Radio Shack®

Cat. No. 26-4940

MICROCOMPUTERS MEAN BUSINESS

MICROCOMPUTERS
MEAN
BUSINESS

Radio Shack®
A DIVISION OF TANDY CORPORATION
FORT WORTH, TEXAS 76102

©1983 Tandy Corporation
All Rights Reserved.

Reproduction or use, without express written permission from Tandy Corporation, of any portion of this book is prohibited. While reasonable efforts have been taken in the preparation of this book to assure its accuracy, Tandy Corporation assumes no liability resulting from any errors or omissions in this book, or from the use of the information contained herein.

10 9 8 7 6 5 4 3 2 1

Developed by
CONCEPT INDUSTRIES INCORPORATED
Stamford, Connecticut

CONTENTS

1. **The Microcomputer and You 1**

Some Facts • This Book • A Key Term • A Key Illustration

2. **What the Computer Can Do: Operations 5**

Word Processing • Filing • Order Entry • Accounts Payable • Accounts Receivable • General Ledger • Payroll • Inventory Control

3. **What the Computer Can Do: Planning 15**

Computerized Spreadsheet • Time Management • The Distribution Center

Johnson Distribution. Part 1: Growing Pains 19

4. **Are You Ready for the Computer? 23**

Before the Computer • Is the Pattern Logical • A Major Investment of Workhours? • Creating a Bottleneck • More Timely Information • Computer Readiness Checklist

5. **How to Distinguish Between DP and WP 31**

6. **Alternatives: Service Bureaus and Time-Sharing 33**

Service Bureau • Custom Service Bureau • Package Service Bureau • Time-Sharing Company • Time-Sharing Cost Checklist • Comment

7. **The Advantages of an In-House Computer 39**

In-House Computer Pluses • Evaluating Computer Costs

Johnson Distribution. Part 2: The Computer Decision 43

8. **Meet the Microcomputer 47**

9. Focus on the Microprocessor 49

10. The Central Processing Unit (CPU) 51

Internal Memory • Bits and Bytes • RAM and ROM • Summary

11. Load the System: Operating Software 55

Operating Software • Typical Loading Procedure • More About the DOS

12. External Memory: Mass Storage 59

Diskettes in General • Microcomputer Diskettes in Particular • Random Access to Diskette Data • Diskette Disadvantages • Diskette Care • Diskette Don'ts • Hard Disks: A Brief Comment

13. How to Talk With Your Computer 65

Keyboard • Visual Display Unit (VDU) • The Printer • Letter-Quality Printers • Dot-Matrix Printers • Friction and Tractor Feeds

14. User Software 73

Application Programs • Interactive Software • Documentation • Documentation Criteria Checklist

15. Computer Languages 79

High and Low Languages • Popular High-Level Languages • What Does BASIC Look Like?

16. How to Buy the Computer You Need 83

1. Buy Retail • 2. Buy Name Brand • 3. Buy Packaged Software • 4. Consider a Service Contract • 5. Create a System Description

Johnson Distribution. Part 3: The Meeting 87

17. **Define the Operations, the Numbers, the Components** 91

Step 1: Define the Operations • Step 2: Define the Numbers • Step 3: Define the Components

18. **Selecting the Computer: A Checklist** 97

Step 1: Define the Operations • Step 2: Define the Numbers • Step 3: Define the Components

Johnson Distribution. Part 4: The Implementation 101

19. **From Manual to Computer: Direct Approach** 105

Testing • Implementing • Hardware-Related Limitations • Software-Related Limitations

20. **From Manual to Computer: Parallel Technique** 109

Advantages and Disadvantages

21. **Developing a Software Library** 113

Packaged Programs • In-House Programming • Contract Programming • Proprietary Programs • Comment

22. **Training and the Work Climate** 115

Involve Those Involved • Respect the Machine • Comment

23. **Data Security and Confidentiality** 117

From Tampering or Unauthorized Disclosure • From Accidental Damage or Loss • Make Back-up Copies • Make Hard Copies • Label Storage Devices • Protecting Data Checklist

24. The Computer Environment and Electricity 121

The Environment • Electrical Conditions

25. Supplies and Furniture 125

Computer-Related Supplies: Diskettes • Printer-Related Supplies: Paper, Ribbons, Printwheels • Furniture

Johnson Distribution. Part 5: The Outcome 129

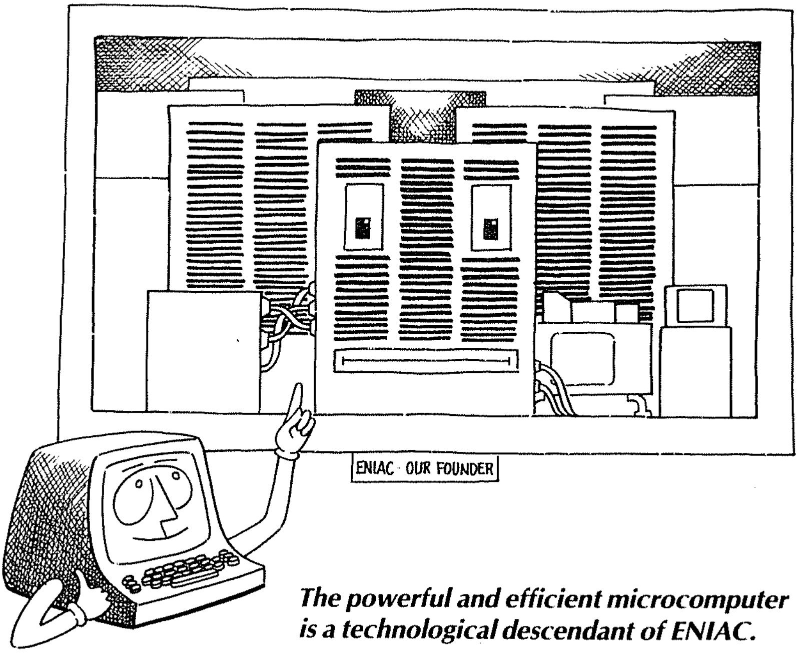
Computer Terms 131

1

THE MICROCOMPUTER AND YOU

ENIAC, the first full-grown computer, entered the world in 1946. Its unabbreviated name was "Electronic Numerical Integrator And Computer." Its switching circuits used over 18,000 vacuum tubes, and it consumed as much electricity as a small town.

Today, technology has miniaturized the capability of that enormous machine to such an extent that an inexpensive desktop microcomputer can perform ENIAC's tasks, and perform them more reliably. This innovative technology has caused many changes in the way we work and live. "But," you say, "as a businessperson, what does the microcomputer mean to me?" Plenty. And that is what this book is all about.



The powerful and efficient microcomputer is a technological descendant of ENIAC.

Some Facts

One fact is this: a microcomputer can help even a very small business. Another fact: a microcomputer can usually pay for itself in about a year. How? By providing the basis for more informed decisions and more efficient operations. Moreover, by putting off buying your own microcomputer, you may be losing money in the form of opportunities: in receivables you won't bill, in sales/inventory imbalances that you could have corrected, in money not accruing interest in your bank.

This Book

Microcomputers Mean Business is a guide to computerization for a businessperson starting an operation or trying to improve one. This book will show you how to analyze your business needs and how to make intelligent decisions about computerization and microcomputers. It includes information about

- What a microcomputer can do for you.
- What hardware and software are all about.
- How to convert from manual operations.
- How to set up the best support environment.

The descriptions and explanations are expressed in ordinary language. You will be able to understand the information even if you have never seen a microcomputer.

A Key Term

You may have noticed that we are using the term *microcomputer* instead of *computer*. However, for our purposes, the distinction between a computer (such as ENIAC) and a microcomputer (such as a contemporary desktop model) is mostly a matter of size. So, from now on, unless we want to draw a comparison between a large and a small computer, we will use only the term *computer*.

A Key Illustration

To show what a computer means to a small business, we have woven a narrative into the text. This is the story of the Johnson Distribution Center. It illustrates the successful computerization of business operations that have outgrown the old methods of handling them. The story is told by B. J. Johnson, the owner of the Center.

"All right," you say. "I'm interested. What can the computer do?"

2

WHAT THE COMPUTER CAN DO: OPERATIONS

In general, the computer can do four kinds of work. It

1. Stores and retrieves information.
2. Performs mathematical calculations.
3. Communicates with users through terminals.
4. Controls electrical devices.

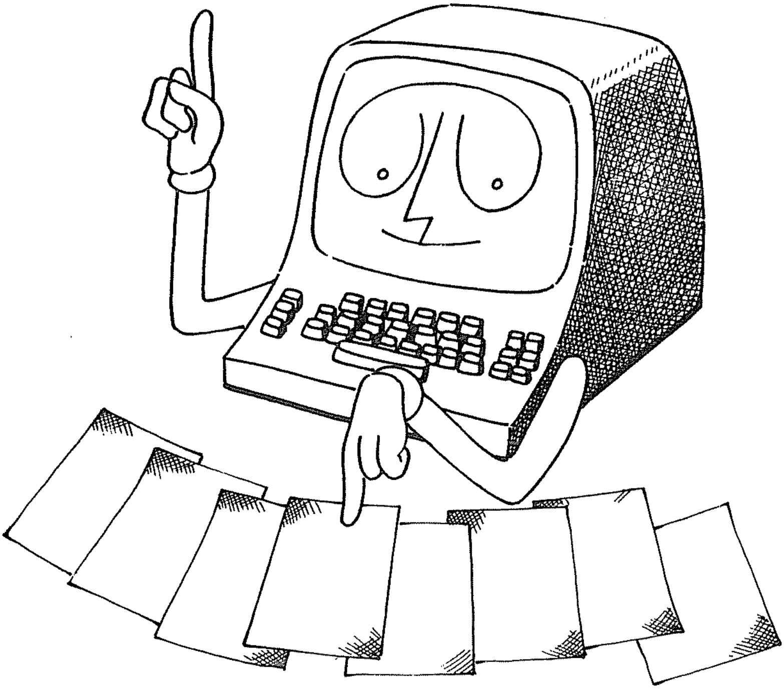
Business operations depend on information and paperwork. And most of the paperwork involves storing and retrieving information or performing mathematical calculations. Thus, a correctly applied computer becomes a vital tool for business. For example, it can simplify paperwork with its word processing capability. It can drastically reduce the routine record-keeping that uses up valuable time. It can liberate clerical workers from the endless demands of paperwork and permit them to get on with more productive tasks. It can provide inventory personnel and salespersons with immediate information about stock levels and price changes, customer accounts, and order status. It can facilitate payroll, control accounts payable, and even keep track of your appointments.

Some operations in your business may require changes when you computerize them. Clearly, you can't simply bring in a computer, plug it in, and expect it to start handling your inventory control or accounts receivable. (Like a new employee, a computer must first learn about your operations before it can handle a task that requires specific information.)

However, other operations in your business will not require any changes. A computer can handle these operations almost immediately. For example, you can begin using your computer's word processing capability right away. You can also start right off using your computer to keep lists (such as customer names and addresses).

