COMPUTER MANAGEMENT AND PLANNING

UTPAL K BANERJEE

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Computer Management and Planning

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To
Jharna
and
Tapati

Foreword

It is recognised that, apart from human resources (with its aspects of intelligence, skills, dedication and the human spirit), the important components for development are materials, energy and information. Capabilities relating to information storage, processing, transmission and handling have grown greatly with the recent developments in electronics, and their impact on the fields of computers and communications. Many now regard this as the Age of Information.

The field of computers is today characterised by a variety of computing systems, from pocket calculators and microprocessors through mini computers to very large systems; from dedicated to general-purpose systems; and from purely commercial to largely scientific systems. Applications are already very diverse and are growing. Information processing systems are becoming increasingly all-pervasive. Electronics Data Processing (EDP) management and planning has acquired great significance under these conditions. Hardware produced by the manufacturers, starting from very large-scale integrated circuits to various input-output and peripheral devices can all be integrated into systems of different complexities and capabilities; with this, the demand for software for different applications has enormously increased. The need, therefore, for software capabilities, and for developing different management cultures, required for the wide spectrum encountered in the EDP environment today is obvious.

It is clear that computerisation will grow, and grow rapidly, in the country. It is essential for the government, for those selling computer systems, for those running in-house computer centres and service bureaus, and for a variety of users who need information processing in their areas of activity, to evolve relevant and meaningful policies and practices, keeping track of world developments.

The present book is an attempt to fulfil the need for a comprehensive account of the existing Indian experience, which needs to be taken note of as we plan for the future.

Dr Utpal Banerjee has done a valuable service in bringing out this book on computer management and planning, which is the first of its kind in India, as far as I know, with special reference to the Indian situation. The book is both timely and of great value. Apart from the material that he himself has put together, largely based on lectures that he has given and his experience in this field in a variety of organisations, the value of this book has been considerably enhanced through articles contributed by those working in this field, who have great experience in many sectors relating to electronic data processing.

M G K Menon
Member, Planning Commission
Yojna Bhawan
New Delhi

Preface

This book aims at bringing together the corpus of knowledge relating to management and planning facades of computers in a developing country. The Indian practice has been largely used to illustrate how one sets out to plan for acquisition of a computer system and to manage a computer installation in its manifold aspects. Technological aspects, as embedded in computer sciences and software engineering, are beyond the purview of such a book and have been kept out.

The book begins in Part One with an overview. The reader is gradually initiated into the basic concepts of a computer (Ch. 1), followed by a survey of the national computing scene in India along with its emergent computer policies over the present and the immediate past decades (Ch. 2). Some insights have also been given on world developments as to where computing technology is poised to go from here and how (Ch. 3).

Part Two of the book devotes itself to the management aspects: organisation of a computer centre (Ch. 4); staff deployment and setting of tasks at managerial and systems analyst's level (Ch. 5); the same at programmer, operation and support service level (Ch. 6); forms and job content of managerial personnel (Ch. 7 and 8); costing of computer services (Ch. 9); education programmes and training levels (Ch. 10); nature as well as scope of continuing education (Ch. 11); and the relationship between computer users and computer professionals (Ch. 12).

Part Three deals entirely with the planning aspects: general selection and evaluation criteria (Ch. 13); evaluation precepts and practice in three different organisations (Ch. 14); and measures and review of computer performance (Ch. 15). These are followed by four illustrative case-studies on how computers are planned for different organisations: a large system for TISCO (Ch. 16); a mini system for a refinery (Ch. 17); a mini-system for public administration (Ch. 18); and a microcomputer in an industry (Ch. 19). The actual case studies have all been adapted to suit academic purposes, without missing (hopefully) the flavour of real-life situations. Planning for

installation is incomplete without due regard paid to maintenance, and the principles of the latter is covered in Ch. 20.

Part Four on computer frontiers tries to engage attention on those twilight areas of computerisation which either escape adequate notice or are far too often taken for granted. Computer security is focussed upon in Ch. 21, whereas principles of systems standards (with examples) and systems audit are covered in Ch. 22. Computer ethics (Ch. 23) is still a funny matter but is dealt with primarily for highlighting the desired professional qualities as well as pitfalls which some computer centres have apparently been ignorant of in India.

The three appendices at the end of the book bring out an assorted material which may be of further help to the large variety of computer users and system practitioners. Appendixes A and B cover the detailed organisation of a computer centre and its technical job specifications in that order. Appendix C is an attempt to show sample aptitude tests at different levels, illustrating how these are to be constructed to test the mental abilities in comprehension and logic at entry points.

In general, manufacturing of computers in India has perked up considerably in the eighties. While the late seventies were marked by 8-bit devices coming in the market, the eighties have seen the advent of 16-bit devices from DCM Data Products, NELCO, ICIM, IDM, HCL, MMC, ORG, UPTRON, WIPRO, ZENITH, HINDITRON and a host of others. They are mostly built around INTEL-8086 chips and rarely, Motorolla-6800 chip or other special chips. These computers, which still use imported input-output devices, have proved a boon to Indian users, who do not need import license for buying them. The application scene, too, has become remarkably varied—computer-controlled space, satellite application, and remote sensing of national resources being at one end and dedicated process control and numerically controlled machines being at the other end of the spectrum.

The book, in trying to cover the planning and management areas, caters to two types of readers. Those interested in setting up and running a computer centre would find Part Two useful, with a comprehensive coverage of all related topics. Those who intend to acquire a computer system would find the planning issues relevant as delineated in Part Three. In fact, Part Three goes further to describe planning for large computers, minicomputers and micro computers separately as the considerations in their planning can be different from each other. For instance, a large computer system with multiple terminals and with a multi-task environment would be needed only by a large distributed organisation (like a steel industry). On the other hand, considerations in favour of a microcomputer will be confined to limited application areas, if not to entirely dedicated problems.

