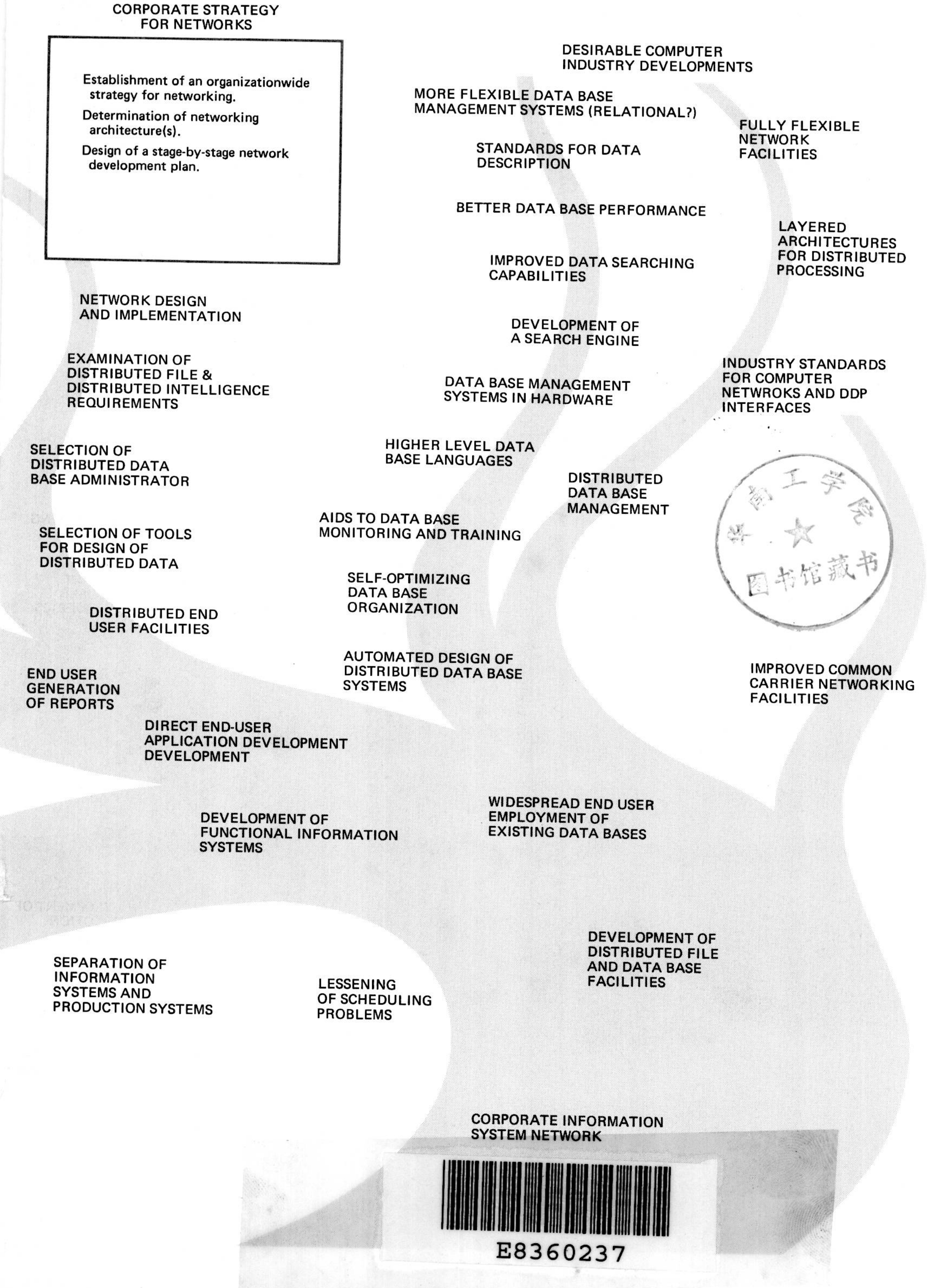
DESIGN AND STRATEGY FOR DISTRIBUTED DATA PROCESSING

A James Martin BOOK


TOP MANAGEMENT COMPREHENSION AND COMMITMENT
CORPORATE STRATEGY FOR DATA BASES
Establishment of organizationwide data base standards.
Adoption of organizationwide data description language.
Selection of data base management software
Data dictionary selection and establishment.
Establishment of design procedures.
CORPORATE STRATEGY FOR DISTRIBUTED PROCESSING
Establishment of an organizationwide standard for DDP.
Establishment of areas of control for DDP.
Determination of how data should be distributed and interlinked
Determination of end user methodologies and strategy.
APPOINTMENT OF A CORPORATE DATA STRATEGIST
SELECTION OF A DATA BASE ADMINISTRATOR
SELECTION OF DATA BASE INQUIRY FACILITIES. QUERY LANGUAGES, REPORT GENERATORS, DIALOGUE GENERATORS
END USER PROGRAMMING LANGUAGES
TOP DOWN PLANNING
Determination of what subject data bases are needed.
Identification of data structures including files.
Determination of geographical location and data structures.
Mapping data structures against application and processes.
THOROUGH TRAINING IN DATA ANALYSIS, CANONICAL SYNTHESIS & LOGICAL DESIGN
END USER TRAINING
END USER QUERIES
ESTABLISHMENT OF A CONVERSION STRATEGY TO ALLOW NON-DATA-BASE SYSTEMS TO COEXIST UNCHANGED WITH THE NEW DATA BASE SYSTEMS
ON-LINE DATA ENTRY
INITIATION OF DATA BASE USAGE
SELECTION OF A SEED PROJECT
PLANNED EDUCATION AND EXPERIENCE DISSEMINATION FROM THE SEED PROJECT
A PLANNED SEQUENCE OF PROJECTS FOR DATA BASE EVOLUTION
BOTTOM-UP DESIGN
Data analysis.
Dictionary Building.
Canonical Analysis.
Schema Representation.
Usage path analysis.
Physical design.
Design of a stable logical model of each subject data base.
DEVELOPMENT O PRODUCTION SYSTEMS
CREATION OF SUBJECT DATA BASES
DATA ENTRY BY END USER DEPARTMENTS DATA CAPTURE AT SOURCE
ACCURACY CONTROLS
PHYSICAL DESIGN FOR OPTIMUM PERFORMANC
INFORMATION QUALITY CONTROLS
SECURITY AND PRIVACY CONTROLS

THE PLANNING AND EVOLUTION OF CORPORATE DATA BASE FACILITIES.