Word processing
Filing
Order entry
Accounts payable
Accounts receivable
General ledger
Payroll
Inventory control

"These I can do now."



But whether or not you have to make changes, here are some ways you can apply the computer to business operations. (Later, we will look at how you can apply the computer to planning and decision making.)

Word Processing

This is a broadly useful and popular application. With it, you can swiftly and efficiently type, edit, format, print, store, and retrieve text. You can use word processing to prepare:

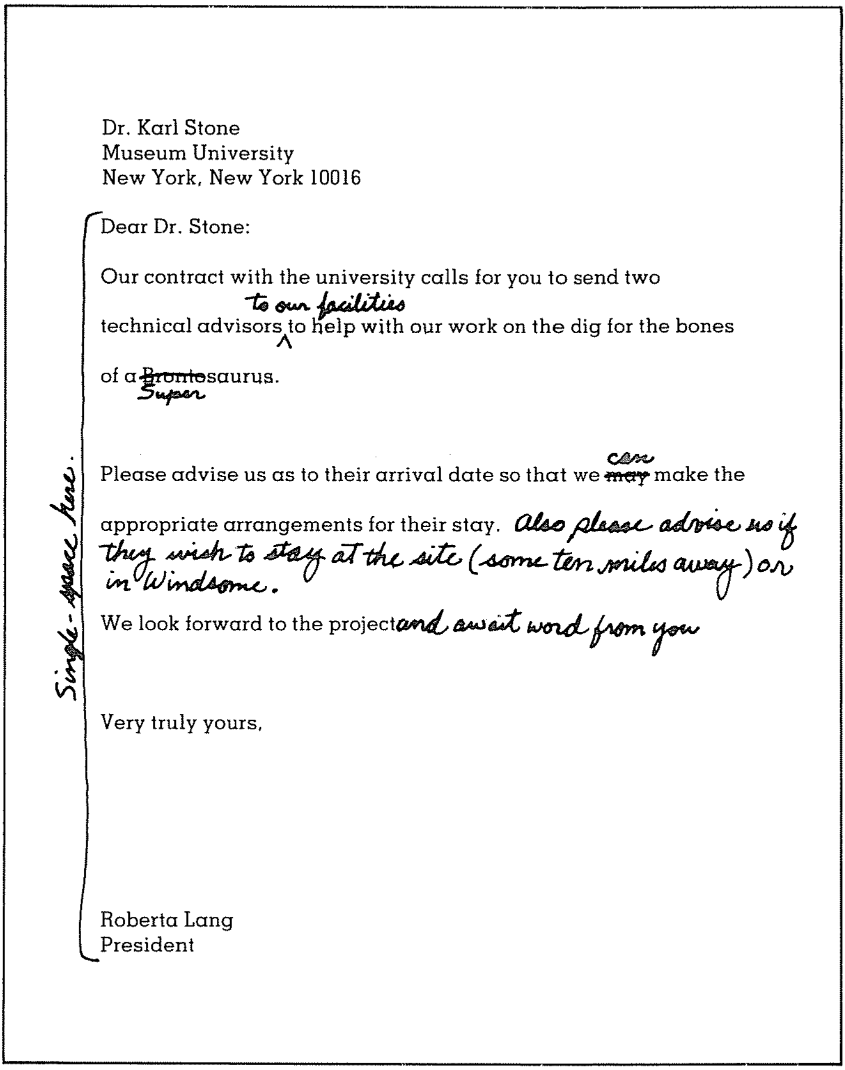
- Letters
- Contracts
- Reports
- Charts
- Tables
- Memos
- Price sheets

In short, you can use word processing to handle any sort of document you need to work with.

You may not be able to distinguish between documents produced on a good office typewriter and those produced using word processing, but there is a world of difference in the production. Using word processing, the typist inputs text on a computer keyboard; but instead of seeing the characters on a sheet of paper in the typewriter, the typist sees the characters on a television-like screen. The typist corrects spelling errors or typos with simple keystrokes. The typist can recall a document and correct it on the screen. Thus you don't need to print a document until you are satisfied that it is current and letter perfect.

Word processing is perhaps most valuable when it comes to revising or editing documents. The typist can do it right on the screen. Or using a printout of the document as a draft, an author can insert or delete text anywhere and in any quantity without worrying about creating a new document and thus forcing the typist into extensive retyping. Instead, the typist quickly makes changes on the screen and prints out the revised text.

Using simple commands you can also select printing formats, text width and spacing, column layouts, justified margins, page headings and footings. With word processing, you can dramatically improve office productivity. You have more control over the text of your documents, and you can have error-free text for as many copies as you need.



Dr. Karl Stone
Museum University
New York, New York 10016

Dear Dr. Stone:

Our contract with the university calls for you to send two technical advisors to our facilities to help with our work on the dig for the bones of a ~~Bronto~~Supersaurus.

Please advise us as to their arrival date so that we ~~may~~ can make the appropriate arrangements for their stay. Also please advise us if they wish to stay at the site (some ten miles away) or in Windsome.

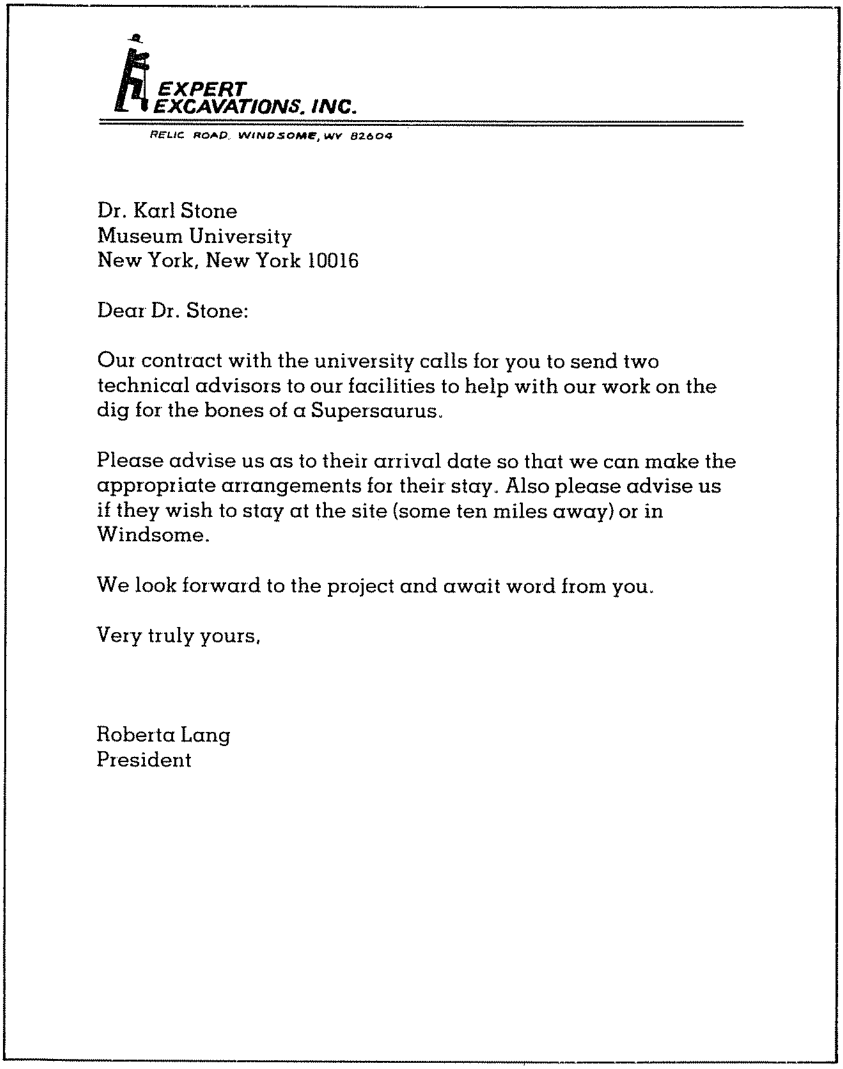
We look forward to the project and await word from you

Very truly yours,

Roberta Lang
President

Single-space here.

The typist makes the author's changes without having to retype the text. Using simple commands from the keyboard, the typist revises the text and prints out a corrected copy.



EXPERT
EXCAVATIONS, INC.
RELIC ROAD, WINDSOME, WY 82604

Dr. Karl Stone
Museum University
New York, New York 10016

Dear Dr. Stone:

Our contract with the university calls for you to send two technical advisors to our facilities to help with our work on the dig for the bones of a Supersaurus.

Please advise us as to their arrival date so that we can make the appropriate arrangements for their stay. Also please advise us if they wish to stay at the site (some ten miles away) or in Windsome.

We look forward to the project and await word from you.

Very truly yours,

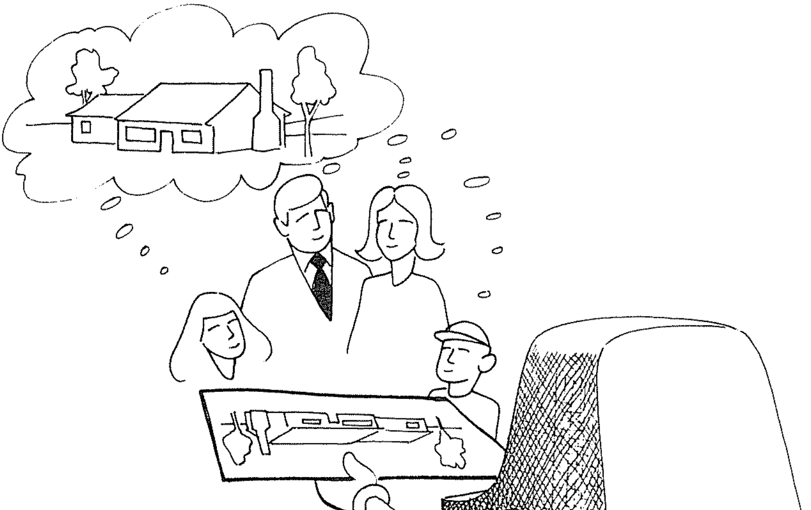
Roberta Lang
President

The corrected copy.

Filing

You can use computerized filing to keep records just as you would with a conventional filing system. However, a computerized filing system does quite a bit more than store information. For example, you can command the computer to go to the file and give you a list of all the clients that have purchased Item **X** during the last year. You may also want to list the clients according to the amount purchased, from the largest to smallest order. The computer will immediately and accurately produce the list. With a manual filing system, you would have to review each client's record, list the names and amounts, and then sort the list according to the quantity of the item purchased. This assignment is both time consuming and prone to error.

Many real estate operations use computerized filing systems to match buyers and houses. For example, each buyer has different requirements for a house size, location, price, and financing. These factors can be entered on a *buyer profile* and scanned against the *home profiles* on file. In moments, the computer can match the profiles and list all the homes that meet the buyer's requirements.



