

Library Automation Systems

Stephen R. Salmon

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TO MY WIFE CHRISTINA

expert editor,

staunch supporter,

apt critic,

and fellow sufferer through it all

INTRODUCTION

There are few librarians today who are not wondering how computers and networks will affect the operation of their libraries tomorrow. Questions are raised regarding automation--what to automate; when to automate; how to automate. Should work on automation proceed individually or in consortia; should services be purchased from others; or should automation not be considered at all, and why?

In a sense, these questions cannot be answered unless and until a library establishes evaluation criteria. But before criteria can be developed rationally, there must be a foundation of understanding as to how the field developed, where it is today, and where it might be going tomorrow.

This book provides such a foundation. It will be useful not only to practitioners, but also to their administrators, who must judge proposals that would change the world of libraries, and would frequently require risk capital to be expended.

Finally, this book will be useful to professors in library schools who are obliged to teach their students how to cope in a brave new world.

Allen Kent

PREFACE

This book is intended as a reasonably comprehensive discussion of library automation systems for the librarian without previous knowledge or experience in the field, and for the intelligent layman. Library automation systems, in the context of this work, are combinations of electronic data processing machines and appropriate programs and operating procedures, organized to work together in carrying out, with a minimum of human intervention, some well-defined library process. It is a field that many thoughtful observers feel has reached a certain maturity, and so deserves to have its portrait made.

The approach throughout most of the book is historical, or to be more precise, developmental. There are three reasons for this. In the first place, it is convenient, not only for the author but hopefully for the reader as well; unless one is to pick up and examine systems at random, some rational order is necessary (even if arbitrary), and the historical serves as well as any. Second, library automation systems are seldom independent achievements; those who work in the field stand on the shoulders of those who went before. The work of Fasana and others in automatically generated codes for controlling card production, which led to the MARC format recognition technique, and the use of "traveling cards" in special library serials systems, which led to Voigt's pioneering "arrival card" serials system in San Diego, are only two examples. Finally and more generally, it seems to the author that we must understand the way in which the field of library automation has developed if we are to understand fully where we are today, and why. Library

automation systems do not exist in a vacuum, and what we do today is partly determined by what was done yesterday, as well as by the mechanical and social circumstances in which we find ourselves. Library automation, that is to say, like any other development, is inextricably tied to its history.

I have avoided the "cookbook" approach, with instructions on how to automate a library, not only because such works already exist, but also because such an approach inevitably runs the risk of being narrow and restrictive, of describing only one technique for mechanizing particular areas of library automation when in fact several methods are available and appropriate. With few exceptions, I have also omitted descriptions of data processing equipment and the way in which such equipment operates, since this information is readily available in a number of standard works.

The principal argument of the book is stated in the first chapter: that the story of library automation is best told through a description of actual operating systems. As even the casual reader must be aware, the literature is replete with descriptions of proposed systems, plans, and projects under way. Many of these projects were never implemented, and those that were implemented underwent substantial changes before actually doing the jobs for which they were designed. In order to avoid misleading the reader with seemingly logical schemes which in practice may be flawed, therefore, I have with few exceptions omitted discussion of any system that is not yet operational. The obvious exception is Chapter 9, which discusses only those projects and practices that failed to withstand the test of practicality.

A secondary thesis which I have attempted to demonstrate throughout the work is that there is a central key to understanding the development of library automation systems to date, and this is the gradual yet dramatic improvement in communications between man and machine. A review of the reports, documentation, and actual operations of the hundreds of library automation systems now installed leaves this impression most strongly: that the improvement

in communications is perhaps the most significant trend discernible, and certainly the most encouraging.

One obvious difficulty with a book that attempts to cover this large and still-changing field is that portions of it will be out of date as soon as it is written. I have tried to include as much material as possible without delaying completion of the manuscript unduly, and the method of page composition and printing has been chosen deliberately to enable publication of the information in as timely a fashion as possible. Nevertheless there will be omissions as well as other errors, and I can only hope that my readers will point them out so that they can be rectified in any subsequent edition.

A second limitation arises from the fact that any book must draw a line at some arbitrary point not only in time but also in subject matter. For example, this discussion of library automation is limited to activities customarily performed within the library, and hence excludes such important functions as computer searching of the machine-readable data bases constructed by various indexing and abstracting services, even though few librarians would question the fact that the rapid growth of commercially-available data base services has major implications for reference and information services in libraries of all sizes and types. Readers who explore the literature further will find many such related matters of interest.

For practical reasons, it has not been possible to visit each project personally, and the information given on many systems is thus based solely on the published literature. Some of this may be considerably out of date, and I will greatly appreciate receiving more current information.

