
Time and Motion Studies in Libraries

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THE ESSENTIAL elements of time and motion study and flow chart analysis are commonplace, and it is doubtful if any reader of this journal has failed to make use of them both in his work and in everyday living. In fact, librarians before and since Melvil Dewey have devoted a fair share of time, effort, and pages of literature to finding and reporting more effective ways of getting work done. The literature of library architecture, to cite one example, is concerned basically with promoting building plans which save the time of staffs in receiving, cataloging, and preparing books for the shelves, and of both staffs and readers in the use of those books.

Formal motion and time study, however, goes somewhat beyond the concept of work simplification and streamlining of processes. One author¹ lists four distinct parts to the process, namely, (1) finding the most economical way of doing the job, (2) standardizing the methods, materials, and equipment, (3) determining accurately the time required by a qualified person working at a normal pace to do the task, and (4) assisting in training the worker in the new method. The different parts may be considered separately, but must all be taken into account in utilizing this form of management control and improvement of performance. While library literature contains many examples of cost studies and reports of time devoted to different phases of the library operation, there has been almost no application of time and motion study technique in the formal sense.

Joseph L. Wheeler² credits Emma V. Baldwin and W. E. Marcus³ with the first industrial motion study process chart to appear in library literature. Their study, published in 1941, was designed to establish measuring rods for the evaluation of library service. Deductions and conclusions are based on data from thirty-seven public libraries, reporting the experience of 1,560 individuals in the daily performance of work for a four-month period. It is a time study in the sense that

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the apportionment of staff time to the major functions of library service is presented.

The process chart itself, prepared by Martha Gilbreth, shows the typical route of nonfiction books through the cataloging department of the Montclair Public Library. Lillian M. Gilbreth, management engineer, was a consultant for the study. The Gilbreths, known widely in recent years through the best seller, *Cheaper by the Dozen*, developed motion study as it is known and applied today.⁴

The first formal motion and time study of a library routine reported in the literature followed shortly in 1943, and was conducted by D. D. Battles, Howard Davis, and William Harms.⁵ This was carried out at the Bradley Polytechnic Institute under the direction of Marvin E. Mundel, with the assistance of Arthur M. McAnally, then librarian at the institute. It concentrated on one part of the circulation routine—loaning a book to a patron. Techniques included micromotion analysis with motion pictures, a microchronometer, motions broken down into therbligs (Gilbreth spelled backwards), and a simo chart (simultaneous motion chart). The study showed the possibilities of reducing the time required in the process by at least 35 per cent through such changes as (1) simplification of card files; (2) rearrangement of books to place heavily used groups near the loan desk; (3) rearrangement of date-due slip and pocket; (4) rounding of corners of book cards; and (5) redesign of date stamp. Reduction of fatigue was stressed as one of the main objectives of motion and time study. Attention was given also to lighting, temperature, and control of ventilation as factors affecting work performance.

Six years later Jewel C. Hardkopf⁶ reported the results of applying methods and motion techniques to the processing of books for circulation at the New York Public Library. Over and above presenting findings, this report is of interest for (1) reviewing the historical development of methods and motion study; (2) analyzing the techniques used; and (3) reviewing previous reports on methods and motion studies as applied to libraries. Referring to the work of Battles and his associates at the Bradley Polytechnic Institute, she says: "This approach . . . should have opened a new era in the realm of library housekeeping. But there is nothing more in library literature to date [1949] about further application of methods and motion techniques to library processes."⁷

The absence of reports of formal studies, however, does not mean that librarians have made no use of the principles and techniques in-

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volved nor that developments in business, industry, and public administration have been ignored. Felix Reichmann's survey of the literature dealing with cataloging costs⁸ traces this concern of librarians in one area of library operations mentioning among other studies the work of the American Library Association's Committee on Cost and Method of Cataloging (1914) and Robert A. Miller's doctoral dissertation,⁹ which involved a detailed analysis of time spent in various steps of the cataloging process.

The Training Within Industry program of the War Manpower Commission during World War II deserves special mention. Its aim was to increase productivity through good use of manpower. Its influence resulted in a number of articles, including those by Frances C. Gates,^{10, 11} Margaret R. Meyer,¹² Edward C. Heintz,¹³ and more recently Joseph L. Wheeler,² which urge more interest on the part of librarians in work simplification and its various ramifications.