You can also use computerized filing with word processing in order to produce personalized letters as well as labels for mailing out sales literature. Many firms use computerized filing to select clients. Then they use word processing to print out personalized letters to these clients. For example, a wholesaler might want to run a sale on certain items and to mail sales notices only to customers who normally buy those items. The wholesaler can use computerized filing to find these customers and then word processing to mail the sales literature to them.

Order Entry

Chances are that somewhere along the line your business, like others, has suffered from orders misplaced in the paperwork mill. Wandering orders can be expensive. You may lose not only the order. Worse, you may lose the customer. So it is no surprise that order entry is one computer application frequently asked about. And it is one that the computer can easily handle.

You can enter orders directly into the computer. The computer then associates all the necessary ancillary information (such as customer names and addresses, account status, as well as sales commissions, prices, and discounts). Because your entire accounting process is probably triggered by order entry, a computer can give you strong control at the beginning of operations.

Accounts Payable

Timely and accurate information about accounts payable can improve your cash flow and perhaps even reduce borrowing. A computer can provide account information much faster than manual procedures can. You can schedule payable accounts to take advantage of discounts, and you will have a more precise knowledge of your company's cash status.

A computer can print checks, determine cash requirements, generate aging reports, and provide totals for posting to the general ledger. A computer can handle discounts and advise you on your current cash position. You can use the computer with either cash or accrual accounting methods.

A good computer will handle several hundred vendors and several thousand invoices. Many computers can generate all of the following accounts payable reports:

- Vendor List
- Invoice List
- Posting Report (with general ledger totals)
- General Ledger Recapitulation
- Cash Requirements
- Aging Status
- Check Preview
- Check Register
- End-of-Period Processing (with general ledger totals)

Accounts Receivable

A computer can keep track of current and aged accounts receivable, and it can generate invoices and monthly statements. It can handle "open item" and "balance forward" accounts. It can have an automatic customer billing option, produce summary and detail aging reports, and accommodate flexible open-credit reconciliation procedures. It can also handle customer list maintenance, customer activity query, and transaction editing.

A computer can generate the following accounts receivable reports:

- Account Listings
- Invoices
- Trial Balance (with or without Aging)
- Unposted Transactions
- General Ledger Journal
- Customer Account Activity Lists
- Statements

General Ledger

The substitution of computer files for ledger books is truly a blessing. The computer saves time as well as file space. Moreover, the computer can keep your data right up to the minute. Your books are never out of date.

A computer can produce balance sheets and profit and loss statements. It can handle several hundred accounts. It simplifies automatic "out of balance" detection, entry totaling, and document balancing. A computer can make it easier to deal with optional expense categories, and it can print totals up to $99,999,999.99 with 16-digit accuracy. A computer can accommodate enough entries per document to satisfy most small business needs, and it will provide well-defined audit trails.

Payroll

The computer can generate all your payroll paperwork automatically. It can calculate deductions, taxes, benefits. You can have better records and more confidence in their accuracy.

Computerized payrolls are very popular. The computer can calculate and print checks, compute state tax and federal taxes, and print W-2 forms at the end of the year.

Inventory Control

A computer can keep your inventory status clear and current. This alertness speeds customer service and avoids the prolonged billing cycle that can result from an unresponsive inventory control system. A computer also permits you to carry less inventory and thus to decrease inventory-related expenses.

A computer can handle several thousand inventory items, hundreds of vendors, and on-hand quantities up to the hundreds of thousands. It can project reorder needs based on historical data and sales trends. A computer can generate the following inventory control reports:

- Master Inventory List
- Vendor List
- Transaction Posting Report
- Suggested Order List
- Physical Inventory Error
- Inventory Performance

In addition, the computer can provide all the information you need for your general ledger file.

3

WHAT THE COMPUTER CAN DO: PLANNING

Besides assisting operations, a computer can help you to manage better. Good planning and decision making are the keys to good management. When planning, you must contend with financial statements, cost projections, budgets, schedules, materials, personnel, and market predictions. A computer can help you to clarify, organize, and work with this information so that you can make more timely and realistic decisions.

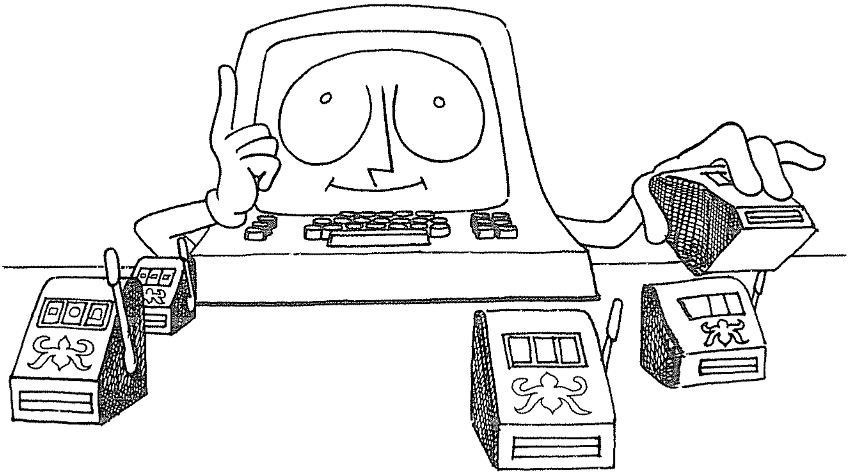
Briefly, here are two ways that a computer can help you in planning and decision making.

Computerized Spreadsheet

A computerized spreadsheet works with a model that gives the computer the capability to accurately forecast the potential effects of decisions. Once you plug in all the numbers relevant to your business, you can change figures without having to rework every affected figure. The computer does it for you. For example, if you are planning to hire a new employee, you enter the salary and the computer will recalculate every related cost to reflect the financial impact of that decision. Thus you can make decisions with far greater certainty about their actual consequences.

The spreadsheet is an ingenious planning device. Many business executives buy a computer just to be able to use it. It helps you with budgeting, job costing, cash flow, product pricing, engineering, and more. It literally replaces pencil, calculator, and column pad.

The spreadsheet has been used by many different businesses for many different applications. For example, a small service organization used a spreadsheet to predict the effects of a planned change in their rate structure. Management found that if the company charged lower fees on certain very popular services and higher fees on other more specialized services, the overall profit picture did not change. Thus they were able to use the lower fees to attract new customers and to increase overall revenue. One large casino has even used it to help plan the best locations of slot machines for maximum use and revenue. Management assigned a code number to possible machine locations and then projected coin intake and entered this and other data (such as traffic patterns, distances to change booths, restrooms, refreshments, and exits) for each location. Management then used the spreadsheet to analyze the data against the use and revenue objective. The computer suggested where to place additional machines and where to shift existing machines. Management changed the slot machine layout according to the spreadsheet analysis. The result was a marked increase in machine use and revenue.



But most businesses use a spreadsheet for less glamorous work, largely answering the daily "if this — then what?"

Time Management

You can use a computer's time management capability as a business/personal organizer to plan activities and to maintain accurate and complete records for future reference. For example, imagine you get a call from one of your out-of-town representatives, and the conversation ends with the representative's saying "I'll call you next Wednesday." You could simply make a mental note of it. Or, if you have a time manager, you could type in next Wednesday's date with a descriptive notation and then forget it. When the next Wednesday rolls around, your computer can remind you that the representative promised to call. (*You* may forget, but your computer won't!)

A time manager will display every appointment and activity from day to day until you mark it completed. The time manager can compute expenses according to various criteria, and it can help you keep records for tax purposes.

A good time manager permits you to prioritize entries as well. For example, you may assign a priority of one to a sales meeting six weeks away and assign a priority of three to a dentist appointment for the same day.

Whom to call and when, where to be, what to talk about, and everything prioritized for tomorrow or for months ahead are all easily handled by a time manager and your computer.

The Distribution Center

We promised you an example. So, let's take our first look at the personal account of B. J. Johnson, founder and manager of the Johnson Distribution Center, a successful and optimistic small business with problems on the horizon.

JOHNSON DISTRIBUTION

Part 1. Growing Pains

When I founded the Distribution Center eight years ago, it wasn't much of an operation. Not much more, really, than myself and three others. Everyone did everything, from answering the phone to cleaning the coffee maker. I found myself packing and shipping books as often as I made sales calls or planned for the future.

Then we started to grow and we took on more help as areas of responsibility became more sharply defined. A little more than eighteen months ago, I hired a marketing director, an outspoken and ambitious young woman named Judy Jones. Due in large part to Judy's strong efforts, sales have been climbing steadily for over a year. However, cash flow is becoming a problem, getting more sluggish every month.

Judy and I met not long ago in my office to review the last year's bank statements and to discuss the cash flow and what we might do to improve it. Our meeting began like this:

"Well, I guess the direct mail campaign was a success," Judy said.

"I've got you to blame for that, Judy. Give you a decent promotional budget and you run right off and increase sales by 40 percent!" (I pointed an accusing but joking finger.) "You better slow down before we go broke here."

"It's not really a joke, B. J.; we're definitely developing a cash-flow problem."

When Judy first entered the company, a phone order was normally processed in three or four hours. That is, within four hours of receiving an order, we had the order on the loading dock ready for shipment and the customer's bill ready for the mail.

As a result, we could count on receiving payment within thirty days of an incoming order. Since suppliers often gave more liberal terms (sixty or ninety days), cash flow was logical and timely. There was always enough cash on hand to pay our suppliers on time.

But now, since inventory and the number of customers have increased so dramatically (and suppliers' terms have become less lib-

JOHNSON
DISTRIBUTION
COMPANY

eral), there is normally a lapse of several days between receiving an order and shipping it. In addition, another lapse has appeared between shipping and invoicing the customer. These lapses have restricted our cash flow and threaten our future growth.

"Let's take a closer look at our operation flow, Judy. We've got to isolate these cash choke points and figure out what to do about them."

Judy opened a file folder and unrolled a flowchart of our operations.

"How did you know this is what I wanted to talk about?" I asked her, impressed once again by her foresight and initiative.

"Here is the way our order-placed payment-received path works," she said to me (ignoring my question, as she did whenever we both knew the answer).

"A customer calls in with an order. The order-entry clerk must first check the inventory to be sure that books are available. Once we know that the order is available, the clerk must check the customer's account status to be certain it's in the clear."

"And we know that the status is often out-of-date. What happened with the Global Stores account just yesterday?" I added. "They made a payment that had not been posted yet. So when they called in with another order and referred to the payment, we had to delay the order until we cleared up the confusion."

"That's right, B. J. It's this kind of confusion that has been wasting time and delaying both shipping and billing routines. This is the very kind of thing that's choking off our cash flow."

"OK, but let's not get ahead of ourselves here. First let's just look at the rest of the flow."

"In addition," Judy continued, "the order-entry clerk must confirm the customer's shipping and billing address, and then send the processed order to the inventory clerk, who then deducts the order from inventory. From there, the order goes to shipping where a clerk prepares a packing slip and then from shipping to accounts receivable where a clerk prepares an invoice. But the clerk cannot finish the invoice until shipping reports the shipping charges."

