# OFFICE AUTOMATION EQUIPMENT

# THE PRESENT BASE AND FUTURE PROSPECTS TO 1985

Prepared by:

R. W. Hough and Associates Ltd.
Contract 06GR.36100-9-0883
File 5412-4-6 (DOC)
32-19(DEA)

Edited by: M. Estabrooks
L.A. Shackleton
August 1980
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# Chapter 1

## INTRODUCTION

In October, 1978, the research sector of the Canadian Department of Communications initiated a research and development study into the rapidly emerging field of office automation and advanced office communications. Among the issues and considerations that led to this project were the following:

1. A recognition that changes were beginning to be introduced in offices in North America and around the world, by way of sophisticated new machinery called "word processing" equipment;

2. A leading producer of such equipment was a Canadian-owned and managed company, AES Data Ltd., of Montreal;

3. A great deal of discussion had begun to emerge in computer circles, communications circles, trade publications, conferences and the like on the so called "Office of the Future";

4. These forecasts and prognostications of things to come invariably included glowing promises for the next new generation of word processors, namely communicating word processors or CWPs;

5. The immediate implication of the above (suitably amplified into extensive technical and economic studies and reports, market forecasts, surveys, "expert" prognostications and so on) was that data processing,

word processing, and communications would all combine very shortly to reconfigure the office environment on entirely new lines, ushering in completely automated information and document storage and retrieval, instant electronic mail, terminals on every desk, and a host of other transformations;

6. And finally, if such forecasts were true, or even partly true, it would be greatly to Canada's advantage to be in on the development process from as many standpoints as possible, particularly that of Canadian manufacturing and initiation of a wide range of the new products, services, and systems that would be required in the "Office of the Future".

These issues, combined with others, made it clear that a fruitful area for DOC research would indeed be the office environment, particularly if a project could be constructed that would have as its principal output demonstrable moves toward stimulating, fostering, and helping to initiate and promote Canadian participation in the office automation field.

One of the first projects to be initiated by the Office Communications Systems (OCS) program was that dealing with market intelligence. Specifically, the department had to know the current installed base of office communications equipment and systems and to forecast how this would change over the next five years. This report addresses these issues. What follows is an analysis and estimation of the office automation market in Canada to the year 1985.

This report has several conclusions. The first is that major changes are beginning to take place in the office and word processing is performing an important role therein. However, it is a realistic observation that these changes are taking place in an evolutionary rather than a revolutionary manner and no case can or should be made for magical changes and solutions to the problems confronting office automation overnight. Finally, the report concludes with estimates of the 1978 base for office equipment and projections to the year 1985. No revolutionary changes are expected to occur over this period.

Chapter 2

## Estimation of Market and Installed Base Figures for Office Communications Equipment and Systems

In this section, we concern ourselves with market estimates, forecasts and statistical data for the office communications market in Canada. Specific attention is given to the following types of equipment:

1. Business Telephones,
2. Office Typewriters,
3. Word Processors,
4. General Purpose Computers,
5. Small Business Computers,
6. Data Terminals with Communications,
7. Telex/TWX Terminals,
8. Other Message System Terminals,
9. Facsimile Terminals, and
10. Photocopy Machines.

The following subsections provide estimates of the installed base for each of these types of equipment.

Business Telephones

Statistics on business telephones are derived from Statistics Canada and are contained in Table 1. This is in fact the only business communication item for which records are kept by Canada's official statistical agency, Statistics Canada.

The reason for this, of course, is that telephone companies in Canada, as in the U.S. are regulated by government agencies, either federal or provincial. Since this is the case it is an easy matter to require these companies to furnish certain kinds of information, broken down in various ways. As may be seen in Table 1, one of these pieces of information, collected over a substantial period of time, has been the number of business telephones.

We have recorded in Table 1 the statistical series as it exists only as far back as 1959. In fact, the series predates this year by at least twenty more years, but 1959 to 1978 data are quite adequate for our present purposes. Table 1 also records only business and total telephones, and the ratio of one to the other; while it is not shown, therefore, we assure the reader that residence telephones make up the difference for all years, since "business" and "residence" are the only categories used for this breakdown. The number of business telephones has grown at almost 6% per year over this period.

An interesting point to be noted from Table 1 is the extraordinary regularity of the breakdown between business and residence installations, covering the entire twenty year period. This ratio, recorded in Table 1 as the percentage of business to total telephones, has fluctuated only 1.1% over this time, from a low of 28.7% to a high of 29.8%, where it is now. Moreover, what

Table 1

Business Telephones in Canada, 1959-1978

(000)

| Year | Business Telephones | Total Telephones | Percent of Total |
|---|---|---|---|
| 1959 | 1569 | 5439 | 29.8 |
| 1960 | 1674 | 5728 | 29.2 |
| 1961 | 1730 | 6014 | 28.8 |
| 1962 | 1817 | 6330 | 28.7 |
| 1963 | 1910 | 6657 | 28.7 |
| 1964 | 2016 | 7019 | 28.7 |
| 1965 | 2142 | 7445 | 28.8 |
| 1966 | 2290 | 7893 | 29.0 |
| 1967 | 2423 | 8358 | 29.0 |
| 1968 | 2557 | 8818 | 29.0 |
| 1969 | 2719 | 9296 | 29.2 |
| 1970 | 2854 | 9750 | 29.3 |
| 1971 | 2996 | 10269 | 29.2 |
| 1972 | 3183 | 10987 | 28.9 |
| 1973 | 3428 | 11677 | 29.4 |
| 1974 | 3691 | 12454 | 29.6 |
| 1975 | 3928 | 13165 | 29.8 |
| 1976 | 4127 | 13885 | 29.7 |
| 1977 | 4309 | 14488 | 29.7 |
| 1978 | 4528 | 15172 | 29.8 |

Source: Statistics Canada, Catalogue 56-203.

fluctuations have occurred are recorded to have taken place only very slowly and gradually, indicating, apparently, that even substantial changes in the economy (several recessions have occurred during the period) have had little effect on this particular series.

Office Typewriters

The process of developing estimates for office typewriters has been an interesting one. At first one is struck by the great contrast between trying to find out how many typewriters there are in the country versus how many telephones there are -- the difficulty being that Statistics Canada does not count typewriters in place -- or word processors, facsimile machines, or computer terminals either for that matter. From here on, therefore, the plot thickens substantially, and considerable imagination, ingenuity, and willingness to compromise are required.

In the typewriter situation we have found that statistical series on imports, exports, and domestic production are the best to use. Our objective in this case is to establish reasonable figures for "apparent domestic disappearance" of typewriters over a substantial period of time, and from these figures develop a best obtainable estimate for the cumulative installed base of business typewriters, using a reasoned approach to what may have happened along the way.

To begin, Tables 2 and 3 show, for total and electric typewriters respectively, statistical series on (1) domestic production (i.e., "shipments");

Table 2

Total Typewriters 1960-1978

| Year | Total Shipments | Imports | Exports | Re-Exports | Apparent Domestic Disappearance |
|---|---|---|---|---|---|
| 1960 | 85,704 | - | 17,611 | 2367 | 65,726 |
| 1961 | 90,132 | 49,108 | 17,375 | 1027 | 120,838 |
| 1962 | 94,445 | 60,280 | 18,494 | 990 | 135,241 |
| 1963 | 89,166 | 48,593 | 6,425 | 4564 | 126,770 |
| 1964 | 112,216 | 64,086 | 13,146 | 614 | 162,542 |
| 1965 | 122,052 | 57,384 | 10,131 | 1008 | 168,297 |
| 1966 | 121,580 | 72,234 | 13,053 | 1177 | 179,584 |
| 1967 | 96,599 | 106,100 | 12,307 | 2227 | 188,165* |
| 1968 | 103,963 | 104,790 | 33,514 | 643 | 174,596* |
| 1969 | 112,841 | 110,013 | 41,929 | 4972 | 175,953* |
| 1970 | 159,094 | 145,540 | 54,709 | 86 | 249,839 |
| 1971 | 162,587 | 182,972 | 38,565 | 866 | 306,128 |
| 1972 | 137,938 | 180,955 | 37,872 | 6260 | 274,761 |
| 1973 | 184,026 | 141,828 | 67,470 | 969 | 257,415 |
| 1974 | 224,625 | 161,091 | 95,489 | 611 | 289,616 |
| 1975 | 213,609 | 169,691 | 63,402 | 1132 | 318,766 |
| 1976 | N/A | 168,197 | 78,736 | 1851 | N/A |
| 1977 | N/A | 163,010 | 98,225 | 1841 | N/A |
| 1978 | N/A | 181,157 | 119,148 | 2314 | N/A |
| | | | | TOTAL | 3,194,237 |

* Domestic Disappearance low because of confidentiality of numbers for shipments of Portable NES typewriters

Source: Statistics Canada Catalogues 65-202, 65-203, 42-216.