The contribution of the editor of this issue of *Library Trends*, Ralph R. Shaw, stands out in recent years. He has influenced librarians' interest in management techniques in all of their aspects in at least three ways: (1) by personal research and applications at the Gary Public Library, the Department of Agriculture Library, and in surveys; (2) by development of machines; and (3) in teaching, participation in conferences, and personal association with colleagues. His report on the development of continuous photoprinting¹⁴ is an excellent example of analysis and research on a specific problem, combined with experimentation and the development of cost-saving processes and equipment. The end result was a 50 per cent reduction in the charge made for this service. His "Scientific Management in the Library"¹⁵ presents a general overview of his approach to management techniques as applied to libraries. Robert F. Price's study,¹⁶ conducted at the Beltsville Branch of the Department of Agriculture Library, serves to illustrate the time analysis method of estimating man-hour requirements for repetitive library routines.

Many library surveys, particularly those in recent years, have given attention to work simplification, improved flow of materials, and work measurement. Some have even made formal use of flow process charts. Reports of the Los Angeles survey,¹⁷ for example, include data on distribution of staff time by functions and recommend a work measurement program as a tool for managerial and administrative control. Process charts, not published in the survey reports, were prepared in connection with a work simplification program.

Wheeler's survey of order and cataloging department policies at the San Diego Public Library¹⁸ included before-and-after motion charting and diagramming of the clerical processes, although the charts were not published. Over-all savings from recommendations were estimated at \$1,500 to \$2,000 yearly in a relatively small operation.

It is quite understandable, therefore, that the Public Library Inquiry should have devoted staff attention to time and work unit measurement. The full title of the report prepared by Watson O'D. Pierce¹⁹ is significant: *Work Measurement in Public Libraries; a Review and Manual on Time Studies and Work Units with a Statistical Analysis and an Evaluation of Administrative and Management Procedures in Certain Public Libraries*. The study presents a mass of data and interpretation commensurate with the somewhat extended title. Reference to Part II (chapters 4 and 5) will serve the purposes of this paper. These chapters describe in detail how time measurements can be made by the staff of a public library, and together form a manual of instructions in carrying on time and work unit measurement. They describe preliminary stages of training and preparation, the orienting of library personnel to measurement studies, and the method of analyzing the results. Report forms are included.

Recent surveys of the New York Public Library by the firm of Cresap, McCormick, and Paget represent the most extensive and detailed analysis to date of technical processes in a major research library. Two studies cover acquisitions and preparations, respectively, giving attention to organization, staffing, management controls, methods (including flow of work), and such physical factors as location, layout, and furnishing. Librarians interested in some of the more specific accomplishments of these studies are referred to the articles by T. D. Morris²⁰ on acquisitions and R. E. Kingery²¹ on preparations.

While Miss Baldwin and Marcus are credited with the first process chart to appear in library literature,³ it was used only for analysis and description, and was not accompanied by any attempt to show how the procedure might be simplified. It was not until 1952, in the survey of the Houston Public Library, that H. H. Young²² used this technique to show first the actual route of the order card from preparation by the division head to final filing (twenty-eight steps), and second, the proposed simplified plan which reduced the route to eighteen steps. The charts employed symbols based on N. N. Barish's work²³ showing "Operation, Transportation, Inspection, and Storage."²⁴ Time

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taken at each stage is not shown, however, so no estimates of savings are presented.

Published literature represents perhaps only a fraction of the management activities being carried out in libraries in general and with special reference to work simplification. The work being done at the Brooklyn Public Library under Francis St. John, for example, is reported only in a general way.²⁵ Jewel Hardkopf, whose thesis has been mentioned, devotes full time to studies of internal operations and procedures at Brooklyn. The photoclerk experiment undertaken in 1952 drew upon the experience of staff members in twelve libraries and stimulated research and study of various procedures in the cooperating institutions. The University of California Library at Berkeley supplied several significant examples of flow charts based on work done there, both in relation to internal operations and in connection with the development of the standard interlibrary-loan form. The Detroit Public Library supplied a floor plan of the Binding Department layout, showing the flow of work through the Department. Alma Jacobus²⁶ described the use of work flow charts at the 1950 meeting of the Special Libraries Association. Carolyn Hale²⁷ reports the work simplification clinic held at the University of California School of Librarianship, Berkeley, which included presentation of the Gilbreth method of process procedure analysis, while the Library of Congress has produced a sound film, "The Flow Process Chart and How to Make It." Several theses bearing on the subject have been reported from the University of Illinois, but are unpublished.²⁸⁻³⁰ Other items may have escaped this writer's attention.