"But all this can take several days!" I had not really looked at the problem this closely in some time. I have probably been so elated with the sales increases that I had overlooked the potential difficulties the increases bring on.

"Can, and usually does take several days," Judy replied. "And if we have to make a partial shipment, the entire process becomes even more complicated."

Judy then pointed out that it takes inventory control several days to put together a list of titles that it needs to reorder, and often the list is incomplete because twelve hundred titles are a lot to handle manually.

You can see how closely interrelated all these operations are. A phone call brings a check on customer records and a credit check. If an order is taken, there is a direct impact on inventory control, invoicing, accounts receivable, and accounts payable if the title must be reordered.

And somewhere in the middle of all this, we must maintain adequate records for the accountants and for tax purposes. Clearly, we need a more carefully organized system. Our volume of business has outpaced our planning. Something must be done.

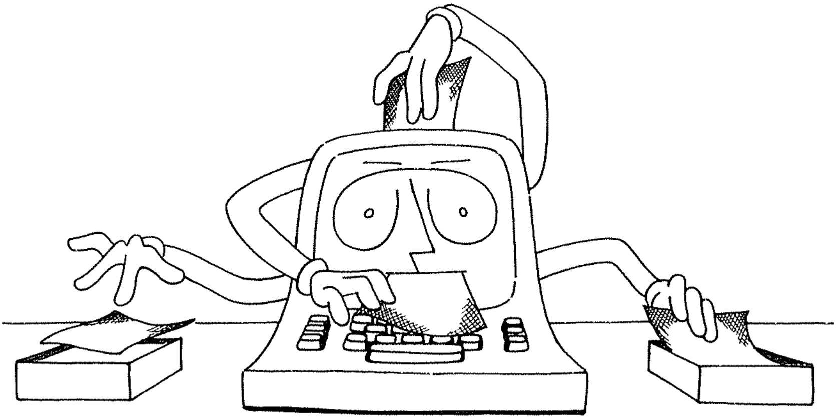
Comment

B. J. and Judy know that cash flow is a problem. They also know that the solution involves a change in the work and information flows that begin with an order. In the next part of the story, B. J. and Judy decide to investigate the possibility of bringing in the computer.

4

ARE YOU READY FOR THE COMPUTER?

As you now know, the computer can perform all the conventional business operations: it can keep lists, process orders, control inventory, bill customers, print invoices, keep track of receivables, update the books, issue paychecks, and process correspondence and other kinds of communications. And it can support management functions as well.



You can apply the computer not only to repetitive tasks but to business planning and modeling as well.

A computer is not simply an elaborate calculator. Far from it. A computer is a data processor, and you should think of it as that. As a data processor, a computer can do a lot more than your arithmetic. It can list, sort, file, retrieve, and summarize any kind of business data you work with. For example, any business struggles to maintain current files. The more up to date the files, the better the operations and the profits. For day-to-day decisions, you must rely on data from your files. You must know: what items are selling well this week? Is inventory keeping up with sales? Who owes how much? This is the kind of information that a computer can instantly serve up. This is the kind of information you need to know in order to make the best-informed decisions.

The computer is a major resource and its acquisition is a milestone in the life of a business. But because a computer is a logical device, it requires a logical environment. Frequently, such an environment is not characteristic of small business operations. Therefore, one of the major benefits of a computer is not a direct consequence of computer technology. When a typical small company decides to acquire a computer, it must carefully review the way it does business. Often, this review leads to the development of more streamlined and efficient business structures. This "hidden" benefit can help to improve *all* the operations.

Before the Computer

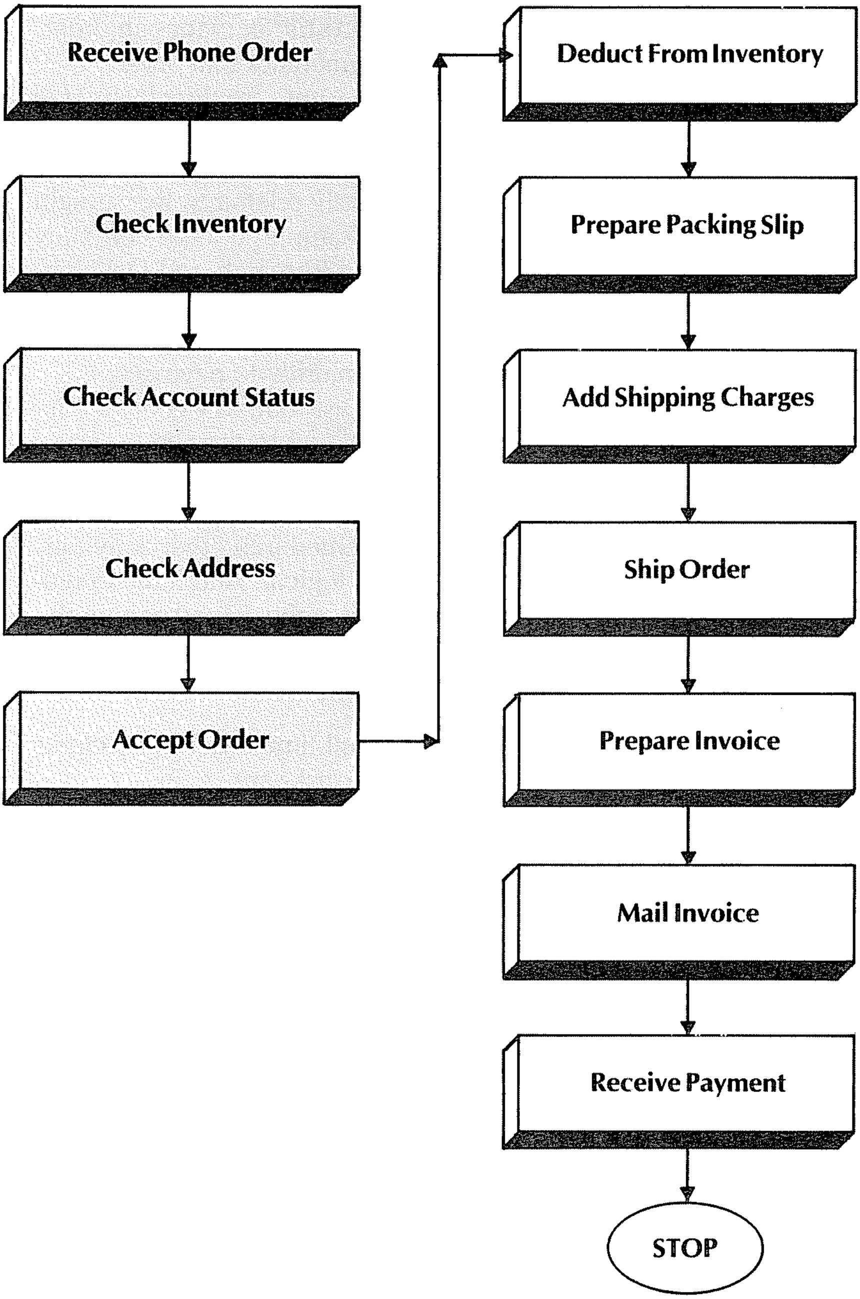
Is *your* business ready for a computer? Let's take a look and try to decide. First, you must review how you manage work and information flows. Then, you must try to understand how the computer will affect these. Let's consider the Johnson Distribution Center. If we were to draw a diagram of how B. J. Johnson runs his business, it would look something like the one on the next page.

To judge the computer-readiness of the Distribution Center, we must answer some critical questions about its operations.

1. Is the pattern of operations logical? (For each operation, do all the actions relate to a single, basic objective?)
2. Do these actions represent a major investment of workhours with most of this time devoted to relatively simple, repetitive tasks?
3. Although logical, does any action create a bottleneck? (Would a reorganization *measurably* improve performance?)
4. Does management require more timely information in a form that will simplify decision making?

Is the Pattern Logical?

When we look at the flowchart, we see that the answer is "yes." The Johnson business is "sandwiched in" between a logical begin-


Receive Phone Order
Check Inventory
Check Account Status
Check Address
Accept Order
Deduct From Inventory
Prepare Packing Slip
Add Shipping Charges
Ship Order
Prepare Invoice
Mail Invoice
Receive Payment
STOP

ning and a logical end. It begins when a customer places an order. And it ends when the Center receives payment for that order.

Almost all the operations in a small business are directly related to the actions required to go from this initial point to this final point. Of course, in a large company, significant amounts of time and money are devoted to activities not directly related to the straight path between order and payment. For example, a large company may have departments such as Advanced Research and Development, Shareholders Relations, and Public Relations. While these departments eventually contribute to the company's success, their activities are outside the straight path from order to payment.

The business pattern of the Johnson Distribution Center is logical. Most of the activities are directly related to the order-placed payment-received path, and all the activities are subordinated to the delivery of a service in the form of a product. Some of the activities can be streamlined, and some can be merged into other activities. On the whole, however, the operation is logical. And if the operation is logical, then you can computerize it, either in part or entirely.

A Major Investment of Workhours?

The Johnson operation requires two full-time order-entry clerks engaged in simple, repetitive tasks. These tasks are

1. Checking inventory status.
2. Checking account status.
3. Checking address.
4. Passing the order to inventory.

The tasks of the inventory control clerk are as simple as those of the two order-entry clerks. The tasks of the shipping and invoicing clerks are also repetitive and time-intensive. As it stands, the work flow involves at least four employees:

2 order-entry clerks
1 inventory control clerk (who is also the shipping clerk)
1 accounts receivable clerk (who is also the bookkeeper)

These four employees represent about a *third* of the company's work force. Unless the business volume decreases, these people are fully occupied in these activities and their tasks represent a major investment of workhours.

Creating a Bottleneck?

When we look at the overall order-processing operation at the Center, we can see that although it is logical, it has become a bottleneck for the organization. It retards growth, impacts unfavorably on cash flow, and can jeopardize customer goodwill and thus endanger profits.

Therefore, either the entire order-processing flow or its various parts:

- Order entry
- Credit checking
- Inventory control
- Shipping
- Invoicing

are candidates for computerization. Whether to computerize the entire flow or only part of it depends on statistical information such as the

- Number of daily transactions.
- Size of the inventory.
- Range of the customer list.
- Number of invoices generated daily, weekly, and monthly.