Table 3

Electric Typewriters - 1960-1975

| Year | Total Shipments | Imports | Exports | Re-Exports | Apparent Domestic Disappearance |
|---|---|---|---|---|---|
| 1960 | 16,994 | - | - | - | 16,994* |
| 1961 | 17,953 | 4,371 | - | - | 22,324* |
| 1962 | 25,066 | 1,612 | - | - | 26,678* |
| 1963 | 27,486 | 2,443 | - | - | 29,929* |
| 1964 | 33,565 | 2,696 | - | - | 36,261* |
| 1965 | 42,600 | 4,689 | - | - | 47,289* |
| 1966 | 46,886 | 8,351 | - | - | 55,237* |
| 1967 | 56,143 | 11,253 | 7,801 | 448 | 59,147 |
| 1968 | 72,099 | 10,431 | 26,058 | 191 | 56,281 |
| 1969 | 85,909 | 12,903 | 32,147 | 809 | 65,856 |
| 1970 | 107,924 | 35,549 | 42,419 | 13 | 101,041 |
| 1971 | 100,470 | 45,436 | 32,187 | 469 | 113,250 |
| 1972 | 99,741 | 47,851 | 36,473 | 530 | 110,589 |
| 1973 | 142,039 | 32,216 | 54,221 | 146 | 119,888 |
| 1974 | 177,469 | 45,194 | 66,993 | 553 | 155,117 |
| 1975 | 186,631 | 45,610 | 54,518 | 745 | 176,978 |
| | | | | TOTAL | 1,192,859 |

* Note: No separate class for electric typewriters, exports or re-exports, during these years. 1960: no data exists on imports.

Source: Statistics Canada, Catalogue 65-202, 65-203, 42-216.

(2) imports; (3) exports; (4) re-exports, and (5) a calculated figure for what we will call "apparent domestic disappearance". This latter figure is the algebraic sum of the first four items, as follows:

Domestic Disappearance = Shipments + Imports - (Exports + Re-Exports)

This calculation assumes, obviously, that whatever was produced or imported into Canada, less what left the country according to export records, remained in Canada at each year of record, and, incidentally, still remains here.

From the records in Tables 2 and 3 we now construct several additional series. First, we note that in today's offices it may reasonably be assumed that virtually all typewriters are electric ones, and this has undoubtedly been the case for some time. Moreover, if we assume that 1960 was, in fact, a reasonably accurate beginning date for the introduction of office electrics in Canada, and that since 1960 the entire stock of non-electric office machines has been replaced with electrics, this would mean that an appropriate cumulative series of office electric typewriters would yield the estimated present installed base figure we are seeking.

Pursuing this line of reasoning, we first note, from Table 3, that domestic disappearance of electric typewriters started in 1960 with approximately 17,000 machines, and increased steadily for the next 15 years, to some 177,000 in 1975. Of these, only some are office electrics, because beginning in approximately 1970, portable electric machines were introduced to the market. To obtain office electrics alone, therefore, it is necessary to

reduce domestic disappearance as recorded in Table 3 to account for portable units -- which can reasonably be assumed to be destined for personal (i.e., home) rather than business consumption.

Detailed import data, available for 1976-1978 only, show us that the yearly ratio of portable to standard electrics is now almost 80%. This ratio has been increasing steadily, as shown by Table 4.

If we assume that all portable electrics are for personal (i.e., home) use and all standard and automatic electrics are for the office market, we can revise our approximation of the installed base. We must however, make a few more necessary assumptions. These are, that the percentage of portable to total electric typewriters holds true for domestic disappearance as for imports; that portable electric typewriters were introduced to the consumer market in 1970; and that previous to 1970 all new electric typewriters were office electrics. It is also necessary to assume a gradual growth of the portable electric typewriter market. We have decided on the percentages listed in Table 5 as % of Portable Electrics.

Maintaining our assumption that the entire stock of electrics from 1960-1969 are office electrics (a total of 415,996) we subtract the portion of portable electrics from domestic disappearance to determine apparent disappearance of office electrics. Finally, we can take the last steps in our analysis, namely reducing domestic disappearance even further, by taking into account replacements of early models of electric typewriters with new ones.

Table 4.

Imports of Typewriters, 1976-1978

| Typewriters | 1976 | | 1977 | | 1978 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Standard Electric new | 24,017 | 37.19 | 22,680 | 28.80 | 16,560 | 19.56 |
| Standard Electric used | 93 | .14 | 28 | .04 | 210 | .25 |
| Portable Electric new | 34,294 | 53.10 | 53,042 | 67.34 | 67,630 | 79.90 |
| Portable Electric used | 337 | .52 | 33 | .04 | 244 | .29 |
| Automatic new | 5,693 | 8.81 | 2,940 | 3.73 | - | - |
| Automatic used | 153 | .24 | 39 | .05 | - | - |
| Total | 64,587 | 100.0% | 78,762 | 100.0% | 84,644 | 100.0% |

Source: Statistics Canada, Catalogue No. 65-207.

Table 5

Domestic Disappearances of Office Electric Typewriters, 1970-75

| Year | Domestic Disappear | % Portable Electrics | Portable Electrics | Apparent Domestic Disappearance Office Electrics |
|---|---|---|---|---|
| 1970 | 101,041 | 3% | 3,031 | 98,010 |
| 1971 | 113,250 | 9% | 10,193 | 103,057 |
| 1972 | 110,589 | 15% | 16,588 | 94,001 |
| 1973 | 119,888 | 23% | 27,574 | 92,314 |
| 1974 | 155,117 | 31% | 48,086 | 107,031 |
| 1975 | 176,978 | 41% | 72,561 | 104,417 |
| | 776,863 | | 178,033 | 598,830 |

In order to approximate replacement, we must make the gross assumption that all electric typewriters purchased in 1960 were new and were not purchased for the purpose of replacing existing electric typewriters. If an electric typewriter has a ten year life span, then in 1970, the typewriters purchased in 1960 are being replaced. Thus, we have assumed that 10% of sales in the period 1970-1975 are for replacement purposes, and that all the typewriters which are being replaced are either junked or reconditioned for sale in the personal market. Table 6, provides us with a reasonable approximation of the estimated current installed base of office electric typewriters in Canada. In 1975 the estimated current installed base of office electric typewriters is therefore 690,612.

As a method of evaluating our approximation, we considered employment figures for the period 1960-1975 and attempted to determine the number of working individuals who might have a typewriter at their desk. Statistics Canada data provides us with estimated employment by occupation as follows:

1975 (all occupations) 9,363,000

(Steno & Typing) 381,000 (4.07% of Total)

$$1975 \frac{\text{estimated cumulative base office electrics} \times 100}{\text{employment 1975 (all occupations)}} = 7.4\%$$

If we match each individual who is classified Steno & Typing with a typewriter, we have accounted for 55% of the estimated base of office electric typewriters. Further it is not unreasonable to assume that among the 8,982,000 other persons employed in all other occupation classifications we can account for the remaining 310,000 office electric typewriters. (Consider for example

Table 6

Installed Base of Office Electric Typewriters, 1960-75

| Year | (1) Prev Year Installed Base | (2) 10% of (1) | (3) Apparent Dom Disapp | (4) Real Dom Disappear | (5) Estimated Current Installed Base |
|---|---|---|---|---|---|
| 1960 | | | 16,994 | | 16,994 |
| 1961 | | | 22,324 | | 39,318 |
| 1962 | | | 26,678 | | 65,996 |
| 1963 | | | 29,929 | | 95,925 |
| 1964 | | | 36,261 | | 132,186 |
| 1965 | | | 47,289 | | 179,475 |
| 1966 | | | 55,237 | | 234,712 |
| 1967 | | | 59,147 | | 293,859 |
| 1968 | | | 56,281 | | 350,140 |
| 1969 | | | 65,856 | | 415,996 |
| 1970 | 415,996 | 41,600 | 98,010 | 56,410 | 472,406 |
| 1971 | 472,406 | 47,241 | 103,057 | 55,816 | 528,222 |
| 1972 | 528,222 | 52,822 | 94,001 | 41,179 | 569,401 |
| 1973 | 569,401 | 56,940 | 92,314 | 35,374 | 604,775 |
| 1974 | 604,775 | 60,478 | 107,031 | 46,553 | 651,328 |
| 1975 | 651,328 | 65,133 | 104,417 | 39,284 | 690,612 |

Source: Hough and Associates, based on Statistics Canada Data.

all those individuals classified as administrative, sales, clerical, reception, etc.). In addition, discussions with government officials indicate that the Department of Public Works estimates that the federal government has about two typewriters for every employee classified as clerk-typist, secretary, stenographer or stenotypist. This ratio also tends to support our estimate of office typewriters.