It appears from the above information that the essential elements of time and motion study have been used by librarians in fulfilling management responsibilities. Going back to Barnes's four points, librarians have been interested, even if in varying degrees, in (1) finding the most economical way of doing jobs; (2) standardizing methods, materials, and equipment; (3) determining time required by a qualified worker to do a given task (i.e., the setting of performance standards); and (4) on-the-job training of staff. We have seen, also, that only the smallest beginning has been made in relation to the potential gains from application of the principles of motion and time study to library operations.

We know as a result of industrial experience, from Taylor on through the World War II period and to date, that research and study of methods, materials, and equipment pay tremendous dividends in

increasing output per worker and in lessening fatigue. We know, too, that these same methods when applied to various aspects of library work produce comparable results in better service, lower cost, or both.

The conclusion might well follow that librarians by and large are failing to fulfill their management responsibilities in the area of applying modern techniques in general and motion and time study in particular. This writer would hazard that a jury hearing the evidence would bring a verdict supporting such an accusation. But rather than press charges against ourselves, it will be the purpose of the remaining paragraphs of this paper to suggest some of the more obvious ways in which librarians might proceed to be sure that adequate attention is given to time and motion techniques in the management of their libraries. This will represent one person's opinion, admittedly prejudiced because he has spent dozens of relatively unproductive hours checking and reviewing library literature on the subject.

The first suggestion ought not to be new for librarians, namely, to read a book on the subject, not from library literature but directly from the industrial engineering field. Any one of several possibilities will do, and standard bibliographical sources will produce their titles. Business managers were given this same advice by Burton Crane in his review of the Spriegel-Myers compilation of the *Writings of the Gilbreths*, published in the spring of 1953.³¹ Speaking of the book, he says:

. . . it starts with rules issued by Gilbreth's firm of general contractors for pouring concrete, laying brick and breaking in apprentices. It proceeds through motion studies, elimination of fatigue and the other tools of modern management to incentives and the necessity of making each worker feel that he is a member of a team.

Today procedures recommended by the Gilbreths are followed by most of our larger companies but the underlying principles are too often on the dusty library shelves of a generation ago. A good many managers, whether in industry or selling, would benefit by the fresher course provided in this new book.³²

The second suggestion is to place responsibility within the organization for making use of such techniques. In other words—organize and staff for the purpose. While the specific solution will vary with each library, all supervisors, including the chief administrative officer, should have a part in the program. Larger organizations may need a specialist position, but this does not relieve other supervisors of responsibility. Smaller organizations would do well to secure the assist-

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ance of a specialist on a consulting basis. As specific projects get underway, all staff members affected should be brought into discussions.

The third suggestion is to identify and to recognize similarities and differences in library operations in relation to the industrial activities for which time and motion techniques were developed. Such techniques normally apply only where the activity or operation is repetitive. An early paragraph in the report of the survey of the preparation procedures at the New York Public Library is particularly significant.

To the management analyst accustomed to the office routines and production techniques of business and industry, the preparation machinery of a large research library presents both a challenge and a fascinating field for study. Here one finds the customary exterior of a mass production office operation—files, forms, typewriters, and controls. But there the similarity largely disappears and a complexity complicated by strange terminology is encountered in almost every phase of the work. The concept of repetitive operation which is the keynote of economical mass production in business is strikingly absent in the Library because each new piece prepared may present new or unusual problems to the searcher, the cataloger, the filer and other assistants. In this respect, preparation exhibits characteristics more closely allied to those involved in manufacturing a custom-made product. As one becomes more intimately acquainted with the substance of cataloging, it is more readily apparent that preparation is not a series of simple clerical tasks but a professional undertaking requiring skills that only specialized training and experience provide.³³

This statement should not be read to exclude the use of scientific management methods from areas involving exercise of professional competence, but rather that time and motion techniques may be more productive in some aspects of the library operation than in others.

The fourth suggestion is to recognize the significance of small gains either in actual dollar savings or in staff convenience and elimination of fatigue. A continuing saving of \$100 per year may justify spending up to \$2,500 for research or new equipment, and \$100 may be as little as one week of one staff member's time in a year.

The fifth and final suggestion is to recognize that perfection is rarely if ever reached. Operations should be kept under continuous scrutiny, assuming always that further improvements can and will be discovered with study and experience. There is, of course, the corollary

—"Don't try to reach perfection in one step." In fact, it is frequently more practicable to freeze certain aspects of an operation in order to focus attention sharply on a related aspect, just as the scientist often starts with certain assumptions, but in due course, if not in the immediate process, retests and corrects these assumptions.

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