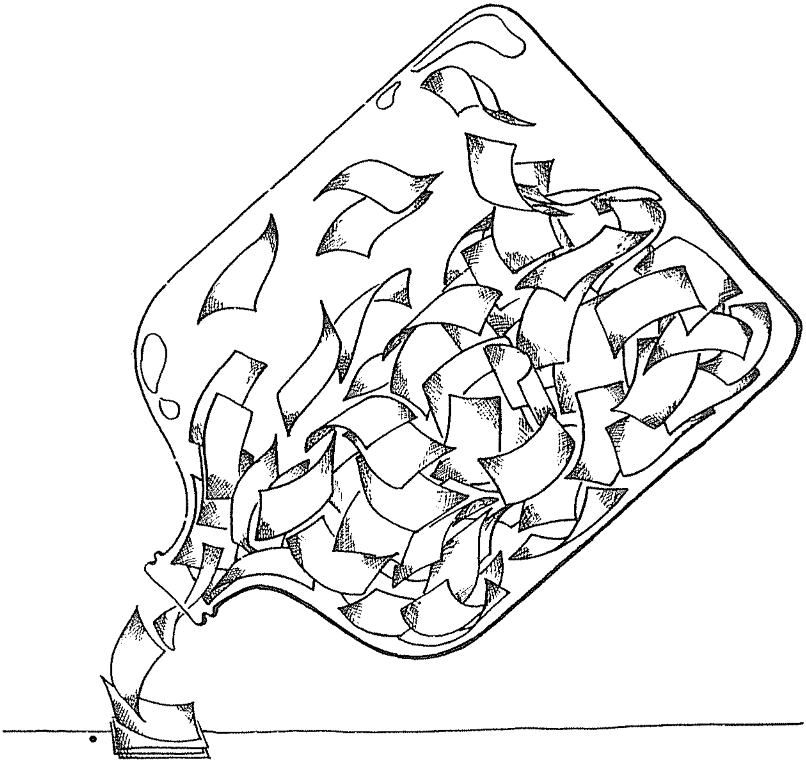
These statistics help to determine the type and power of the computer needed to handle them. Naturally, this in turn affects the price tag of the computer.

Order processing is a key area for most small businesses, since they operate almost entirely within the order-placed payment-received path. As we have noted, a typical small business sustains relatively few activities that are not directly related to this path. (While accounts payable is not *directly* in the path, it is closely associated with inventory control since most payables in a small business are directly related to the products or services sold.)

B. J. Johnson, or any other small-business owner who chooses to computerize only the order-processing flow, will see a less direct, but still significant and favorable impact on the general ledger, the payroll, general tax records, and operating budgets. (Naturally, you can also computerize these areas.)

While you might *want* to computerize the *entire* order-placed payment-received path, most small businesses can neither afford, nor do they need, such comprehensive computerization. The more ambitious the scope of computerization, the larger the investment.

The idea is to identify major bottlenecks, and then *go slowly.* Jumping in too soon can precipitate more problems than benefits. Later we will explore some painless and safe ways to convert from manual operations to computerized systems.



Information bottlenecks retard operations.

More Timely Information?

The answer here is "yes." B. J. Johnson receives a brief weekly report about sales activities and a somewhat more comprehensive quarterly report. However, this information is isolated and often does not reflect the real up-to-the-moment figures. Johnson must pull out and review old reports in order to do comparative analyses. Additionally, critical factors such as margins, cost increases, and cash-flow figures are difficult to cull from these standard reports.

Computer-generated reports are much more timely and comprehensive. And they are much easier to prepare. A manager can spot emerging problems and avoid them and analyze strengths and reinforce them.

The following list provides some simple checks when you begin to review information and work flows in your business activities.

Computer Readiness Checklist

An operation is computer-ready:

√ If the actions are logical but slow.

√ If the actions block the order-placed payment-received path.

√ If the actions represent a major investment of workhours.

√ If the actions are simple and repetitive.

√ If account status must be frequently checked.

√ If inventory status must be frequently checked.

√ If related activities (invoicing, shipping) are interdependent and time-intensive.

√ If an action restricts cash flow despite increased sales.

√ If the number of daily transactions is high.

√ If order processing is often delayed because of limited inventory control.

√ If the exchange of vital information is delayed because of time-consuming paperwork.

√ If an operation is a bottleneck in the business flow.

√ If more timely and comprehensive reports will aid decision making.

5

HOW TO DISTINGUISH BETWEEN DP AND WP

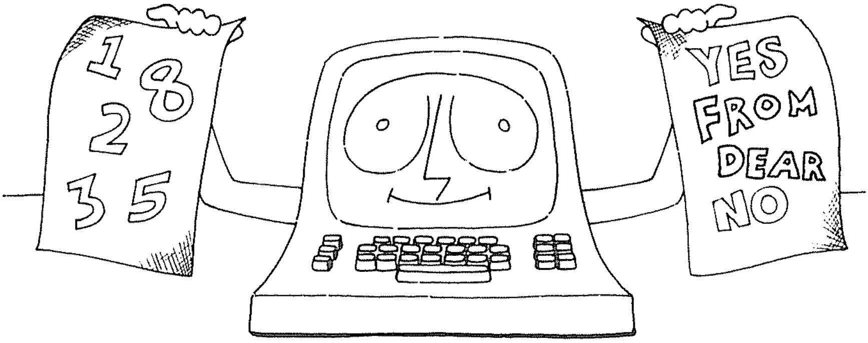
Together, data processing and word processing are referred to as *information* processing. Data processing, "DP" for short, is the manipulation of numerical data. (DP is also colloquially known as "number crunching.") Word processing, "WP" for short, is the manipulation of textual data. Both activities represent the flow of some kind of work.

Control over work flow is established by control over information. Regardless of its size, every business must control two types of information: numerical data and textual data. Here are some examples of each.

Numerical Data	**Textual Data**
Cases of product	Customer names, addresses
Price per case	Sales letters
Number of customers	Memoranda
Shipping costs/unit	Letters to creditors, debtors
Manufacturing costs/unit	Product bulletins
Units/case	Price sheets
Credit limit	Product specifications
Cash on hand	Newsletters
Cash in banks	Contracts
Current assets	Agreements
Current liabilities	
Long-term assets	

Traditionally, data processing has been separated from word processing. But, currently, the same computer can perform both types of manipulation, although some manufacturers produce and market computer systems designed primarily for word processing. (These are called *dedicated* systems.)

As we will see in more detail later, a computer doesn't know if it is figuring your inventory or writing a letter to one of your customers. Moreover, it doesn't matter!


1
8
2
3
5
YES
FROM
DEAR
NO

6

ALTERNATIVES: SERVICE BUREAUS AND TIME-SHARING

Let's say that you have analyzed your work and data flows, composed a flowchart, and determined that your business does indeed meet the four criteria:

1. It is logical.
2. Its operations are time intensive.
3. It has an operational bottleneck.
4. It needs more timely information.

Also, if you computerize the bottleneck, you will measurably improve performance. In short, you would like to take advantage of the capabilities of a computer to organize, streamline, and expand your business. But you don't want to buy the computer. You don't want the responsibility of having it around. What are the alternatives?

1. A service bureau
2. A time-sharing company

Service Bureau

A service bureau maintains a large and powerful computer system and, for a fee, applies this system to a variety of data processing and text processing needs for unrelated clients. You can divide service bureaus into two kinds of organizations.

- Custom Service Bureau
- Package Service Bureau

Custom Service Bureau

The custom service bureau handles every conceivable data processing or word processing need. For example, it handles payroll, accounts receivable, accounts payable, inventory control, general ledger, and mass-mailing of sales letters. Moreover, a custom service bureau will modify its system to a client's needs. A custom service bureau is expensive and so it is generally used by larger businesses for limited applications.

Package Service Bureau

The package service bureau handles only one or a few major applications, such as payroll; information storage, retrieval, and distribution; and customer list maintenance. Package bureaus are less expensive. But they cannot customize their programs for you. So, they may not offer some of the applications you want, such as word processing or time management.

In addition, both kinds of service bureaus often install a keyboard terminal or other input device in your office; and thus, performing the data entry becomes your responsibility, just as it would if you owned a computer.

When evaluating the usefulness of service bureaus to your particular needs, you must investigate five key factors:

1. Cost
2. Turnaround time
3. Error correction
4. Confidentiality
5. Security of data

Cost. This depends on the volume and type of data, frequency and number of transactions, format of the submitted and final data, and method of transmitting data. (Thus, you must first develop statistics and general notions of formats.)

Turnaround time. This refers to the time between submission of your data and the delivery of processed information. Data may be returned processed the same day, overnight, or weekly, depending on the volume and type of data (and on your willingness to pay premium rates for faster service).

Error correction. You will need to work out a method for catching and correcting errors in data before you submit them to the bureau (raw data) and after the data is processed (processed data) by the bureau. Since the service bureau is likely to be fairly distant from you, you need to establish a reliable and speedy method for correcting errors.

Confidentiality. You may need to safeguard your proprietary data from those who should not have access to it. Most service bureaus do a good job of this, but investigate their security measures before you use their services.

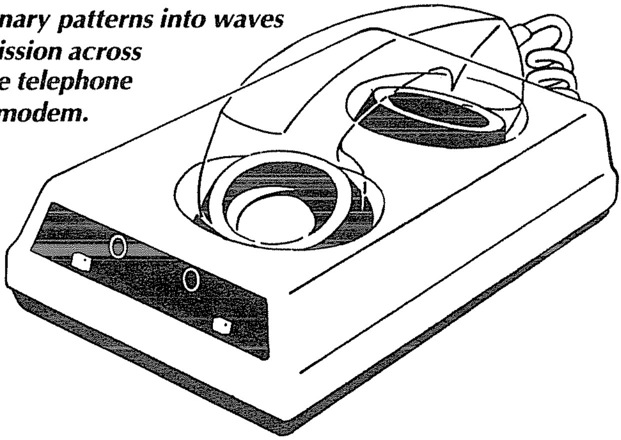
Security of data. You can lose data through destruction by the service bureau. You will find that most service bureaus are liable only for the replacement of such data and will disclaim responsibility for damages you may incur because you don't have the lost data available when you need it.

Investigate service bureaus in terms of the five factors. Remember, however, that with either the custom service or the package service, you are tied into *batch* processing; that is, your data will be processed in a large batch, often with data from other companies. This means that your data may not be "fresh." If your business requires instant information and you want to be genuinely on top of the situation, service bureaus are probably not for you. But you can consider time-sharing.

Time-Sharing Company

As the term implies, a time-sharing company enables you to share a large computer with other clients (*users*). The computer may be located nearby or clear across the country. The clients are linked to the computer by means of input/output terminals. Because the terminals are relatively slow to transmit and respond and the computers are so fast, many users can serially use (*access*) the computer without interfering with each other's operations. The computer moves its resources between different users at such high speeds that they do not notice (except in rare circumstances) that they are sharing the computer with others.

You can use the time-sharing computer in different ways. For example, some time-sharing companies have developed programs for payroll, accounts receivable, inventory control. (We will explain what "programs" are later.) You access the computer by sending in your raw data and receiving processed data via your in-house terminal (keyboard, screen, or printer). This involves using the phone lines and a special interface device called a *modem*. Some time-sharing companies offer only the computer system, and you must develop the programs you need.



A modem (modulator/demodulator) converts the computer's binary patterns into waves suitable for transmission across telephone lines. The telephone receiver sits in the modem.