The result of these calculations indicates, to a best approximation using these methods, that the total number of office typewriters in use in 1975 was probably about 700,000, increasing to some 800,000 in 1978 (see Figure 1). We believe that these numbers have been derived conservatively, and are not unreasonable taking into consideration office employment by occupation. We conclude therefore that they should stand until, at least, improved estimates become available.

Word Processors

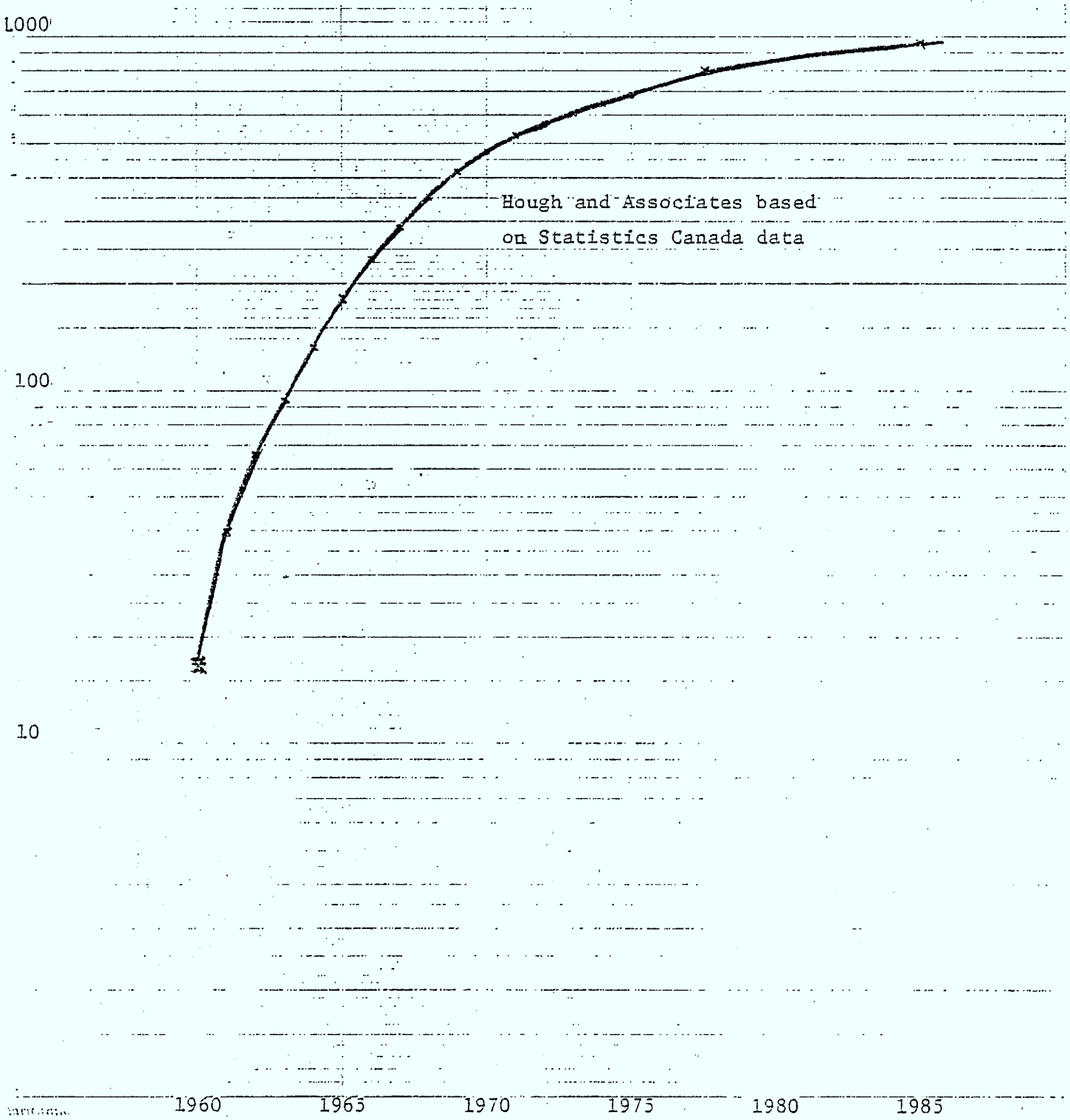
It is a curious fact, as we will see in this section that something as well established as typewriters is very difficult to "get a handle on", whereas estimates for word processors and other new equipment are much easier to establish. Essentially, this is because new equipment is being introduced to the market in recent times, and thus both suppliers and observers of the market -- researchers for example -- have knowledge of approximations of units sold, dollar value, but on and so on. These estimates may vary substantially in some cases, but in other cases there is quite acceptable agreement.

FIGURE 1

Office Electric Typewriters

Estimated Installed Base, 1960-1985

(000)



This is the situation with word processing. Again, there are some differences, but on the whole both present estimates and forecasted growth are in general agreement, using the sources we have at our disposal.

Previous work in this field (Price Waterhouse and Hough and Associates, 1977) has provided estimates of present installed base and growth patterns for word processing in Canada. In general terms these estimates are somewhat more conservative than those from many trade sources.[1] In the light of other current information we are inclined to set the estimate somewhat higher today, at about 19,000 for 1978, growing to 30,000 for 1980, 56,000 for 1983, and 75,000 for 1985 (including communications and word processors). Figure 2 illustrates these data.

We are of the view that there are very few communicating word processors in existence at the present time in Canada (we think that 1,000 is about the right number), and that even fewer are being used in a communicating mode. Moreover, those that are communicating are not doing so in a terminal-to-terminal context but for experimental, very limited, or very specialized applications such as transmitting text to a typesetting system or collecting address lists from a computerized data base.

Some parts of this situation may be expected to change substantially over the next three to five years, particularly with respect to the fact that users may be expected to purchase many more units with communications options. Nevertheless, we also believe that it is more than likely that message communications with these devices will continue to be modest for some time.

---

1 It should be noted at this point, that our estimates of word processing growth are intended to include low priced systems such as those marketed by Radio-Shack (i.e., the use of very small business computers specifically and exclusively for word processing), as well as more conventional systems (i.e., AES, Wang, etc.).

