

**PRACTICAL APPLICATIONS
OF THE
PUNCHED CARD METHOD
IN
COLLEGES AND UNIVERSITIES**

**EDITED BY
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FOREWORD

THE appearance of a volume such as this, pointing out specific methods for the utilization of punched card equipment, will be welcomed by the increasing number of educational institutions which are undertaking to facilitate both their routine recording processes and their work in research. At a first glance these two uses of the punched card machines seem widely separated. Recording and accounting, necessary and essential functions in all educational institutions if the sinews of war are to be supplied to the educational world, are nevertheless often viewed as purely matters of routine which the average educator would dispense with if he dared. On the other hand, his research and instruction have been viewed as almost entirely in the realm of language and thought and not in any sense as matters which can be facilitated by machines. To be sure, the mechanically inclined mathematician and the engineer have developed many ingenious devices which aid their calculations. In recent years they have even considered it desirable to instruct students in the use of such machinery and to urge them to substitute mechanical methods for laborious hand calculations. Nevertheless it is only recently that recognition of the laboratory, and of technical methods, has gained any foothold in many of the subjects taught in our educational institutions.

We are even now only faintly aware of the diminishing differences between the costs of instruction and research in the so-called laboratory sciences and in the social sciences and humanities. Many who are thoroughly convinced of the possibilities of research in these latter fields, and as a matter of fact have themselves engaged in such research for many years, are still unconvinced of the need for mechanical appliances of the type here discussed. It also comes as a shock to those who supply the financial needs of educational institutions to realize that the expense in laboratory facilities and mechanical contrivances which is being requested by these fields is only the forerunner of increasing requests of a similar type. They have fondly hoped that the expensive laboratory demanding equipment of all types would remain limited to mechanics and physical sciences in which they first began.

The social scientist now realizes that many of the problems which he undertakes to solve can be managed on a machine basis whereas in earlier years he would not have undertaken them at all because of the enormous amount of hand labor involved. It is true that in none of the fields of research have machines reduced the necessity for clear thinking and accurate observations, but they have, notwithstanding, enormously reduced the labor of putting data in shape for these essential processes. Mr. Baehne and his associates are to be commended for their effort to place before research workers and the in-

structing staff of our educational institutions the experience of pioneers in the use of the Punched Card Method. It is to be hoped that the appearance of this book will encourage many others to experiment with these and similar machines in order that greater and greater use may be made of such excellent devices.

C. S. YOAKUM.

Ann Arbor, Michigan.
January 15, 1935.

EDITOR'S PREFACE

FOR many years the Punched Card Method, also variously known as the *Hollerith, Tabulating Machine*, or *Electric Accounting Machine* Method, has played an important albeit silent part in the work of leading universities.

Developed originally almost fifty years ago for tabulating census data, its application to other fields was rapid and eminently successful. Commerce and Industry, Institutions and Governments throughout the world have found in it a matchless tool for an almost infinite variety of statistical and accounting tasks.

It is not always clear that mechanical calculation has become as utilitarian and necessary to educational institutions as mathematics and that its development is, in fact, the natural outgrowth of the statistical method of approach to modern learning.

We have only to examine the last census in support of the first of these contentions. In the past three decades of this century the population of the United States increased approximately sixty-one per cent. During the same period the number of students enrolled in our colleges and universities grew 850 per cent, or nearly fourteen times faster than the rise in population. At present close to one million men and women are studying for degrees. Hundreds of thousands more do extension work or take casual courses in summer schools. The college has become a small city with all the problems familiar to a small city. Moreover, with decreasing income and increasing expenses balanced budgets are difficult to strike. As outworn and tedious accounting programs of another day have become impractical and ineffectual, more efficient methods of control and cost analysis have become imperative.

Obviously, then, since universities and colleges have participated in a world growth the problems raised by this expansion outside of these centers of learning are no strangers to it. Problems of group control familiar to a government or industry are just as familiar in a restricted way to a smaller body with similar aims and ideals. The economies that any social group can effect by adopting mechanical technique in management are economies a university can likewise effect by the same methods. Fundamentally, it is administration plus expansion of detail. A college dollar can be just as well or poorly spent as any other dollar.