You can categorize the cost of using time-sharing into specific components. You should analyze each component before you agree to a time-sharing arrangement.

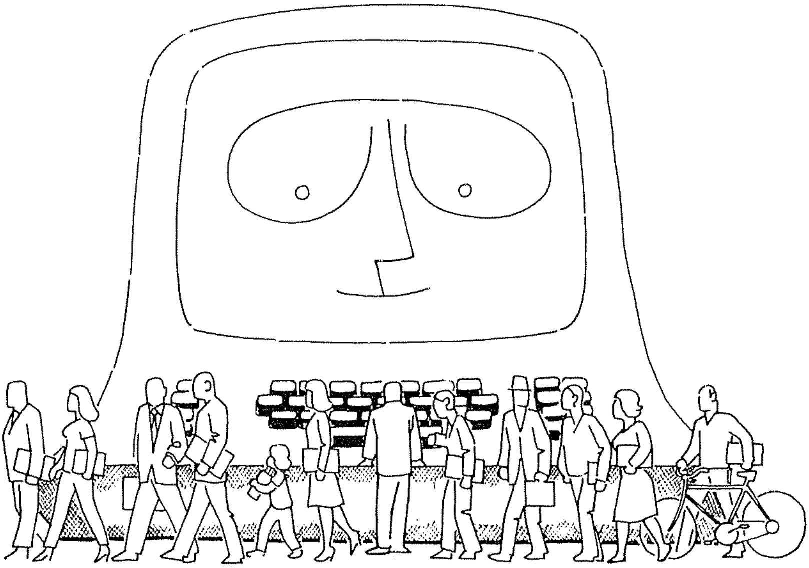
Time-Sharing Cost Checklist

- √ The terminal(s): you can lease as well as purchase these.
- √ The acoustic coupler (modem): lets your terminal "talk" to the computer via the telephone line.
- √ The "connect" time: the *actual* time you are hooked into the computer.
- √ The "processing" time: the *actual* time the computer is working on your data.
- √ Telephone: the cost of using telephone lines to communicate with the computer.
- √ Storage: the cost related to the volume of data that you store on the computer's storage media (disks, tapes).

- √ Storage on-line or storage off-line: you are charged more for data to which you can have "instantaneous" (*on-line*) access and less for data stored in an archive (*off-line*). If you need to access the archive, you must ask to move the data into the on-line storage.

Along with the obvious cost components, you must be aware of more "hidden" costs.

- √ Escalation of costs caused by excessive connect and processing time.
- √ Excessive telephone bills associated with the use of the terminal.
- √ Inflationary charges. Time-sharing is both labor- and capital-intensive. Therefore, it is highly sensitive to general inflation.
- √ Loss of confidentiality. Caused either by inadvertent or deliberate breaking of the code-based security system. (Rare, but possible event.)
- √ Cost to input the data.
- √ If necessary, cost of customizing programs to suit your business.



Time sharing permits many persons with different needs to access the computer efficiently.

Comment

With time-sharing, a monthly bill for computer time (say, 40 hours) could be enough to pay for an in-house computer in a few months. Time-sharing is terrific if you need a large computer capability (the Government uses time-sharing), but for a typical small business, time-sharing is probably not cost effective. In short, if you are considering time-sharing, you might as well consider the advantages of an in-house computer.

Radio Shack
TRS-80
ACOUSTIC MODEM
ORIG OFF ON
CARRIER
READY
Radio Shack
TRS-80
MODEM II

Acoustic modems from Radio Shack

7

THE ADVANTAGES OF AN IN-HOUSE COMPUTER

If service bureaus are inflexible and slow and if time-sharing is expensive, then what are you left with? Your own in-house computer. If you had said a few years ago "We're not big enough — it doesn't make sense for a small company to buy a computer," you would have been right. No longer. Virtually every small business can afford its own computer. The development of the microcomputer has made this possible. For example, in 1972, you could buy a luxury car new for about $5500. If the cost of that car had kept pace with the cost of computer equipment over the last 10 years, the car would cost about $960 today. A computer is a bargain.

But besides the reasonable cost, an in-house computer offers many other significant advantages over service bureaus or time-sharing. Here are some of them.

In-House Computer Pluses

+ Full control. The computer is under your control. You can computerize operations when and how you want to. Also, you don't need to conform to the programs offered by bureaus or time-sharing companies. You can customize the computer to your procedures and operations.

+ Immediate information. You have instant access to information. No waiting, no wasted time!

+ 24-hour availability. Since you own the computer, you never need to wait to get information or to enter information.

+ No extra charges. Computer services are capital- and labor-intensive. Costs can push you onto a treadmill where it is too expensive to maintain your computer service and too expensive to drop it.

+ Security and confidentiality. Proprietary information stays in your office and you can program the computer with passwords and other security measures to protect private information.

+ Significant tax advantages. You can amortize. You can depreciate. And you acquire an asset that becomes an important business tool.

+ Packaged programs. These are inexpensive and you have an enormous selection. You can probably use a series of off-the-shelf programs, thus adding capabilities for just the cost of the program (instead of paying additional charges to a time-sharing company or service bureau).

Naturally, you must bear certain costs and commitments in order to acquire the benefits of an in-house computer. Here's a list of some of these.

Evaluating Computer Costs

√ Initial capital investment. You must buy the computer. About $1800 to $6000.

√ Operator training. You must train personnel to operate the computer. However, anyone who can type can learn to work with the computer.

√ Supplies. These include paper, recording disks or tapes, ribbons for the printer, etc.

√ Dedicated work space. You must prepare a suitable environment. You do not have to pamper the computer, but you should not move it around a lot. Keep it cool and dry and vibration-free, and don't place it in the path of dusty air.

√ Security procedures. These can take some thought but not too much cost. You should safeguard your information from accidental or deliberate damage.

Microcomputers are a development from the technology of miniaturization. The circuits that form the "brain" of a microcomputer fit on a silicone "chip" so tiny it can rest on your fingertip.

The microcomputer is used in small business, by home enthusiasts, and by organizations that require limited power but insist on full capability.

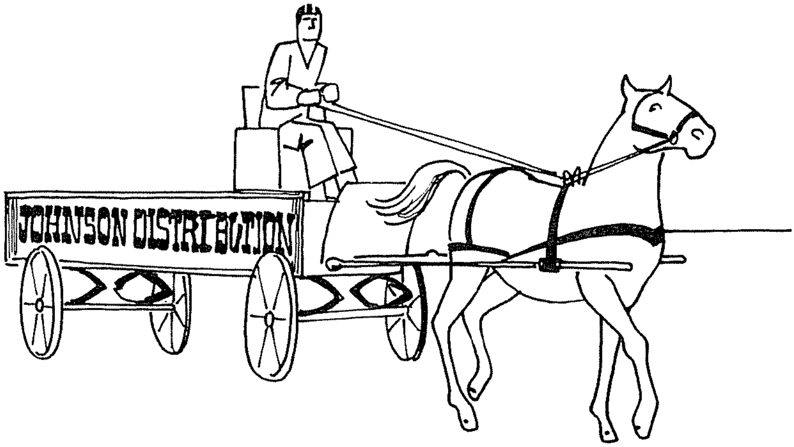
We will soon take a closer look at microcomputer hardware to see how the components relate and work together to create the computer system. But first let's go back to B. J. Johnson and the Distribution Center, as he and Judy begin to talk about computerization.

●

JOHNSON DISTRIBUTION

Part 2. The Computer Decision

After the last meeting with Judy, I began to think more anxiously about the problems created by our rapid sales expansion. We were handling our paperwork, the information that keeps us going ahead, with the same methods we used when our sales were one quarter what they are now. Clearly, these methods are inadequate. We are using a horse and buggy to pull a trainload. The result has been a very sluggish cash flow. What shall we do? So I called another meeting with Judy.



"Well, it's clear to me now that our problem is not simply slow cash, Judy. The problem is really slow operations."

"Yes," Judy stated flatly. "Our customers are still paying in the usual 30 days. But that's 30 days after we bill them. If we could ship more quickly, we could bill more quickly and, consequently, we could speed up our cash flow."

We agreed. But we still needed a plan. Spotting a problem and resolving a problem were quite different. I had some ideas and I was certain that Judy did also.

"I've been thinking about computerization, Judy," I said. "Actually, I've done a little homework on the subject and thought we might discuss it together."

"After our talk, I also did some research," Judy smiled. I could see we were going to get somewhere.

"I was hoping you would say that. What have you been thinking about?"

"Well, from what I've read and from talking with people who've been through this, I've learned that the first step is to take a close look at our operations flow."

Judy had matched my thinking. She went on to point out that our pattern of operations was essentially logical and made up of simple, repetitive tasks, but the tasks involved a major investment in work-hours.

"You mean checking the account status when taking an order or looking at the inventory list to check available stock."

"Yes," Judy answered. "It's these simple tasks that are slowing down the works. We have bottlenecks at several places. Take, for example, the inventory. It's not unusual to receive an order for titles that are out of stock. This is because the inventory list is not current. It can be two or three days behind actual inventory. And then what do we have to do? We have to call up the customer the next day and explain that there will be a delay in shipping. We lose orders that way, B. J. It doesn't make us look very good."

She was right.

"OK then, we need to computerize some of our operations," I said. "But we have to decide where to start. Several of our operations are candidates, but what to do first? And do we buy a computer, or time-share, or work with a service bureau?"

Judy and I went to work on these questions. When we met again, she suggested that we first decide what we wanted to computerize to start with. We concentrated on order processing, ignoring (for the moment) office correspondence, payroll, general ledger, and other operations not directly in the order-placed payment-received path.

Most of our orders are phoned in, and when we get one, our phone representative first checks the customer's credit status. We cannot accept an order from a concern whose account is in arrears. This checking has been accomplished by referring to paper files, so this was a logical place to begin computerization.

"If we don't computerize another thing," Judy pointed out, "having instant access to a customer's account status will speed up the process."

"So then, we want to set up a *customer file* on the computer," I said. "One that will give our phone representatives the account status, payments made, balance outstanding, credit limit, maybe even a record of what titles they've bought in the past."

"Exactly. And that isn't difficult to set up. It's just a matter of creating a data base that contains all that information filed under the name of the bookstore, or under an account number. All our operator would have to do is to enter the name of the account to be checked and there it is — the account status."

"And it would be up to date, every day." This possibility excited me because too often we had either accepted an order on an account that was over limit or held up an order on an account whose recent payment had not been posted because of the lag-time in updating the paper files.

"While we're talking about up-to-the-minute, let's consider computerizing the inventory file at the same time." Judy was getting enthusiastic now. "How often have we taken an order for stock we didn't really have? I mean, if one operator takes an order for twenty copies of the Write for Success book and another does the same thing on the same day, and we have only twenty copies in stock, someone is not going to get their order filled until we restock! Our paper files simply aren't *that* current."

"But if they were on a computer . . ."

"Then everyone would be happily writing for success."

