

Counting and Accounting: A Speculation on Change in Recordkeeping Practices

TRUDY HUSKAMP PETERSON

ONE OF THE MOST FUNDAMENTAL ACTS OF an organized people is counting: how many people are there? how many sheep and goats? how many boats? how many members of this group or circle? Recording the count is also necessary, whether for tax and revenue purposes or for purposes of control. A people need not have a written language to be able to record a count; for example, the people of pre-Columbian Peru, masters of textile arts, used a system of knots on strings or cords to record census and tax information. But many of the oldest known written documents concern counting, whether for a government or a business.¹

If counting is a fundamental concern of an organized society, then it is reasonable to assume, first, that there will be a premium on recording the count rapidly and accurately, and second, that the recording system that works best and most rapidly is the one that will be adopted.² As societies become larger and more complex, the strains on the counting (or data management) system lead to a search for more efficient systems. A new system that performs better than the one in use will ultimately supplant the older one. One can speculate, therefore, that changes in recordkeeping have been linked to problems in recording counts.

Clay tablets worked well to record the

¹This is not to suggest that counting is the only fundamental recording need. Another fundamental requirement is the need to document legitimacy. As the clan was replaced by urban society, the need arose to guarantee an organized, publicly acknowledged succession of the family and its property. One can speculate that this led to documenting the legitimacy of children by recording births. Other questions in the area of legitimacy are enfranchisement, claims for rights and benefits, reciprocal obligations, and the desire of the ruler to know who comprises the taxable population. In the last case, legitimacy and census (counting) needs intersect.

²Max Weber argued that modern bureaucracy has prevailed over older forms of administration because of its greater "precision, speed, unambiguity, [etc.]. . ." See the chapter "Bureaucracy" in H.H. Gerth and C. Wright Mills, eds., *From Max Weber: Essays in Sociology* (New York: Oxford University Press, 1946), p. 214. Although I have drawn few specific ideas from his work in this paper, Weber's spirit of inquiry forms the basis of it; I invariably find rereading his work illuminating.

count: they were cheap, the procedure was simple, the recording could be continuous. The tablets were small units and the edges could be used to index them, so retrieval was quick. Clay tablets presented a problem, however: once they were baked, the scribe could not add to or subtract from the data on them. Scrolls of papyrus presented the opposite problem: while additional sums could be written on them long after the first recording was completed, the scrolls had to be unrolled and scanned to find the needed information. A form of indexing on the outside of the scroll did develop, but the process of data retrieval was still slower than pulling a relatively small tablet from the shelf and locating the information.³

There are many theories about the development of the book. But it is safe to assume that the reasons for its continued dominance are practical ones: easy to store, easy to retrieve, and reasonably easy to peruse and preserve, a book quite effectively protects the information it contains. The first books were probably collections of sheafs of pages already inscribed the next step was a book with blank pages to be inscribed. It was at this juncture that the ledger could develop. It has the advantages of both the scroll and the tablet: as with the former, data can be easily added or subtracted, but the book also resembles the tablet in that the information is recorded on relatively small surfaces that are simpler to locate than the sheets embodied in a scroll.⁴

The age of the ledger continues, although its book form is less and less

common. Ledgers are static forms. If the same population or other aggregation must be counted in several ways—first by geography, then by sex, then by race, for example—or if the data must be used for some purpose other than that for which they were collected, it is difficult to shuffle this information if recorded in the ledger form. In an increasingly complex society, the need is not only to count, but to categorize and reorder those things already counted, and again the ledger makes this difficult. Bits of information can be shuffled more easily by using small, loose sheets of paper that can be ordered and reordered, and in the latter part of the 19th century card systems evolved. One well-known example of this evolution involved U.S. Civil War pension claims. In 1879 Congress passed the Civil War soldiers' pension act, which brought a flood of claims. The Surgeon General's Office in the War Department was responsible for furnishing information for use in adjudicating pension claims: hospital records of invalids and the cause of death of deceased soldiers. The problem was that although the hospital records were extant, the information had been entered into the hospital ledgers chronologically as the patients were admitted. By 1886 there was a backlog of thousands of pension claims; at this point Army Captain Fred C. Ainsworth solved the problem by having clerks copy the hospital ledger information onto cards, which could then be sorted by regiment and arranged alphabetically by name. The system worked, and the 1887 Cockrell Commis-

³The best summary discussion of the ancient forms of recordkeeping is Ernst Posner, *Archives in the Ancient World* (Cambridge: Harvard University Press, 1972).