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PREFACE

The key to success in any enterprise is good design and strategy. This is important for the management of distributed processing. The technology of distributed processing is complex and requires a clear understanding to prevent a formula for chaos.

Distributed processing is *not* a new buzzword designed to increase the attendance at seminars or the sale of books. It has been described as inevitable as the leaves appearing on a tree in spring, and just as useful!

In this book we shall describe a clear strategy for and illustrate the techniques of good design. The benefits of distributed processing are many; the pitfalls are great.

Many factors are contributing to distributed processing and the rate of change is dramatic. Soon it will be necessary for every DP professional including senior management to be fully aware of the technology and how it can be applied. It is essential that management develop a concise strategy which identifies the implementation, if applicable, the choices and commitment for distributed processing. The impact of distributed processing in such areas as office of the future and comparison with centralized processing are discussed.

In the last section of the book, important issues such as security and auditing of distributed processing are reviewed, with recommendations proposed to deal with these sensitive areas.

Distributed processing is here to stay and will change the way hardware and software are implemented. Readers might also be interested in the author's companion book, *Computer Networks and Distributed Processing,* which deals with networks and how to connect machines together.

James Martin

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A James Martin BOOK

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1 THE REVOLUTIONARY CHANGE IN DATA PROCESSING "MIRACLE CHIPS"— TIME MAGAZINE

INTRODUCTION

A revolution is taking place in data processing—again. Soon after chess-playing machines began to appear in stores, a friend showed me one he had just bought. It was one of several such machines on the market, about the size of a large pocket calculator. It could be set to play at one of six levels of skill. At level 1 it was easy to beat; at level 3 quite difficult; at level 6 it took 24 hours to make each move, blinking its lights menacingly all the while.

Since neither of us could be considered the world's greatest chess player, we decided to tackle the machine jointly. We began after dinner, playing level 3. The machine took about 20 seconds to make each move and longer when we got it worried. In deciding on our moves we took a minute or more debating the alternatives and pointing out dangers to one another. Many hours and half a bottle of Scotch later, the sinister gadget beat us.

The point of this story is that three years previously a game like that would have required one of the world's largest computers. Logic circuitry has been dropping in cost at a phenomenal rate and will continue to do so for the next decade or more. Many programs that require the world's largest computers today will run on small computers three years from now. If there is a large enough market for them, they can be put on sale at low cost, like chess-playing machines.

This breathtaking change in technology is plunging the data-processing community into an era of revolution, in which the methods of the past are no longer necessarily the right methods. From now on all data-processing managers and analysts have to consider the extent to which they will use *distributed data processing*.

Until the mid-1970's most computing was carried out by systems employing a large, centralized computer. The *central processing unit* (CPU) had a diverse collection of relatively simple machines attached to it, some of them connected via telecommunications links. For certain applications networks were built in which large numbers of simple terminals were connected to a central computer system. Sometimes the central computer system had two processors for reasons of reliability, but the processing of each transaction was done by one large computer.

The 1970's brought the era of minicomputers, and later microcomputers. With LSI (large-scale integration) circuits the cost of building a processor dropped steadily until it became clear that one computer system could be comprised of many processors if this were useful. At the same time there was a change in the perception of how computers should be used. The concept of an isolated, factorylike machine room processing batches of data for many users gave way to users wanting their own terminals and processing capability. In some cases the users' local processing machines were connected to a distant, larger machine which maintained a data base and provided extra processing power if needed.

By the mid-1970's requirements for a new type of system architecture had become clear. A new generation must provide a stable foundation for on-line, transaction-driven data-base applications. Unlike architecture designed for batch processing, it must be highly reliable because on-line users become very frustrated if their system has frequent periods of failure. It must meet a diverse range of processing requirements. Furthermore, as technology is changing very rapidly, the architecture must facilitate the introduction of new technology without a major system disruption.

Most important, a very high proportion of people must be able to use the machines. One major study indicated that by 1985, 70% of the U.S. working force would work with computers for at least some portion of their work activity. Most of these people would not have programming skills, nor should we expect them to be able to remember mnemonics or fixed sequences of input, as many of today's operators do.

Computing, then, must change its image. It must be regarded as a communications medium, in the same sense that television, newspapers, telephone directories, and shopping catalogs are communications media. Electronic information systems are a more powerful and flexible communications medium than any of the above, increasingly vital to industry and office work everywhere.

To meet these requirements microcomputers (like the chess-playing machine), minicomputers, and large computers will all play a part. The new and difficult question is, What mix of these will provide the most effective computer resources?

New computer systems are likely to interconnect many processors, large and small. They will often be interconnected over large distances with computer networks. The term *distributed processing* implies multiple processors, usually interconnected by telecommunications.

The main promise of microprocessors and minicomputers is that they will bring computing power to vast numbers of end users. In doing so they compete with the use of terminals connected to traditional data-processing systems. Who wants to use a terminal or time-sharing service to do a job that could be done on one's own pocket calculator? However, in most of its uses a computer does not compete with a pocket calculator. It collects and disseminates information. The question of where