After more research, Judy and I decided then that we should begin by computerizing a customer file and an inventory file. We also decided that it was time to bring in the rest of the staff. I asked her to set up a general meeting to include the order operators, the inventory clerk, the shipping people, and the accounts receivable clerk. We needed to know their requirements and felt that bringing them all into the decision-making process would ease potential anxieties.

"B. J., let's talk a minute about what kind of computerization we're considering." Judy, as usual, had thought this all out. "There's time-sharing, a service bureau, or our own computer."

"OK, let's see. A service bureau seems unsuitable for our purposes because we need instant data. It wouldn't make much sense to save up our customer or inventory file updates and then send them to a bureau for processing."

"No. And since we would want the computer on-line, accessible to us every minute during the working day, time-sharing would run us into a lot of money. As I understand it, most people who use time-sharing need the computer for only limited periods during each day. That way it makes economic sense to share a computer."

"So we are talking about our own computer," I stated. "Good. I'll do some looking into what kind of computer we might need and where we might buy it. I don't want to break the budget on this thing."

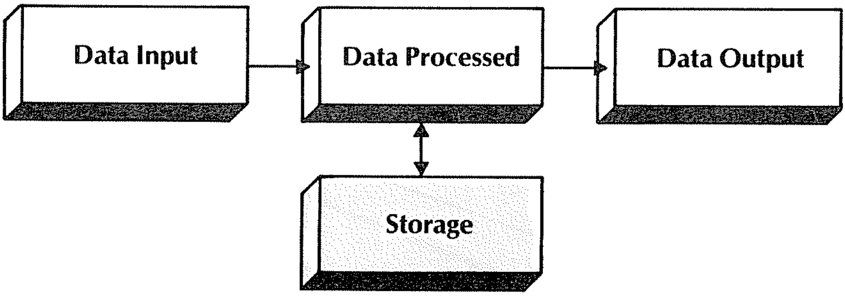
"I've read a lot about these new desktop microcomputers, B. J. They say that these computers do quite a good job."

"And they don't break the bank!"

8

MEET THE MICROCOMPUTER

We borrow the term *micro* from the Greek language. It means "little." However, the first point that you must understand is that the microcomputer is no less a computer because it is small. Like other computers, it is an assembly of electronic circuits that process data. Data, as we know, is information, such as numbers or letters. Data composed of numbers *and* letters is called *alphanumeric* data. Any action taken by the computer on the data is called *processing*. The following diagram is a simplified picture of a computer system.



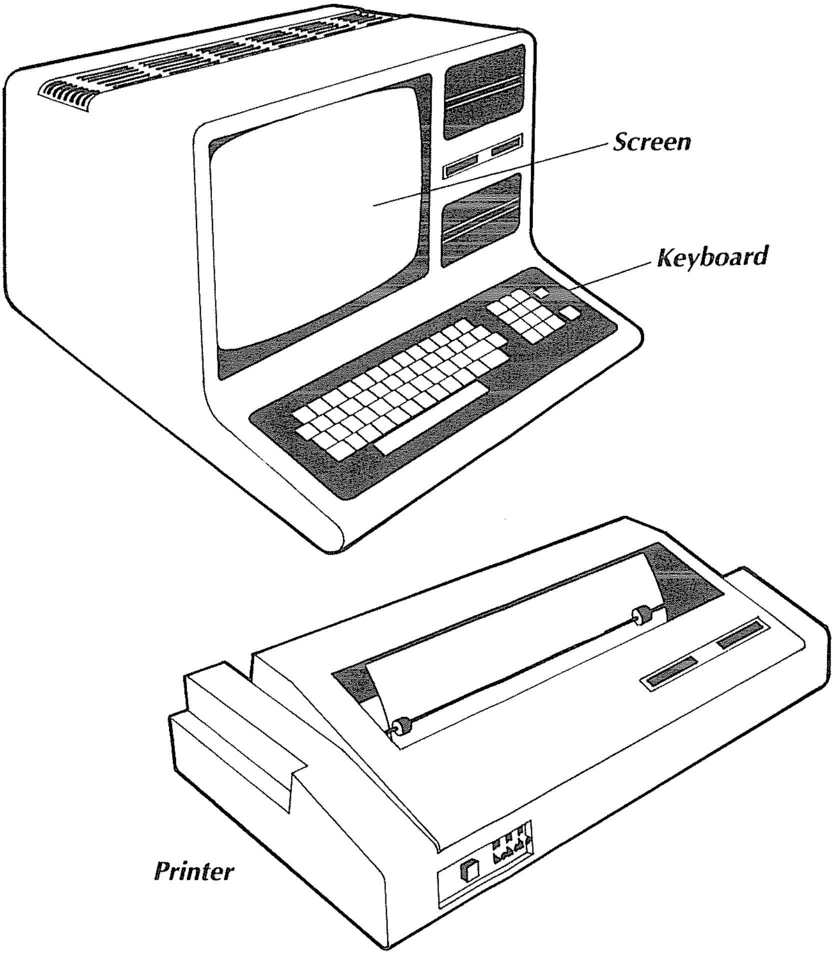
Like the circuits of larger computers, the circuits of the microcomputer must be able

- To operate automatically to perform data processing without the intervention of an operator. This ability distinguishes a computer, however small, from even the largest and most elaborate electronic calculator.
- To make decisions. While engaged in data processing, the computer must be able to "take" alternate courses of action.

Like every computer, the microcomputer has three basic parts. These are

- A central processing unit (CPU).

- A memory (to store instructions and data).
- Input-output terminal(s), such as video screens, printers, and keyboards.



Within the central processing unit, a microcomputer uses an element called a *microprocessor* to control its operations and the flow of information within it. If you want to know a little more about the microprocessor, read through Topic 9. The information is technical, but brief and interesting.

9

FOCUS ON THE MICROPROCESSOR

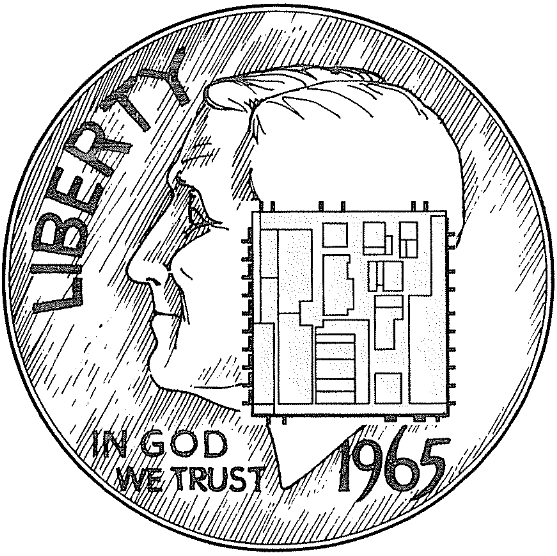
The ENIAC computer of 1946 was 100 feet long, 10 feet high, and 3 feet deep. It weighed about 30 tons, occupied a volume of 15,000 cubic feet, and could perform 5,000 calculations per second. It demanded 150,000 watts of power and gave off an enormous amount of heat. It had to be kept in a very carefully controlled, dust-free environment, and much of its life was spent waiting for its inventors to track down burned-out vacuum tubes.

Today, a microcomputer weighs about 40 pounds, occupies about one cubic foot, uses perhaps 150 watts of power, and can outperform its great ancestor by a factor of at least 100! Why? Because of the microprocessor. The following table compares the characteristics of ENIAC and the microcomputer.

ENIAC			**Microcomputer**
Weight	(lbs.)	60,000	40
Volume	(cubic ft.)	15,000	1
Power	(watts)	150,000	150
Speed	(calculations per second)	5,000	500,000
Cost		$4,000,000	$2,000

The calculations of computers are managed by circuits governed by simple switches. Each switch is either closed or opened in order to represent the digit 1 or 0. The pattern is called the *binary code*. The computer designer uses this binary code to create the computer's logic. In the beginning, vacuum tubes conducted the current for the switching. Then, in 1952, transistors became commercially available. They functioned in the same way as the vacuum tubes, but they were smaller than tubes. They did not need heated filaments, and they operated with less power and more reliability. The transistorized computers of the 50's were more reliable, smaller, and less expensive. Then, in the late 50's, an innovator combined two or more separate transistors onto the surface of a semiconductor material, silicone. Thus, the *integrated circuit* (IC) was born.

Today, one integrated circuit can do the work of thousands of transistors, miniaturizing them to a small flat "chip" that measures about 1/4 inch on each side. This one chip, called a *microprocessor,* can contain all the elements needed to work a computer.



The tiny microprocessor that runs a computer can fit on a dime.

Exactly how microprocessor chips are made is too complex for our discussion. A method of photoengraving the circuits onto a thin slice of silicone makes it possible. And the industry expects that continued large-scale integration (LSI) of circuits will make microprocessors even more powerful in the future.

The microprocessor chip is where the actual work of a microcomputer is performed. Here the computer does the arithmetic, compares one piece of data to another, retrieves data from memory, and controls the actions of the rest of the components. In a microcomputer, a microprocessor is the main element in the central processing unit, which, as you know, is one of the three parts of a computer system.

10

THE CENTRAL PROCESSING UNIT (CPU)

The CPU is the "brain" of the computer. It receives information, acts upon it, and sends commands to other computer parts, such as the internal memory and the input-output terminals. These commands say, for example, "display this information on the screen," "delete this character," "print out this screen," "rearrange the columns on this printout." When issuing these commands, the CPU follows rules given to it by "programs," or *software.* (You usually cannot see the CPU. In most microcomputers, it is inside the console.)

In order to be able to do its tasks, the CPU needs an arithmetic-logic unit, a processor clock, address-control circuits, memory-access circuits, and input-output circuits. Thus the CPU is a microprocessor with added components.

Internal Memory

The CPU has a memory, sometimes called *internal* memory (or *internal* storage) to distinguish it from *external* memory (storage media outside the computer). This memory is usually measured in terms of how many thousands (K) of characters it can hold. For example, if the internal memory is 8K, then it can hold 8000 characters. The CPU's memory power is used to store the programs that conduct the computer through its tasks.

There is a direct relationship between CPU memory size and computer "power." More power means more transactions performed faster. The larger a computer's internal memory, the more characters the computer can store. The more characters it can store, the more complex the programs you can run. Therefore, we say that a computer with a large internal memory is more "powerful" than a computer with a small internal memory.

Bits and Bytes

The terms *bit* and *byte* are common computer parlance. These represent the means by which the switches (that we discussed earlier) create the messages that the computer stores in its memory. For all practical purposes, a byte is one character: letter, number, space, or symbol. The one character is composed of 8 bits. Each bit is a binary 1 or 0. A pattern of 8 bits represents a single character.

One byte = 8 bits		
8 bits	**01000001**	**01000010**
One byte	Represents **A**	Represents **B**

RAM and ROM

The CPU memory has two areas: random access memory (RAM) and read only memory (ROM). Random access memory is what people are talking about when they say "I have a 48K computer." This means that they have a CPU that can store 48,000 bytes in RAM. You temporarily store data and programs in RAM. You lose the data and programs stored in RAM when you turn the computer off.