Just as the population has grown and forced overboard the older methods of regulation, so has the scope of education expanded and radically altered the technique of scientific inquiry. The modern inquisitive trend is so entirely devoid of limitations that there is no possible way of predicting what statistical problem may be raised at any time. In the various sciences the demand now

is for knowledge and more knowledge regarding changes and trends which represent complicated and time-consuming arithmetical labor. Medicine, Law and Education, the Natural and Social Sciences, and even the Humanities all impose burdens of calculation and tabulation with absolute disrespect for the possible time involved.

This has resulted from the logical development of statistical thought. It has been gradual rather than precipitate, with its true origin in the 17th century of Galileo and Newton. However, the very modern phase has occurred within the past thirty odd years, the era of Thomson, Millikan and Einstein. Thought itself has changed. Just as in the 17th century when the statistical approach was first evolved the original mechanical calculator was invented, so, in recent years, numerous high speed calculating machines have been perfected, in common with the Punched Card Method, as the need for them became peremptory. In our day, when neat classifications are falling before the onslaught of a great curiosity about the various and detailed, rapid and accurate devices for making the requisite quantitative analyses are an absolute necessity. The machinery did not precede the trend, it did evolve as a result of a very basic need created by fundamental thought changes.

Statistical projects formerly prohibitive in time and money have suddenly become practical. No matter what the material on hand, economical surveys can be made from every pertinent point of view. The net result is that whatever it is advantageous to know can be revealed, whether that item is a manufacturing cost, a suspected cosmic variation, or a complex problem in budgetary administration.

So numerous are the uses of the Punched Card Method in colleges and universities and so great the interest shown by these institutions that the preparation of this volume was a logical development. In a way this book constitutes an act of self-defense on the part of many of its contributors, whose time has been severely taxed by trying to take care of a growing volume of inquiries concerning their experiences with this method.

Briefly, the object of this book is threefold: (1) To assist those engaged in statistical research to select methods which will lighten their burden of detail and give them more time for productive work; (2) To introduce new norms for measuring the practicability of large scale statistical studies that have not been undertaken in the past because of the prohibitive expense of hand methods, and (3) To assist university administrators to reduce the expenses and increase the efficiency of their institutions.

"How," it may be asked, "is it possible for one system to be applied efficiently to so widely different purposes?" The answer to this question must needs be found within the covers of the book itself. No few words can adequately tell what the Punched Card Method is or what it does, but the reader's attention is called to a brief summarization of the subject on pp. 4 to 8 ff.

A few remarks regarding the arrangement of the book may not be amiss. It was felt at the outset that our readers would prefer authoritative articles actually prepared by the users of the method in the various universities to a general theoretical discussion of the subject. All chapters of this book have,

therefore, been written by men of recognized position and authority, many of whom spent years in perfecting the methods here described.

The chief disadvantage of this otherwise most desirable arrangement is the fact that it has resulted in a certain amount of unavoidable duplication. While, in general, the scheme has been to separate the various applications according to the usual division of activities in universities, this has not always been possible. In those cases footnotes call attention to other parts of the book where similar applications are described.

In order to simplify the reprinting of individual parts of this volume, appendices which would normally be relegated to the end of the book have been inserted immediately following their corresponding chapters.

No attempt has been made to explain in detail the routine procedures that are used. These vary with the types of machines employed, the volume of data and other considerations and have to be worked out to fit a particular situation. The principal aim has been to show *what* the Punched Card Method can do and *why* it can do it, with the *how* delegated to a secondary place.

Users of the punched card method are naturally progressive and it may be assumed that by the time this book reaches the reader important additional applications will have been developed and improvements made in existing methods. There are still many possible uses which have never been investigated. The application of tabulating machines to new fields of work in education is a project which deserves and which will repay careful research.

Our sincere thanks are due to our contributors, who have given freely of their time and experience and have cooperated unhesitatingly in adjusting their chapters to meet the needs of the book. If others will realize that there is here presented a unique tool for effecting economies, for increasing coordination of institutional activities and for doing statistical research on a scale which seemed impossible before, the book will have served its purpose.

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