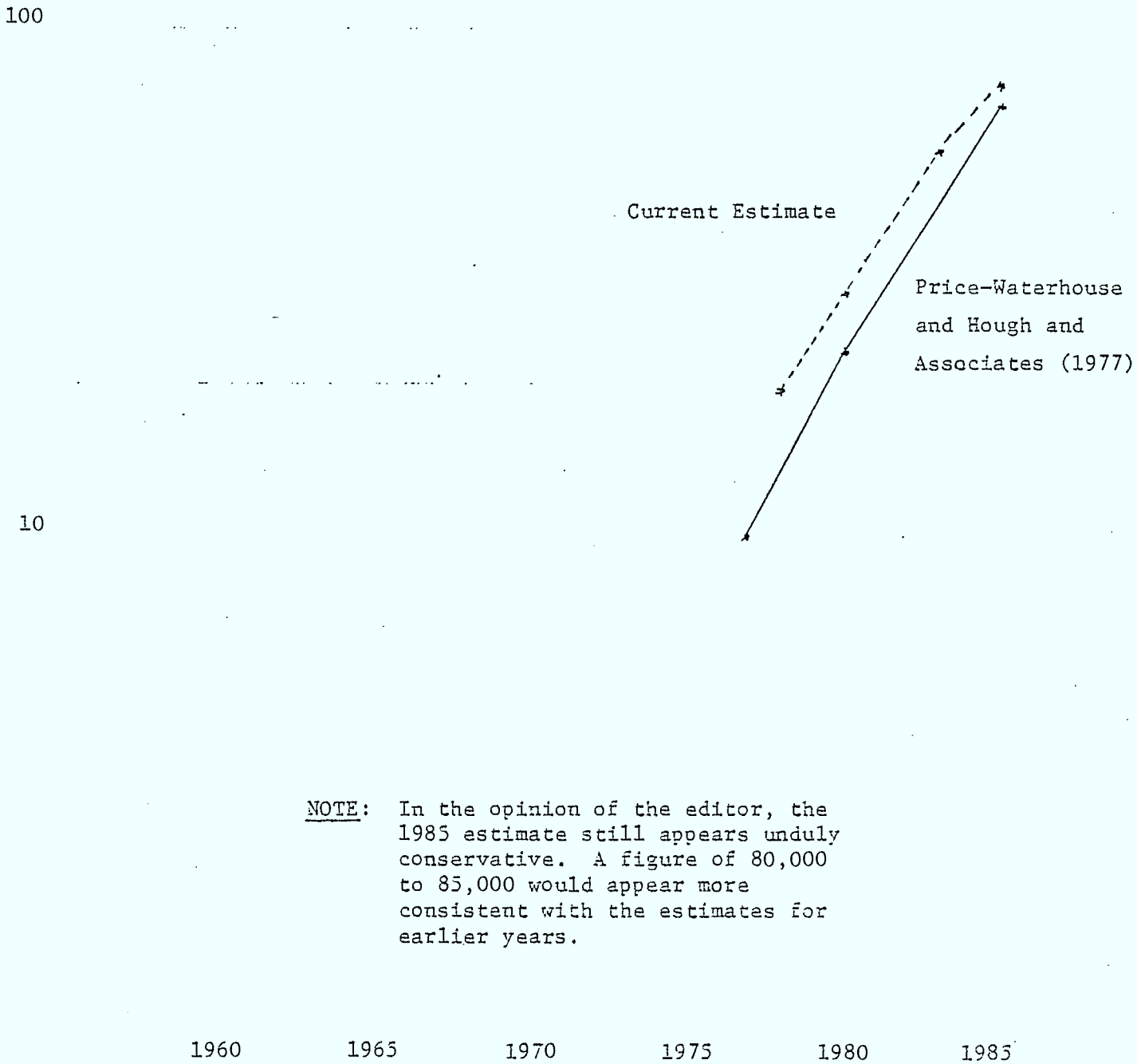
FIGURE 2

Word Processing Estimates and Forecasts

Total Systems Installed in Canada

1977-1985

(000)




NOTE: In the opinion of the editor, the 1985 estimate still appears unduly conservative. A figure of 80,000 to 85,000 would appear more consistent with the estimates for earlier years.

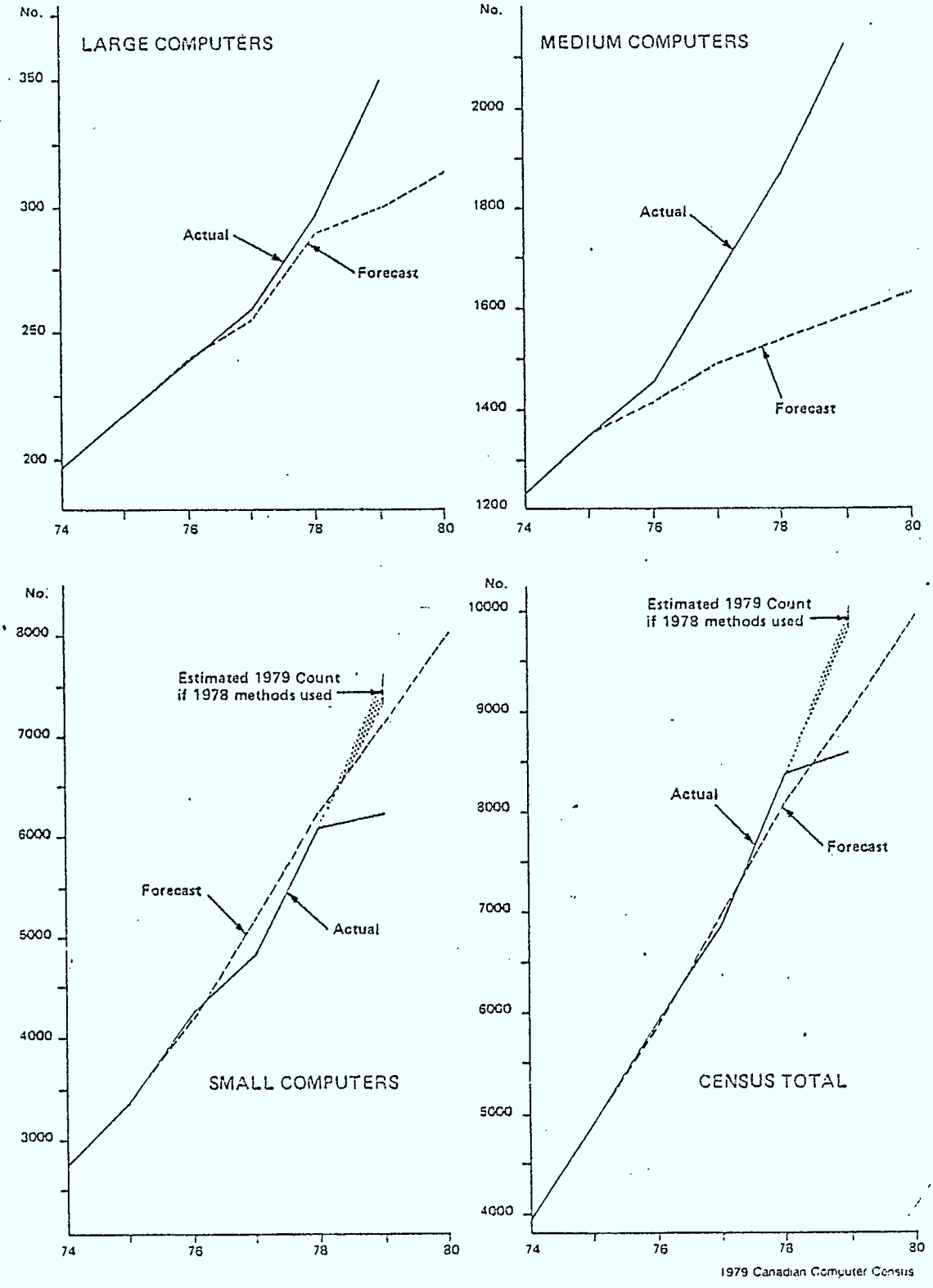
General Purpose Computers and Small Business Computers

These two categories of business equipment may be analyzed together. In both cases, reasonably good data are available, especially in the first case, where Canadian Information Processing Society (CIPS) census figures may be used. Fortunately, this well known survey has just been published for 1979, thus making the information very up-to-date. In addition, a second industry publication, EDP In-Depth Reports (Evans, 1979), makes available additional figures, covering especially the low end of the computer spectrum in more detail.

We begin the discussion with reference to Figure 3, which is a chart constructed by Al Shackleton in a recent paper describing and commenting on the 1979 CIPS census (Shackleton, 1980). In this figure, it can be seen that the census total for 1978 is recorded as 8,300 machines, which is a cumulative figure for the three size classes "small", "medium", and "large". There is a great deal behind these figures, the classification structure shown, how the census is taken, and changes in census methods over time. (See note, Table 7). In brief, however, what is most important in the analysis is that the "small" class recorded in the census is not, in fact, all small computers, especially today. To be specific, the CIPS size classes are constructed on the basis of computer value, i.e., "equivalent monthly rental", and since 1974, machines with equivalent monthly rentals less than $1,000 have not been included at all in the census -- principally because of the difficulty of accounting for them. What this means, is that the 8,200 figure recorded above (as shown in part 4 of Figure 3) is strictly for computers renting for $1,000 or more per month, and

FIGURE 3

ACTUAL AND FORECAST GROWTH OF CENSUS COUNTS
1974-1980




1979 Canadian Computer Census

By Permissior

thus does not include any machines with a purchase value of, approximately, $40,000 or less.[2] Since there are now hundreds of such machines on the market, the question may reasonably be asked, What about these machines?