My debts are many. Michael Bruer, Ronald Naylor, Karen Latimer, Marvine Brand, Joe Rosenthal, Paul Fasana, William Cole and Wesley Simonton read the manuscript and offered valuable suggestions and comments. Allen Kent prodded me, as a good editor should, to write an earlier version of some of the material that appeared in the *Encyclopedia of Library and Information Science*. Allen Veaner and

Frederick Kilgour corrected errors in the text dealing with the BALLOTS Project and OCLC. And Bobbie Anderson and Jane Hays struggled mightily through the world's worst handwriting and often-scrambled notes to produce not only the manuscript but the final composition. To all, my heartfelt thanks.

Stephen R. Salmon

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Chapter 1

BACKGROUND AND BEGINNINGS

Library automation is the use of automatic and semiautomatic data processing machines to perform such traditional library activities as acquisitions, cataloging, and circulation. Although these activities are not necessarily performed in traditional ways, the activities themselves are those traditionally associated with libraries; library automation may thus be distinguished from related fields such as information retrieval, automatic indexing and abstracting, and automatic textual analysis.

Linguistic purists have argued rightly that the term "automation" applies more correctly and narrowly to automatic process control, and indeed this was historically the first use of the term. The broader meaning, however, has had the sanction of widespread usage for a number of years, and "library automation" is now by far the most commonly used term for mechanization of library activities using data processing equipment.

In the beginning was Billings

The whole automation phenomenon in our society began with a librarian, in a way. Herman Hollerith, the Census Bureau employee who invented punched-card machinery, attributes the idea to a suggestion by Dr. John Shaw Billings, director of the Surgeon-General's Library

(now the National Library of Medicine). According to the *Dictionary of American Biography*, Hollerith's "work on the census brought him into contact with Dr. John Shaw Billings, from whom came the suggestion of Hollerith's main invention. In a letter to a friend written nearly forty years later he described the origin of the idea: 'One evening at Dr. B's tea table he said to me, "There ought to be a machine for doing the purely mechanical work of tabulation and similar statistics."'"¹ Hollerith agreed, and by 1890 had invented equipment using the now-familiar punched cards for tabulating the census figures of that year. In 1896, he formed the Tabulating Machine Company, which later became the International Business Machines Corporation, or as we know it, IBM. Hollerith offered Billings a share in the venture, but apparently Billings declined.

Punched-card library systems

Librarians continued to be mildly interested in such machinery for most of the first half of the next century. Ralph Parker installed a Hollerith punched-card system for circulation control at the University of Texas in 1936² and by the middle 1940s had also experimented with its use in serial record control. In 1942, the Montclair Public Library of Montclair, New Jersey, installed "two specially designed book charging machines," which recorded individual transactions automatically in punched cards.³ The Library of Congress produced a book catalog using punched cards in 1950, and the King County (Washington) Public Library produced another one in 1951.

These were scattered instances of mechanized systems, however. More were installed in the late 1950s, but most of these were in small, specialized libraries. Typically, such systems used standard punched-card equipment, sometimes called "unit record" equipment because the punched card as a unit record was central to its operation. A common assortment was a card punch, a sorter, a collator, and a tabulator such as the IBM 403.

Except experimentally, computers were not used before about 1961, and in this respect, library automation lagged behind business, industry, and science. The lag was not because of lack of interest and

enthusiasm on the part of librarians, however; computers were still assumed by most people to be satisfactory only for numerical work, and computer programs were still oriented toward business and scientific applications. Even unit record equipment was difficult for most libraries to obtain until their parent institutions--universities, local governments, and businesses--had obtained computers. And unit record equipment, by its nature, was limited in the amount of processing that could be done: only fairly simple tasks could be performed, one at a time, under the control of a wired control panel in the tabulator. The only means of "communication" with the machines was by punching holes in cards (or in paper tapes), and communication back to the users of the system was limited to printed reports or to more punched cards. The capacity for manipulation and analysis of data was small, and of course there was no provision for storing data for later retrieval--except, again, on punched cards.

Computerized library systems

The general-purpose computers that became widely available in the 1960s changed all that, and made possible a second era of library automation systems. Punched-card equipment remained, but played only a secondary and gradually diminishing role. Most of the systems common in the 1960s used punched cards for input, so information was fed into the system in a way not very different from unit record systems, but once the data were entered many more operations could be performed during a single processing, or "run." More importantly, the system could now "remember," storing information regarding book orders in progress, books held or on loan, periodicals received, and so forth, all on magnetic tape. Further, the information could be transferred automatically in and out of the computer's "core" storage as needed for complete operations. The speed of operations and the capacity for manipulation and analysis of data were greatly increased, often by several orders of magnitude.

The context of development

The increased availability of computers and the improvements in data processing they made possible were only two of the reasons for