⁴There are many histories of the book. In their introduction to *Conservation of Library Materials: A Manual and Bibliography on the Care, Repair, and Restoration of Library Materials* (2d ed., Metuchen, N.J.: Scarecrow Press, 1971), George M. Cunha and Dorothy G. Cunha wrote: "It is generally agreed that shortly before the emergence of Christianity. . . writers began to use oblong sheets of papyrus for convenience. These, after being inscribed, were gathered into bundles and fastened along one edge by sewing. The few papyri extant today in codex format are stabbed at one edge and laced through the stabbed holes. . ." (p. 4).

sion on government paperwork endorsed the card system of recordkeeping.⁵ The patent files of the late 19th century contain numerous examples of devices designed to hold cards, including trays with rods, multiple rows of drawers in a cabinet, and drawers high enough to hold guide cards with visible top margins. The card file was quick and easy to use, the investment was not great, and cards became a common feature of the data keeper's recordkeeping.⁶

As populations—whether human, animal, or vegetable, animate or inanimate—grew, the data keepers needed a system that could count even more quickly. Again a U.S. government example shows the crisis in the system. The 1880 decennial census was taken on schedule, but it took most of the following decade to tally its data. Herman Hollerith, an employee of the Census Bureau, hit upon the idea of recording the census data on cards by punching holes in them, the position of each hole representing a certain kind of information. After the cards were punched, rods could be run through them—the rods picking up only those with holes in certain positions—and the cards with those particular characteristics counted. The rods could then be removed, run through at other positions, and the cards with those characteristics counted, and so on. This system was used with great success to handle the data collected in the decennial census of 1890, and the coding of bits of information onto cards by the hole-punch method is a direct

precursor of the punch cards of the early computers.⁷

The impetus and credit for the development of the first computer are matters of some dispute, but the compelling problems were those of volume of information, correlation, and speed of retrieval. In a celebrated court case over the patent rights for computers, one of the principal inventors, Dr. John Vincent Atanasoff, said that he set out to devise a computing machine of great accuracy and speed when he saw his graduate students struggling with the masses of numerical data derived from complex physics problems. The counting and enumerating need of an increasingly data-rich society led to an invention that included a new form of documentation: the computer tape.⁸

As the counting and recording needs changed over time, the forms of documentation changed to accommodate their needs. And the forms used for non-counting documents changed also. Ernst Posner suggested that in antiquity there were six basic record types: laws, evidence of administrative action, financial and accounting records, records relating to property, records facilitating control over property (including tax), and "notorial" records that safeguarded business transactions.⁹ At least three of these, the financial and property records, have a counting component. As the scribe maintaining the accounts abandoned the clay tablet and the scroll for the book and the sheet of paper, so did the book and sheet come to dominate the forms used for other, non-

⁵Mabel E. Deutrich, *The Struggle for Supremacy: The Career of General Fred C. Ainsworth* (Washington, D.C.: Public Affairs Press, 1962), pp. 22-47.

⁶Victor Gondos, Jr., "From Bundling to Ballbearings: The Development of Filing Equipment and the Federal Government" (unpublished paper, National Archives Library, April 1956).

⁷An interesting account of the census and its problems is found in Margo Cook, "Accuracy, Efficiency and Bias: The Interpretation of Women's Work in the U.S. Census of Occupations, 1890-1940," *Historical Methods* 14 (Spring 1981).

⁸For a summary of the controversy over the development of the computer, see W. David Gardner, "Will the Inventor of the First Digital Computer Please Stand Up?," *Datamation* (February 1974), pp. 84-90.

⁹Posner, *Archives in the Ancient World*, pp. 3-4.

counting documentation. This relationship between recordkeeping practices in the two areas is not causal: laws were not written in books because numbers were; laws were written in books because that form of recordkeeping was more efficient for them too. The change is not always identical in the counting and non-counting systems, even when change comes to both. For example, for centuries both used books. In the evolution toward loose sheets, accounting records evolved from ledgers to card files and then to mechanical and electronic devices, while non-counting records, principally correspondence, evolved from the register and bound volume to the bound volume and card file, and later to looseleaf filing with card file, and then to the self-indexing looseleaf filing that is common today. The metamorphoses of the two systems have in common a change from a static form—the book—to active forms: the loose sheet, the card, and the magnetic tapes and discs on which machine-readable data are stored.

What does this suggest about computer data? Will they eventually supplant other recording methods? Will a system developed for the counting, data-handling needs of organized society also become the predominant form for correspondence and the other non-numerical, non-data-element forms of documentation? Probably not. Paper sheets have persisted because they are

practical: light, inexpensive, easy to maintain, transportable. They can be read and re-read on a plane, at a beach, in bed. Paper seems to meet human needs (though this may be an illusion engendered by its persistence). Even when conceptual documents are processed on and stored in a machine, paper will probably persist as the principal action form.¹⁰ But in the critical realm of counting, the realm of data ordering, the change to computers is irreversible.

This also suggests that counting is the area in which future changes in recordkeeping practices are most likely to occur. The demands for quick and reliable counting and ordering seem to be a constant feature of organized societies; counting and accounting seems to be the area in which the older forms of recordkeeping most quickly become obsolete. Whether changes in other forms of documentation follow changes in the recordkeeping practices of counting and enumerating depends at least in part on other factors in the society's development, but the historical pattern suggests that, even if the form used in the count is not adopted in its entirety, there is usually at least some type or degree of mutation, either an imitative or a parallel development. And the change comes, to use Max Weber's argument, because the recordkeepers in bureaucracies, both public and private, find the new approach to be more rational.¹¹

¹⁰See "The 'Paperless Office': A Case Study of the State Department's Foreign Affairs Information System," p. 142-154 of this issue. Here a description of a largely automated data storage and retrieval system—in this case for non-counting records—refers repeatedly to high speed printers and paper copies.

¹¹Gerth and Mills, *From Max Weber*, p. 214.