Eastern Economy Edition

Second Edition

Introduction to Information Technology

V. Rajaraman

PHI

Introduction to
INFORMATION TECHNOLOGY

SECOND EDITION

V. Rajaraman
Honorary Professor
Supercomputer Education and Research Centre
Indian Institute of Science
Bangalore

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INTRODUCTION TO INFORMATION TECHNOLOGY, Second Edition
V. Rajaraman

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To
DHARMA
My Constant Companion

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Preface

Information Technology (IT) is currently a major industry in our country. The software services industry employed three million professionals with revenue of around 100 billion dollars during the financial year 2011–2012. Every day a large number of advertisements appear in newspapers for the employment of Information Technology professionals and also for persons in other professions who have a good knowledge of IT. A decision has been taken by many universities to introduce IT as a compulsory subject for all undergraduate students. In today's world, the knowledge of Information Technology is essential. Thus, it is necessary for all students to be conversant with IT and its applications. The main objective of the book is to introduce IT in a simple language to all undergraduate students, regardless of their specialization.

Information Technology is a rapidly changing technology. In a university degree programme, it is important to emphasize the stable fundamental ideas on which this technology is built. The attempt of this book is to take this approach and not to emphasize the routine operation of computers, which is the approach taken in many user-oriented books. This book explains *why* some parts of computers are designed the way they are and how they work. It also describes a number of important applications of computers which are widely used and the fundamental ideas used in designing these applications.

Information Technology is primarily concerned with the acquisition, storage, processing and organization of data. It is also concerned with widely disseminating the organized and processed data for use by people and organizations. In the early days of IT, data mainly meant numbers and text. This has changed now. Besides numbers and text, computers also process image, audio and video data. Thus we need to understand how to acquire all these types of data, as well as how to organize, store, process, and disseminate them.

The first edition of this book was written in 2003. It was widely used by students and was reprinted 10 times. There have been many advances in Information Technology since 2003. I decided to review the book and bring out a new edition incorporating these advances. I have revised every chapter and improved the presentation and added new sections wherever appropriate. The basic structure of this edition of the book has not changed as it was written emphasizing the fundamentals of Information Technology.

This book is broadly organized into three parts. The first part consisting of Chapters 1–9 primarily deals with the acquisition of numerical, textual, image, audio, and video data. In Chapters 1–5, we describe the hardware devices used to acquire these types of data and the methods of converting these data to binary form suitable for storage and processing by computers. In Chapters 6–9, we describe the units of a computer used to store, process, and

disseminate data. Our aim in these chapters is not to describe the hardware units in great detail but to present the basic ideas used to design them. The second part consisting of Chapters 10–14 is essentially related to software used to organize and process data. We describe in these five chapters the basics of programming languages, operating systems, databases, spreadsheets, word processors, and multimedia processing. The final part of this book consisting of Chapters 15–18 presents major day-to-day applications of IT, including applications in business and commerce. In Chapter 15, we give a reasonably detailed account of the major applications of the Internet, such as email, file transfer, remote computing, search engines for locating information in the World Wide Web, and the use of the Internet for telephony and video conferencing. We describe in Chapter 16 how businesses use computers for management. E-commerce is an application of IT which is profoundly affecting our daily life. Thus a chapter is devoted to describing it in detail. The last chapter is intended to bring awareness among students about the many important changes which are occurring in our society due to the advent of IT. Applications such as Facebook, Blogs, Twitter, and LinkedIn are now becoming commonplace and changing interpersonal communications. We also discuss the various career opportunities which have arisen in IT enabled services.

The book is written in a student-friendly style. Each chapter begins with a statement of learning goals and ends with a summary of the main points presented in the chapter. Exercises are given at the end of each chapter to assist students to reinforce their understanding of the contents of the chapter. The index of the book is fairly detailed.

I thank the following persons who helped me in writing the first edition of this book. Mr. N.R. Narayana Murthy, when he was the Chairman and the Chief Mentor of Infosys Technologies Ltd., provided partial financial assistance; Prof. S.K. Nandy, my colleague in the Supercomputer Education and Research Centre, gave several suggestions; Ms. Padmaja read the manuscript and assisted in many ways; Ms. Udaya Neelakantan read the entire manuscript and gave valuable suggestions; Ms. T. Mallika word processed the manuscript and typed several drafts of both the first and the second edition.

I gave the first edition of this book to Professor Hari Balakrishnan, Fujitsu Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, USA, for his review and for suggesting improvements. In spite of his busy schedule, he meticulously read many chapters of the book and suggested several changes. I have incorporated most of them in this second edition. I thank him for his generous assistance.

This book could not have been written without the enthusiasm and wholehearted support of my wife Dharma. She read the entire manuscript, gave suggestions for improvement, proofread the press copy meticulously and assisted me in several ways. I thank her sincerely.

In spite of my best effort, there may still be some errors and some topics may not be clearly explained. I welcome criticism and suggestions from my readers. My email id is rajaram@serc.iisc.ernet.in.