Finally, some topics have been split up into two parts, in order to do justice to the spacing of material and to avoid overlap between disparate themes.

Acknowledgements

A book of this nature—using entirely Indian experience and meant far developing countries—would not have been possible, but for the unstinted help and advice received from many sources. While a large part of the material was developed through a number of lectures which I have been giving in different parts of the country, many issues were sharpened and points focussed by the several questions raised by the participants in those seminars and education programmes. Some material has been modelled academically on the lines of the excellent literature developed by concerns such as Tata Steel, Administrative Staff College of India and Computronics India, all pioneers in their own fields. Their methods of documentation are worth looking at in any event by all practitioners.

Professor M.G.K. Menon, Member, Planning Commission is one of our most eminent scientists and—despite his extremely busy schedule in India and overseas—did make time to write an inestimably valuable Foreword to the book. Mr D.P. Kharia, Deputy Managing Director, Tata Steel and Dr N. Sheshagiri, Executive Director, National Informatics Centre, allowed some material to be included. Mr Vivek Singhal, President, Computronics India, provided consistent encouragement. I remember their high affection for me gratefully and this has made my task rewarding,

Foremost, individual thanks are due to the senior computer professionals who, at my invitation, agreed to contribute special articles in order to enhance the usefulness of the book many-fold. In order of appearance of the contributed articles, they are Major General A. Balasubramanian, AVSM, Fellow, Computer Society of India; Mr F. C. Kohli, Director-in-charge, Tata Consultancy Services; Mr K. Janardhan, Divisional Manager, Tata Steel; Mr Rohit Chand, Executive Director, Computronics India; Mr P.D. Jain, Managing Director, Computer Maintenance Corporation; and Mr Y. B. Reddy, earlier of National Informatics Centre. I am grateful to them for permitting me to include their work here.

Computer writings in India are as yet, far from systematic. Many occasional ideas and many a useful discussion with fellow professionals have gone into the book and enriched the writing experience.

Responsibility for any views expressed or any errors committed remain my own.

UTPAL K BANERJEE

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Part One

COMPUTER OVERVIEW

1

Evolution and Concepts of Computer

1.1 INTRODUCTION

While attempting to understand the basic concepts of a computer, so that a fairly clear background is obtained before proceeding to its application to management and planning concepts, it is salutary to remember that computer growth in India has been quite impressive in the last few years. According to the figures given by Dr. Sanjeevi Rao, Deputy Minister of Electronics, Government of India, at a seminar in Srinagar in June 1982, India has currently 2000 computers. This includes more than 600 second- and third-generation computers (based on transistors and integrated circuits respectively) and the rest in the form of microprocessor-based systems which are gradually replacing the erstwhile unit record equipment. The growth in computing power has been phenomenal in the seventies. To quote the figure given by Prof. M.G.K. Menon, currently Member of Planning Commission, at the National Convention of Computer Society of India in Bangalore in Jan. 1979, computing power has increased eightfold in India between 1971 and 1978. This is tantamount to a growth rate of 56% on compound basis. The growth has been even more explosive in the eighties, if the current indications are any guide.

1.2 UNIT RECORD EQUIPMENT

Unit record equipment covers a number of machines, each specialised to perform a few data-processing functions on information on punched cards.

A complement of machines must, therefore, be acquired to provide an adequate capability. There is virtually no memory, except for the card currently being processed and the facility to take a few totals. Some recent versions, such as the Univac 1004, introduce small quantities of storage. The result is a hybrid between a computer and a true punched-card equipment. This is the basis for the name "unit record", as only one record of information, i.e. the card in the machine, can be processed at a time. Programming (telling the machine what to do) is done by inserting connector wires in a plugboard or panel that makes contacts to set up the appropriate circuits in the machine.

A typical punched-card system consists of a set of key punches and verifiers (for punching cards), a sorter (for arranging a set of cards in a particular order), a collector (for combining sets of cards arranged in the same order), a reproducer (for duplicating cards or parts of cards), and an accounting machine (for listing cards and taking and printing totals).

Multiplication and division facilities are available on some accounting machines or in a special *calculating punch*. Punched cards are the only means of data input and storage. In a typical system, punched cards representing information from transactions since the last processing are processed along with cards representing the past status and fixed information on the various machines. The final output is prepared on the accounting machine. While a job is being processed, stacks of cards travel from machine to machine in job-dependent sequences.

The most significant limitations of punched-card processing are the lack of memory and the rudimentary processing capability. Comparisons of current figures with budgets or past results is difficult and the evaluation of a sales trend "over the last five quarters" virtually impossible. Since storage is in the form of punched cards, these have to be run repeatedly through the machine. After a few passes, they wear out and must be duplicated.

1.3 COMPUTER CONCEPTS

Today, the computer emerges as a means for implementing entirely new management techniques, for throwing new light on how business and industry operate. It is no longer simply a means for speeding up a job, a faster way of handling historical data, or printing out routine documents. Of course, the necessity of performing these functions also should not be overlooked.

It is very difficult to define the word "computer" as it is commonly understood. As technology has improved, functions expected out of a computer have acquired a more varied nature. Computers of the fifties cannot be called so as per today's definition of computers as they were largely calculating machines without stored program facility. A general definition of computer would be: computers are devices that can carry out calculations at a very fast rate (up to a few million operations per second). These computations are carried out in a sequence determined by the initial commands

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