Fortunately, others have asked this question, and have been tracking this segment of the industry as well. In particular, Evans Research Corporation (ERC) in Toronto has made estimates of the small computer market, and Hough and Associates have researched the area also, over the last several months. On the basis of these data, considerable light can be thrown on this question.

Some ten years ago, the smallest computer one could buy was in fact a "minicomputer" -- for example, DEC's PDP-8 or Data General's NOVA -- priced below $40,000 only in a very minimal configuration. Now, of course, this is by no means the case. Instead, equivalent computers to the early PDP-8s and NOVAs now cost one tenth as much, or even less. Principally, this phenomenon is the result of continued decreases in the cost of electronic parts and equipment, particularly logic and memory chips, and while it is unnecessary to go into detail, these cost decreases have resulted in extraordinary changes in the computer market.

For example, at $50,000 - $60,000 total price, according to the scheme described above, it is clear that most minicomputers would be, and probably still are, included in the CIPS census in the small computer category. What are clearly not included, however, are Apple Computers, Radio Shack TRS-80s, and all the others of this type and price range (e.g., $1,000 to about $20,000 total

2 A purchase-to-monthly-rental ratio of about forty to one has been standard in the computer industry for many years, and is still generally effective, except, perhaps, for machines in the smallest size classification, i.e., $1,000 to about $10,000 total purchase price.

price). Moreover, specialized business computers in the $20,000-$40,000 price range would not be included either.

Taking these points into consideration, ERC has, for some years, been making their own estimates of the Canadian population of computers under $1,000/month rental, and since the small "home" or "hobby" computers appeared on the scene (about 1977-78), they have been including these computers in the series as well. Since EDP In-Depth reports are distributed on a subscription basis, we are not really at liberty to reproduce an entire table. One portion of a table, however, is probably legitimate, particularly because it only includes one figure that is an ERC proprietary one, i.e., the estimate for the "Under $1,000/month" classification. Saying this, then, we show (in Table 7) ERC's estimates for computers in Canada, recorded as of the end of 1978; ERC's estimate in the Under $1,000/month category is some 17,100. This figure would be very convenient to confirm or support, if separate, additional information were available.

Fortunately, in the course of another study we are conducting, we have had occasion to do our own investigation of the recent growth of very small, "hobby" or personal computers. What we have found is that large numbers of these machines are not, in fact, being used for home or hobby purposes, but in real business applications. of course, not all of them are being so used, but according to the sources we have established, significant percentages are being purchased for just such purposes. Moreover, we have, at this juncture, our own rough estimates for such computers, and they compare reasonably favorably with those estimated by Evans.

Table 7

Computers in Canada, 1978*

| Monthly Rental Category | Number of Units |
|---|---|
| Under $1,000 | 17,143 |
| $ 1,000 - $ 1,999 | 3,464 |
| $ 2,000 - $ 4,999 | 2,616 |
| $ 5,999 - $ 9,999 | 952 |
| $ 10,000 - $19,999 | 490 |
| $ 20,000 - $49,999 | 432 |
| $ 50,000 - $99,999 | 242 |
| $100,000 and over | 55 |
| Total | 25,394+ |

* Source: Evans (1979), Exhibit B.

+ Note. It should be pointed out that these figures, with the exception of the "Under $1,000/month" rental category, are taken from the Canadian Information Processing Society (CIPS) Annual Census (see, e.g., CIPS, 1980). It has been estimated that this census is, on average, about 70% complete. An actual number for Canadian computers therefore, would be closer to 9,400 instead of 8,200 in the $1,000/month-and-over range, making the total, expressed above, approximately 26,600. For office automation purposes, however, the lower figure is adequate, since the Census also includes process control and other computers that should not be included in totals relevant to office automation purposes.

In summary, we have reason to believe that Evans' estimates are substantially correct for 1978, considering all purchases (and rentals) of under $1,000/month machines -- Apples, TRS-80s, and so on being included, for all purposes, i.e., home, business, hobby, etc. What is left to do therefore is simply subtract those that are not being used for business purposes. According to our sources, business/total ratios are being estimated from 60% to as high as 90% in some cases. We do not believe that the 1978 base would have this latter characteristic, however, and thus are inclined to estimate the business population at the low end of the above range, i.e., some 60% of the total. Considering, then, that 17,000 is probably a quite adequate estimate for the total for this category -- based on our own research as well as Evans' -- a resulting figure of some 10,000 business machines is obtained. This estimate, then, is the one we will use for "very small business computers".

Data, Telex, "Other Message", and Facsimile Terminals

We believe we can dispense with the next several categories of equipment in short order. With respect to data terminals, Shackleton provides the best information available in the paper referenced previously (Shackleton, 1980). Here, the subject of data terminals is discussed with reference to the number of computer access ports recorded in the CIPS census. Shackleton's analysis, briefly, is as follows:

> "Depending on the intensity and timing of use, one access port can support from one to ten terminals. If we increase the adjusted access ports figure for 1978[3] to allow for census coverage (70%) it becomes approximately 71,000. And at a conservative estimate of 3-4 terminals per port, this would suggest a 1978 terminal population of 225,000 - 275,000".

3 Estimated as 49,600 in the Table 8.

Table 8

Terminals, Access Ports and Data Communications Lines 1976-1979

| | Estimated Number | | | | Percentage Change | | | |
|---|---|---|---|---|---|---|---|---|
| | 1976 | 1977 | 1978 | 1979 | 76-77 | 77-78 | 78-79 | 76-79 |
| Own Terminals Reported | | | | | | | | |
| - bulk (high speed) | 3,100 | 4,200 | 6,100 | 8,700 | + 35.5 | +45.2 | + 42.6 | +180.6 |
| - Keyboard or CRT | 29,500 | 41,000 | 51,200 | 84,200 | + 39.0 | +24.9 | + 64.5 | +185.4 |
| - other (low speed) | 4,600 | 6,900 | 9,300 | 15,800 | + 50.0 | +34.8 | + 69.9 | +243.5 |
| Total Reported | 37,200 | 52,100 | 66,600 | 108,700 | + 40.1 | +27.8 | + 63.2 | +192.2 |
| Terminals adjusted for response level | 55,400 | 67,000 | 84,500 | N/A | + 20.9 | +26.1 | N/A | N/A |
| Access Ports Reported | | | | | | | | |
| - under 300 b.p.s. | 11,100 | 12,000 | 13,500 | 12,900 | + 8.1 | +12.5 | - 4.4 | + 16.2 |
| - 300 - 1200 b.p.s. | 5,400 | 9,700 | 10,900 | 20,000 | + 79.6 | +12.4 | + 83.5 | +270.4 |
| - 1201 - 4800 b.p.s. | 4,300 | 7,400 | 9,500 | 14,200 | + 72.1 | +28.4 | + 49.5 | +230.2 |
| - over 4800 b.p.s. | 1,800 | 4,400 | 5,200 | 10,400 | +144.4 | +18.2 | +100.0 | +477.8 |
| Total reported | 22,600 | 33,500 | 39,100 | 57,500 | + 48.2 | +16.7 | + 47.1 | +154.4 |
| Access Ports adjusted for response level | 33,600 | 43,100 | 49,600 | N/A | + 28.3 | +15.1 | N/A | N/A |
| Data Comm. Lines Reported | | | | | | | | |
| - dial in/out | 4,800 | 7,800 | 8,900 | 10,900 | + 62.5 | +14.1 | + 22.5 | +127.1 |
| - leased direct | 7,100 | 11,300 | 13,000 | 20,000 | + 59.2 | +15.0 | + 53.8 | +181.7 |
| - internal | 8,100 | 13,200 | 15,000 | 23,000 | + 63.0 | +13.6 | + 53.3 | +184.0 |
| Total reported | 20,000 | 32,300 | 36,900 | 53,900 | + 61.5 | +14.2 | + 46.1 | +169.5 |
| Data Comm. Lines adjusted for response level | 29,800 | 41,500 | 46,800 | N/A | + 39.3 | +12.8 | N/A | N/A |

Sources: Special tabulations by DOC and CIPS.

Source of this Table: Shackleton (1980)

N/A: Not Available.