V. RAJARAMAN

CHAPTER

1 Data and Information

LEARNING GOALS

After reading this chapter, you should be able to:

1. Explain the difference between data and information.
2. Classify different types of data which are processed by computers.
3. Explain the functions of the units of a desktop computer.
4. Describe how data is processed by a computer.

1.1 INTRODUCTION

Information Technology (IT) may be defined as the technology that is used to acquire, store, organize, process, and disseminate processed data which can be used in specified applications. Information is *processed data* that improves our knowledge, enabling us to take decisions and initiate actions.

Example 1.1 Let us take a very simple example. A home-maker who buys vegetables, provisions, milk, etc., everyday would write in a diary the money spent on each of these (see Table 1.1). At the end of each day she adds up the data on money spent for these items. The total obtained is the information which she uses to adjust expenses to spend within her budget. This is illustrated in the block diagram of Fig. 1.1.

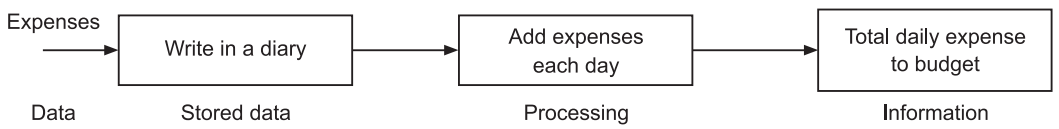

FIG. 1.1 Data and information.

Table 1.1 Daily Expenses

Date	*Expenses in rupees*				
	Vegetables	*Milk*	*Provisions*	*Miscellaneous*	*Daily total*
1.1.2001	25.50	20.00	95.00	150.00	290.50
2.1.2001	30.40	20.00	85.40	250.50	386.30
3.1.2001	15.50	25.00	128.00	80.00	248.50
:	:	:	:	:	:
:	:	:	:	:	:
31.1.2001	19.50	20.00	25.00	15.00	79.50
Total	750.50	650.00	2800.50	2852.50	7053.50

Observe that data is the raw material with which she started, and information is processed data that allows her to initiate action to balance her budget.

The data entered in the diary each day may be processed in other ways too to obtain different information. For example, if the total monthly expense on milk is divided by the monthly income, it gives information on the proportion of the budget spent on milk. This is shown in Fig. 1.2.

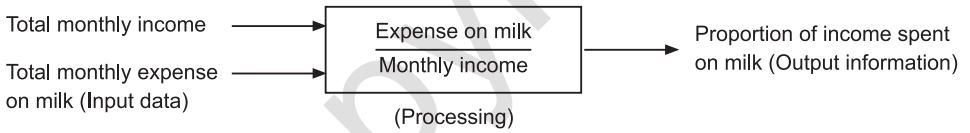

FIG. 1.2 Information as input data.

This information may be useful to manage the family income in a more efficient manner. Observe that the information obtained in Fig. 1.1 is used as data in Fig. 1.2. This illustrates that the distinction between data and information is not always clear. The point to be emphasized is that mere facts and figures about activities do not enable one to take decisions or to initiate actions. Only when they are processed and presented in an effective manner, they become useful.

Example 1.2 As an example of how organizing data enhances our understanding, let us consider the marks obtained by students in an examination. The marks by themselves do not give any immediate idea about the performance of the class. By processing this data, a bar chart may be obtained, which gives the number of students with marks between 100 and 90, 90 and 80, 80 and 70, and so on. This chart (Fig. 1.3) gives the teacher of the class information on the performance of the class that would enable him or her to initiate appropriate action such as which students need special attention.

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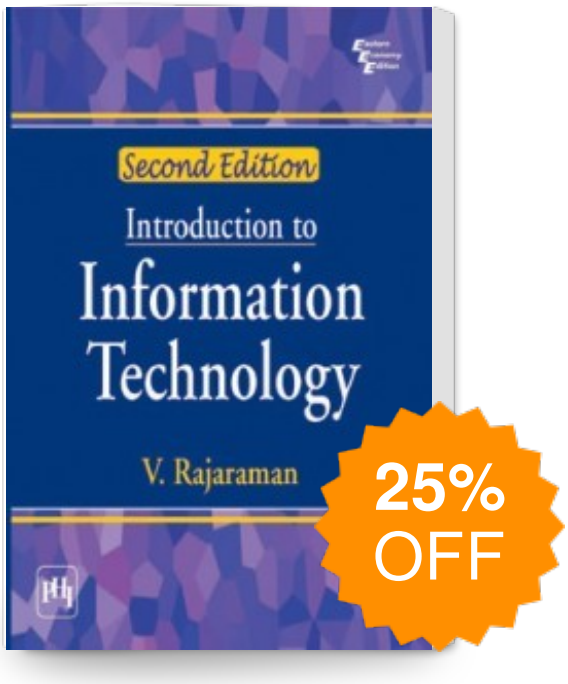

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