These figures are, we are sure, very much correct since they can be derived not only in the above manner, but in comparison to U.S. statistics as well. There, estimates of 3 million or more terminals in use at present have been made by many sources, and on this business equipment item a ratio of 1:10 between the two countries is very much in order. We are content, therefore, to settle on the midpoint of Shackleton's range (250,000) as our own estimate.

In 1976, information available to the Department indicates that there were approximately 36,000 telex terminals and some 4,000-5,000 TWX stations, and the total appeared to be growing by about 6% per year. More recent data indicate that growth has, in fact, substantially levelled off, to a point where the present combined population is still in the neighborhood of 41,000 or 42,000. The same sources suggest a 1978 population of just under 15,000 for other message terminals.

Finally, in the area of facsimile transmission we do have information, derived from the Price Waterhouse/Hough and Associates study quoted earlier (Price Waterhouse/Hough and Associates, 1977). These data are shown in Figure 4. The number of units installed in 1978 is estimated to be 8,000.

Photocopy Machines

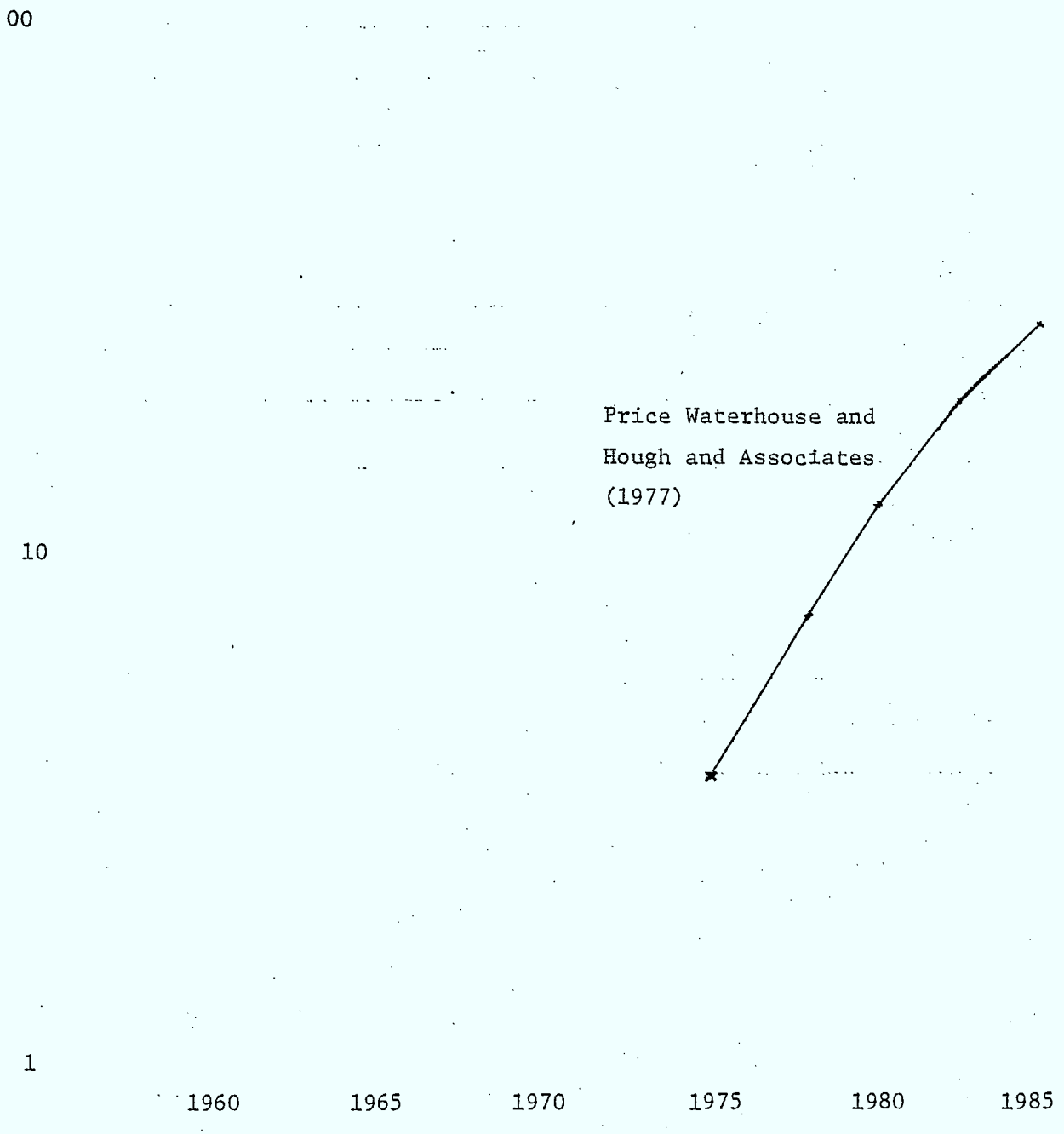
Finally, we have one last category to discuss, i.e., copiers. Here, data are not necessarily scarce, but they are clearly not in a form immediately usable. Instead, as with typewriters, assessment and manipulation of the data available are required.

FIGURE 4

Facsimile Estimates and Forecasts

Units Installed in Canada, 1975-1985

(000)



To begin, we find that no estimates of the installed base of photocopy machines in Canada are available, per se. However, a very acceptable series on imports is available, which can be used quite satisfactorily. First, we note that searching for statistics on domestic production, exports, and re-exports, similar to those same series for typewriters, turns up nothing at all, which leads one to surmise that all or virtually all copying machines used in Canada may be imported.[4]

Second from the import series itself (Table 9), we see that units coming into the country increased substantially from 1966-1974, but have been falling off generally steadily since that time.

Third, bearing in mind that the period covered by the import series is only fourteen years, and that copiers likely have a lifetime similar to electric typewriters, i.e., ten or eleven years, it is probably not too incorrect simply to sum the import series on a ten year running total basis. As shown in Table 9, the 1978 figure for this series is 304,013.

Finally, consider two additional logical points, first, that Xerox is producing at least one machine type in Canada, which would increase the installed base, and second, that we have not so far reduced the import total to

4 This conclusion is not necessarily legitimate because confidentiality restrictions preclude Statistics Canada from reporting production figures for any item for which there are, generally, less than three manufacturers. This would mean that Xerox could, of course, deliver many machines to the domestic market which are unaccounted for. As shown in the text, we do attempt to account for this possibility.

Table 9

Imports of Photocopy Machines to Canada

1966-1979

| Year | Number of Units | Ten Year Running Total |
|---|---|---|
| 1966 | 14,366 | |
| 1967 | 17,191 | |
| 1968 | 20,383 | |
| 1969 | 22,770 | |
| 1970 | 22,688 | |
| 1971 | 23,105 | |
| 1972 | 27,632 | |
| 1973 | 34,127 | |
| 1974 | 42,210 | |
| 1975 | 35,303 | 259,775 |
| 1976 | 30,126 | 275,535 |
| 1977 | 33,516 | 291,860 |
| 1978 | 32,536 | 304,013 |
| 1979 | 36,069 | 317,312 |

Source: Statistics Canada, Catalogue 65-203.

account for any exports or re-exports, of which, obviously, there would be some (though we don't know how many), over the twelve year period.[5] If, then, we were to assume that these two elements cancelled each other out -- i.e., one increasing the total and one decreasing it, each by the same amount -- one would be left with some 300,000 or so machines as at least a reasonably effective installed base estimate.

We do not know, of course, if any of these speculations are correct. What we do know, however, is that we have no better figures in this area at this time, and something is better than nothing.

Summary

In Table 10, we summarize all the estimates derived above of the installed base of office equipment in Canada.

5 According to past experience for example, if imports are substantial, exports/re-exports for repairs, if nothing else, commonly amounts to some 1-2% of imports. (Private communication, Department of Communications, May 1980).

Table 10

Summary of Installed Base Estimates of Office Equipment in Canada as of End 1978

| Type of Equipment | Best Estimate (in 000) |
|---|---|
| Business Telephones | 4,528.0 |
| Office Typewriters | 800.0 |
| Word Processors | |
| Non-communicating | 18.0 |
| Communicating | 1.0 |
| General Purpose Computers | 8.3 |
| Very Small Business Computers | 10.0 |
| Data Terminals | 250.0 |
| Telex/TWX Terminals | 42.0 |
| Other Message Terminals | 14.0 |
| Facsimile Terminals | 8.0 |
| Photocopy Machines | 300.0 |

Chapter 3

# SYNTHESIS

There can be little doubt that changes are beginning to occur in offices. What is often lacking in discussions of the subject, however, are two crucial issues:

1. What is happening -- i.e., from the standpoint of a broad, comprehensive perspective and

2. How fast it is happening -- or how fast it may be expected to happen in the future.

Most reports on office automation discuss some of the issues but all lack an in-depth analysis. Our purpose in this chapter, therefore, is to describe in more detail what is really meant by the Office of the Future (i.e., by other writers and observers), and to document some of the more fundamental issues. We do this by considering in turn the following major areas of concern:

- The role of word processing and electronic mail
- The more appropriate, wider range of business systems and services in place and operating now
- Advances in these systems and equipment already emerging
- Evolution of such systems and techniques on a broad scale, including effects of expected growth, and impediments to growth.

The Role of Word Processing and Electronic Mail

Word processing, it is clear by now, is only part of the office of the future. Unfortunately, when one is talking to a manufacturer of word processing systems, this is a difficult point to get across, but the facts are really these:

> First, offices are composed not only of people, desks, typewriters, and filing cabinets (and now word processors) -- but of telephones, computers, computer terminals, copiers, telex machines, facsimile machines, research facilities, office supplies, and paper -- i.e., "hard copy" documents.
>
> Second, without doubt, many of these items, especially telephones, typewriters and copying machines, occur in substantially greater numbers than word processing systems of any type, be they hard copy units, video display stand-alone units, shared processor systems or whatever.
>
> And finally, this is likely to be the case for some time, as we will argue in this section.

The reason we are mentioning these factors, is to gain a better appreciation of the concept of office automation. In this section, we will attempt to put the estimates of the market for office automation equipment into a realistic perspective.

With respect to electronic mail, several observations may be made. For example, communicating word processors are often viewed as the forerunners of extensive document delivery networks. Of course, this may happen at some time -- i.e., it is entirely feasible technically. Yet, according to information presently available, such uses of word processing still appear to be more an extension of what can or could be done technically, than an observation of what

is in fact already being done, except in certain narrowly defined, special purpose cases. By contrast, hundreds of thousands, even millions of messages are being sent annually, in an "electronic mail" format, by telex, TWX, facsimile, private wire networks, computer networks, and via dial up connections over the telephone. In order to compete with these, electronic mail implemented with communicating word processors will have a long way to go. Here again, therefore, our interest is in context, comparison of alternatives, and placing word processing, CWPs and electronic mail in a better perspective.

## The Range of Business Systems, Services, and Equipment Operating Now

In 1978, according to the data developed in Chapter 2, there were more than 4,500,000 business telephones in service in Canada. By contrast, there were in that year only some 18,000 word processors by our best reckoning, or a ratio of 250:1.

Taking another comparison, say, to typewriters, the ratio is 44:1 (i.e., 18,000 word processors, 800,000 typewriters), and as against computer terminals, the ratio is 14:1 (i.e., 18,000: 250,000).

These figures are just examples, of course, but what they serve to illustrate very dramatically is that word processing, regardless of its glamour and present rapid growth, still has a long way to go, even to catch up. It is, then (at least in our view), somewhat silly to talk about a "new world" coming -- "a world where paper will no longer rule our office workday" -- etc., etc.

On the contrary, paper will rule our office workday for many years to come, except in those situations where, as a result of computerized procedures, data are stored in files, updated automatically and directly to those files (especially with online, interactive terminals), and in general are processed independently from paper documents in their entirety.

Interestingly enough, there are such systems in operation today, but it must be recognized that they are rare. For example, airline passenger reservation systems work this way, up to a point, but against such systems one must contrast enormous numbers of other systems that, even while operating in an online, interactive mode, are still interacting with paper documents also, either in the input stage, the output stage, or both. Moreover, it must be recognized that this applies even to such highly automated activities as airline travel, because, when the whole process is analyzed, it is recognized that only flight reservations are conducted without paper transactions, not the flights themselves. Instead, the process is to prepare what amounts to individual, paper-based transaction documents (i.e., "tickets") for every leg of every single flight by every individual boarding an airplane, including children. Each one of these physical documents, then, must be handled many times, both within offices and elsewhere, before all appropriate transactions concerning them are completed.

Obviously, documents that word processors get involved with are different from airline tickets, purchase orders, bills of lading and so on. The principle is basically the same, however, that regardless of how efficient and sophisticated this equipment becomes, paper douments will be indispensible in

business operations of all types. One could even go so far as to say, perhaps, that the faster, more efficient, and flexible word processors become, the more will be the output to paper-based documents, rather than the less. After all, it cannot be doubted that this is the obvious lesson to be learned from the photocopy industry.

## Changes in the Offing

In this section we begin to discuss the next step, i.e., changes that can already be seen to be coming in office equipment, and requirements therefor. (With the word "requirements", it should be noted, we are speaking not only of what users say they want -- in terms of both surveys and more informal feedback -- but of what one can infer are requirements because they begin to turn up on competitors' equipment). As before, a part, though not the exclusive emphasis, will be the context in which word processing should properly be placed.

## Advances in Word Processing, Per Se

We have indicated previously our inclination to be less than enthusiastic about traditional market surveys,[1] the output of which are almost universally conveyed in terms of massive numbers of often meaningless (or at least difficult to interpret) tables. What is missing, however, are documents that describe in concise, lucid and easily understood terms the types of improvements, innovations, and enhancements to word processing systems that are needed to satisfy new user requirements in the immediate future.

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1 See, for example, Hough and Associates and Communications Studies and Planning, 1979 (pp. 64-70), and Jacoby, 1978.

Without going into detail at this point as to exact requirements, it is useful to destroy several myths about office automation. The first is the myth that paper is about to disappear in the office. Nothing could be further from the truth. A great deal of attention is and continues to be given to the quality of printed documents which are directed to outside recipients. Such communications in the form of mailings, manuals, quotations, specifications, legal documents, correspondence, and so on reflect the image of a company or a publisher and therefore must be of a high quality nature. On the other hand, documents or drafts used for internal circulation do not need the same high quality but often require a faster turn around time. Paper also has permanent storage properties, economy, easy of use, portability and enjoys a legal status all of which are difficult to compete with.

There is a need too for matching a particular kind of printer to a particular application not only among organizations but within the same organization. These applications and therefore the printers they utilize require varying degrees of print speed, print styles, print quality, document sizes, graphics capabilities and so on.

The above reservations illustrate at least two things: (1) more flexibility and options are needed to begin to tailor-make and customise systems to specific customer requirements, and (2) communication requirements for future word processing systems are not at all needed, in the first instance, to provide electronic mail, but instead to provide for interconnecting terminals with a continually increasing variety of output devices.

Among the other areas that must be addressed in order to be competitive with new systems, briefly, are larger, more sophisticated, and more flexible displays (again with specific improvement examples), more and better editing (taking into consideration that everything available now is still clearly expected), more and better storage, with dramatically enhanced capabilities for filing, indexing, searching, and retrieval, and perhaps most important of all, a vastly closer association with data processing capabilities, i.e., not only arithmetic and math subroutines, but sorting.

It should be pointed out, incidentally, that this latter requirement is easy to say, but as computer people have known for many years, sorting is not a trivial data processing problem. On the contrary, it is a very difficult and complex task to implement efficiently, as word processing specialists will soon find out. Here again, then, one might find that eventually the best solution, however distasteful, is transmitting files to large central computers for sorting, then returning the results to the WP system for further processing and manipulation. If this solution is chosen, it again supports a need for communication capability, but a need that is dictated not only by electronic mail requirements but by requirements for internal file processing.

Multipurpose Terminals

Multipurpose or multifunction terminals (or workstations) have been discussed in great detail in various places. We believe the discussion can be simplified by pointing out that, with the exception of very large and complex pieces of machinery like IBM's 8100 Information System, a transition to

multifunction workstations is essentially simple, considering the scenario described in the previous section.

Of course, it appears that Wang, Vydec, CPT, DEC, IBM, and many others have had considerable success in designing and implementing new systems that comply with or tend toward multifunctional capabilities. It behooves Canadian suppliers, therefore, either to act on such indicators, or to decide to remain for some time with their current level of sophistication in word processing (and modest advancements thereto), relying on marketing to carry the day.

Other Equipment

Additional new equipment and systems in offices will include the following:

1. Intelligent copiers,
2. Intelligent PBXs,
3. More sophisticated and higher speed facsimile systems,
4. Computer-mediated mail systems,
5. Advanced terminals in traditional record networks -- Infotex and enhanced telex being examples,
6. Personal, "desk-top" computers, which often will include word processing capabilities,
7. More sophisticated internal store-and-forward message systems,
8. More sophisticated storage and retrieval systems,
9. Electronic mail implemented with PBX systems, and
10. And finally, "integrated systems".

The last item, of course, is the subject of great debate, promotion and just speculation. There is a great deal of glamour here, and much opportunity for market research firms to devise all-encompassing diagrams with everything connected to everything, including voice, data, picture and graphics, Picturephones[2], teleconferencing, print shops, computers, local and remote data bases, and so on. For the most part our own reaction is rather cool to such scenarios, perhaps because, at least in part, we've heard it all before. The real reason, however, is a more practical one; interconnection of devices and systems is coming, of course, but the rate at which they will emerge may be another matter altogether.

## The Evolution of Systems

One of the great shortcomings of the information systems industry has been our inability to manage expectations. This is not surprising when one considers the frequency with which we announce a new management concept or technological breakthrough which will inevitably "revolutionize" the means by which we manage our information resources. In the past ten years, we have thrust upon the world the "revolutions" of timesharing, database management, the minicomputer, the "total" MIS, distributed data processing, distributed databases, structured programming, and microcomputers. Now the "revolution" of office automation is upon us. Each of these proclaimed revolutions has led the user community to a level of expectation which is largely unattainable, at least in the time frames predicted.

The above is a quotation from an article that is now more than two years old entitled, "Office Automation: Revolution or Evolution?" It was written by Michael Zisman, a researcher at MIT (Zisman, 1978), and it concerns, obviously, the specific subject at hand.

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2 Registered Trademark, American Telephone and Telegraph Company.

It can be assumed that we have some confidence in this article, because, as seen above, Zisman without delay exposes a great deal of the myth and mystery surrounding office automation by reminding us, in effect, that "we have all been there before". In concise terms, what any commentator on future changes needs to concern himself or herself, with, is separating fact from fiction. Unfortunately, this is not done often enough.

To take the present case as an example, it is clear that we now have, with the work assembled in this document at least a semblance of a starting point for moving forward on a reasonable evolutionary path. Table 11 contains our estimates of the installed base of office automation equipment in Canada as of 1978 together with our forecasts for these types of equipment to 1985.

There is considerably more work to be done with respect to how this market will develop in a qualitative sense as opposed to the quantitative forecast provided above. The following patterns appear to be emerging:

- Most obviously, the emphasis will remain with voice communications regardless of high growth rates for new products and services;

- Typewriters will continue to be alive and well, -- although it could be, of course, that the low cost of advanced electronic machines will cause replacements to occur at a more rapid pace than might be expected otherwise;

Table 11

Estimates of Office Automation Equipment, 1978 and 1985

| Item | Number of Units, 1978 | Preliminary Forecasts for 1985 |
|---|---|---|
| Business Telephones | 4,500,000 | 6,000,000 |
| Office Typewriters | 800,000 | 960,000 |
| Word Processors | | |
| Non-communicating | 18,000 | 65,000* |
| Communicating | 1,000 | 10,000 |
| Computers | 18,000 | 150,000 |
| Data Terminals | 250,000 | 700,000 |
| Telex, TWX and other Message Terminals | 56,000 | 70,000 |
| Facsimile Terminals | 8,000 | 28,000 |
| Photocopy Machines | 300,000 | 450,000 |

* Editor's Note: This 1985 estimate appears unduly conservative. A total for word processors of both types of 80,000-85,000 would appear more consistent with estimates for earlier years.

- The use of computers and computer terminals will continue to grow, as even more of the structured and repetitious processes and functions in offices are reduced to "programs";

- Advanced message systems will overtake present ones;

- And finally, "copying" -- with more and cheaper copiers all the time -- will continue unabated.

We are aware, of course, that there are strong differences of opinion on these points, since the "electronic" office is a vision of many people and organizations, including the suppliers. We believe, however, that it is much too easy to make forecasts based on technological and cost justification criteria, ignoring completely how developments have proceeded (or more correctly, not proceeded) in the past. What is necessary, therefore, is a more thorough review of the entire office automation area, not just a part of it, and a move in the direction of forecasting evolution based on sound premises and actual data, rather than strictly enthusiasm.

Chapter 4

# SUMMARY AND CONCLUSIONS

In this report we have attempted to provide an analysis of the difficult problem of office automation. The report can only be regarded as a start at a "ground-cleaning operation" in the office automation area. In particular, figures representing the present state of office automation in aggregate terms have been presented, predictions as to potential growth and development of the field have been discussed, and alternative scenarios have been suggested.

Our conclusions on these matters are essentially as follows. First, with regard to growth and development of word processing, there seems little doubt that present trends will continue, both with respect to present products on the market and future manifestations of more sophisticated, flexible, adaptable, and comprehensive equipment. Communications options and capabilities are part of a long list of expanded capabilities now being expected and anticipated by the marketplace, but they are by no means the most important or desirable of new features. Moreover, when communications are chosen as an option for word processing systems, it is likely, at least at this time, that the user has in mind interconnection either of additional devices, such as a greater variety of printers, or access to a computer, rather than communication on a terminal-to-terminal basis with other word processors. (This does not preclude, however, connection to, for example, telex or computer networks, were such connections to be allowed).

With regard to the growth of word processing, electronic mail, and other advanced office automation equipment and capabilities, we see evolution rather than revolution occurring. Paper-based processes, for example, and the equipment to support them, are more than likely to remain a fixture of offices for many years to come, despite either (a) initial experiments which have as an objective the reduction and/or elimination of paper (The "Paperless Office", for example, in Washington D.C.), or (b) strong attempts on the part of some researchers to justify movement to more sophisticated systems on the basis of costs either of paper-based processing or managerial and professional personnel costs. While such arguments can, of course, be supported with evidence of continually decreasing hardware costs and continually escalating personnel costs, it is a very different matter to get a manager in a business environment to use new technology, than to interest a manager in a research laboratory environment in doing so -- and, unfortunately, most predictions of wide use by managers and professionals have been based on just such premises and evidence.

Finally, with respect to continuing activities in this area, it is appropriate to suggest that we are only beginnning to understand the outlines of the office automation problems. What is needed therefore is considerably more in-depth investigation. One approach, for example, would be to build an economic model of the office automation industry, similar to that constructed for the data processing industry by the Department of Communications' Computer/Communications Secretariat. This in our opinion would be a logical next step, and without doubt a very fruitful approach.

## References


Canadian Information Processing Society, Canadian Computer Census, (annual) - various issues.

Evans Research Corporation (1979) EDP In-Depth Reports, Volume 8, No. 11, July 1979.

Hough, R.W. and Associates Ltd. and Communications Studies and Planning Ltd., (1979) Pilot Study to Develop a Methodology to Forecast Canadian Demand for New Home and Business Telecommunications Services in the Period 1980-1990, Prepared for Department of Communications, Ottawa, May 1979.

Jacoby, J. (1978) Consumer Research: How Valid and Useful are Our Consumer Behaviour Research Findings? A State of the Art Review, Journal of Marketing, April 1978.

Price Waterhouse Associates and R.W. Hough and Associates (1977) Threats and Opportunities Study, Prepared for Canada Post, (Proprietary), Ottawa, September 1977.

Shackleton, L.A. (1980) The New Census - A First Appraisal, 1979, (published in Canadian Computer Census, Canadian Information Processing Society, May 1980).

Strategic Business Services (1979) Impact of Interconnected Electronic Offices, (Proprietary), San Jose Calif., July 1979.

Strategic Business Services (1979) Multifunction Workstations and Peripherals, (Proprietary), San Jose Calif., July 1979.

Tyler, T. (1978) Electronic Versus Paper Media, Prepared for SBS Publishing, (Proprietary), San Jose Calif., May 1978.

Zisman, M.D. (1978) Office Automation: Revolution or Evolution?, Sloan Management Review, Massachussets Institute for Technology, Volume 19, Number 3, Spring 1978.

OFFICE AUTOMATION EQUIPMENT :
THE PRESENT BASE AND ...