The random access memory works a little like *your* memory does. Your memory can go directly to any piece of information. For example: "Where did I leave my hat?" *In the closet.* It does this without having to go through data that precedes it. For example: *I walked into the house, put down my briefcase on the kitchen table, took off my hat and put it into the closet!* To extend the example, if the location of your hat had been stored in the computer's RAM and you asked the computer, "Where did I leave my hat," the answer would have been instantaneous: "In the closet" would read out.

The read only memory works a little differently. The information stored in ROM is not lost when you turn the computer off. It is "wired in" at the factory because it includes some of the computer's operating instructions. (ROM is sometimes called "firmware" because the information in it is more permanent.)

You might think of ROM as a phonograph record. You can play it ("read" it), but you can't add or delete anything from it. Why, you may ask, does a computer need ROM?

Because ROM doesn't forget! In short, the computer needs a permanent program in order to know how to begin "to compute." If you only had RAM, then each time you turned your computer on, you would have to give it all the very complex instructions that tell it that it is a computer. Because these instructions are permanently placed in the CPU, the computer is prepared to accept your commands each time you turn it on.

Summary

To summarize then, the central processing unit (CPU) is the brains of the computer. It does the computing and controls the other components. The CPU has a memory measured in thousands of bytes (K). The more K, the more powerful the computer. The memory has two areas: RAM and ROM. You use RAM (random access memory) to store data and programs when you work with the computer, and you lose the data and programs when you turn the computer off. ROM (read only memory) defines the computer to itself. Its information is wired in at the factory and is not lost when you turn the computer off.

As you can see, a computer must be programmed at different levels. On a basic level, it is programmed by instructions fixed in ROM. On another level, you must program it to work as a system. We'll find out more about this kind of programming in the next topic.

11

LOAD THE SYSTEM: OPERATING SOFTWARE

When you turn on the computer, the CPU RAM is empty. Before you can load your program into the computer, you must first prepare the computer to work as a *system* by loading the *operating* software. (The term *software* simply means *programs,* but distinguish it from the term *hardware,* which refers to computer equipment.)

Operating Software

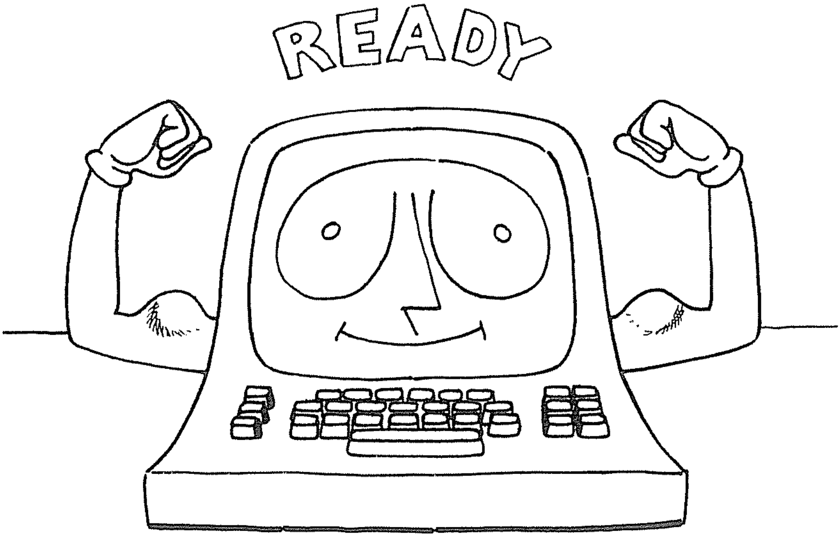
The key to the usefulness and efficiency of a computer system is the operating system software. This software is a set of operating instructions less basic than those stored in the CPU ROM. Among other things, these instructions tell the computer how to read another program, how to send a message to the printer, and how to control the screen image. Most manufacturers refer to the operating system software as the *OS.* If the computer comes with diskettes, the "OS" becomes "DOS" for *disk operating system.* For example, most of Tandy's TRS-80 line of microcomputers come with diskettes, and Tandy calls the system TRS*DOS* (triss-dos). The TRS-80 disk operating system contains all the programming needed to coordinate the software and the hardware.

When you buy a computer with a diskette system, you will normally receive the DOS recorded on an application (user) program diskette. When you turn on the computer and load the application program from the diskette, you also automatically load the operating system. (In a later discussion, we will see more clearly the distinction between the operating system program and user programs.)

Typical Loading Procedure

Let's use Tandy's TRS-80 Model II to illustrate a typical loading procedure. Until you load the operating system, the Model II will not accept any application programs. It will "prompt" you by displaying on the screen the message INSERT DISKETTE. (This message and other data are stored in the CPU ROM.) Once you insert a diskette containing the operating system, the computer prompts you to enter the date. After you enter the date and press the ENTER key, the computer will ask you for the time. You enter the time and press the ENTER key, and the computer automatically loads the DOS. Now that you have loaded the operating system, the computer can accept other programs. It displays the message TRSDOS READY.

In other computers, this readiness may be indicated on the screen by a word or by a symbol. The message depends on the make and model of the computer.



Because you load the disk operating system into RAM, you lose it each time you turn the power off. Therefore, you must load the operating system each time you turn the computer on.

More About the DOS

An operating system is rather like an orchestra leader for your computer. It starts and stops the action; it defines commands you give it; it directs the messages; in short, it manages the activity.

Some of the common functions of an operating system are:

1. Creating a file (a collection of related records treated as a unit).
2. Deleting a file.
3. Displaying a message for the operator.
4. Dumping data for storage.
5. Loading an application program.
6. Displaying a directory of files.
7. Copying one file into another.
8. Setting the date and time.
9. Showing how much space is left on a diskette.

When you are ready to buy a computer, explore the functions and capabilities of the operating system it uses. The degree of sophistication of the operating system can help you to judge the overall capability of the system. If the functions are comprehensive, chances are that the entire computer system is good.

12

EXTERNAL MEMORY: MASS STORAGE

You use special hardware to store data outside the computer system. This hardware enables you to create mass-storage areas, or computer *files*. These files are normally in the form of magnetized devices (such as magnetic diskettes). As a group, we refer to these devices as *magnetic media*. Magnetic media use a mylar surface coated with an iron oxide that can be magnetized in a pattern and later "read" by a small electromagnetic *head* that is sensitive to magnetic patterns.

Diskettes in General

You can obtain diskettes in a variety of types and sizes, and the amount of information you can store on a diskette depends on its type and size. To use a diskette, you insert it into a mechanism called a *drive*. (Thus, we talk about "disk drives.") In a sense, a diskette is a record and a disk drive is the record turntable. Some disk drives are part of the console that contains the CPU and the display screen. Other drives are separated from the console and connected to the computer by cables.

The development and introduction of relatively inexpensive diskettes and disk drives to create mass storage give microcomputers the capability for business applications.

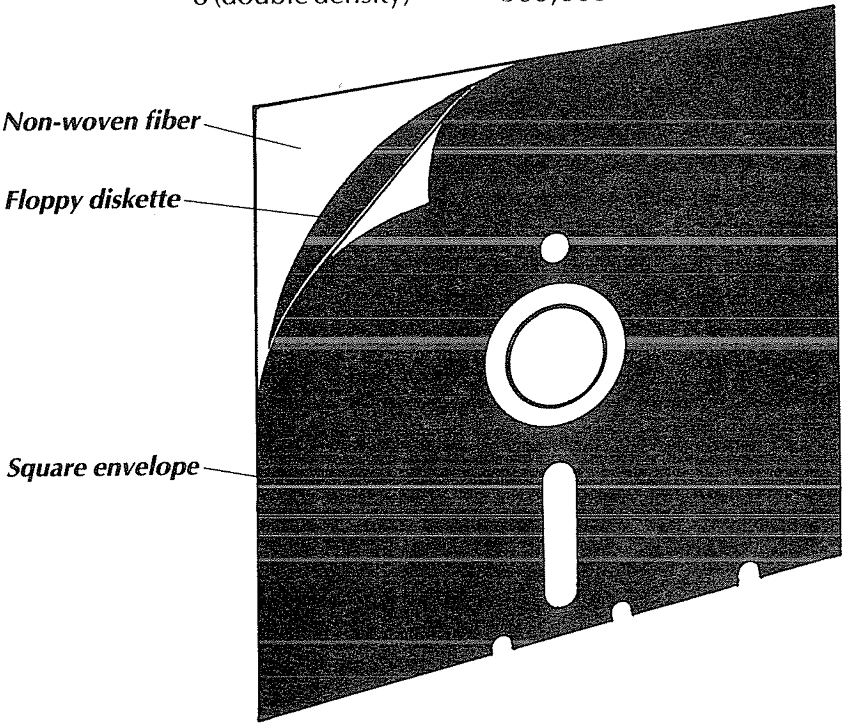
Microcomputer Diskettes in Particular

We refer to diskettes used with most microcomputers as *floppy disks* or *diskettes*. (We can also store data on hard disks. We will discuss these shortly.) A floppy diskette is a magnetic oxide-coated polyester (the same material as ½-inch and ¼-inch magnetic recording tape). You can purchase floppy diskettes in two sizes: 8 inch and 5¼ inch. The smaller diskette is sometimes called a *mini-floppy*.

The floppy diskette is round and flat, with a hole in the middle. It looks like the familiar 45-RPM record, but it is permanently encased in a square plastic envelope. The inside of the envelope is covered with special, non-woven fiber that permits the diskette to rotate easily as it continuously wipes the diskette surface clean. Unlike magnetic tape, some diskettes are coated with magnetic oxide on both sides, which allows double-sided recording and also helps the diskettes to lie flat.

You can store approximately 90,000 characters on the single-density 5¼-inch diskette. You can store approximately 175,000 characters on the double-density 5¼-inch diskette. And you can store up to 500,000 characters on the 8-inch diskette.

Diskette	**Characters**
5¼ (single density)	90,000
5¼ (double density)	175,000
8 (double density)	500,000



Let's briefly outline how information is stored on a diskette. The recording tracks are placed in concentric circles. The tracks are numbered, beginning at the outer edge of the diskette and moving toward the center. (How many tracks varies with the type of diskette. For example, the double-density minidiskette used by Tandy's TRS-80 Model III has 40 tracks.) A diskette is also divided into wedges, called *sectors*. (The 40-track minidiskette used by the TRS-80 Model III has 18 sectors.) Thus, every location on a diskette has an "address" defined by its track and sector number. Each piece of information stored on a diskette has its own unique address.

Now you can easily see the benefits of maintaining office records on diskettes.

1. The diskettes take up far less space than the old filing cabinets.
2. You can easily and quickly duplicate a diskette.
3. You can recall the contents of a diskette almost instantly.

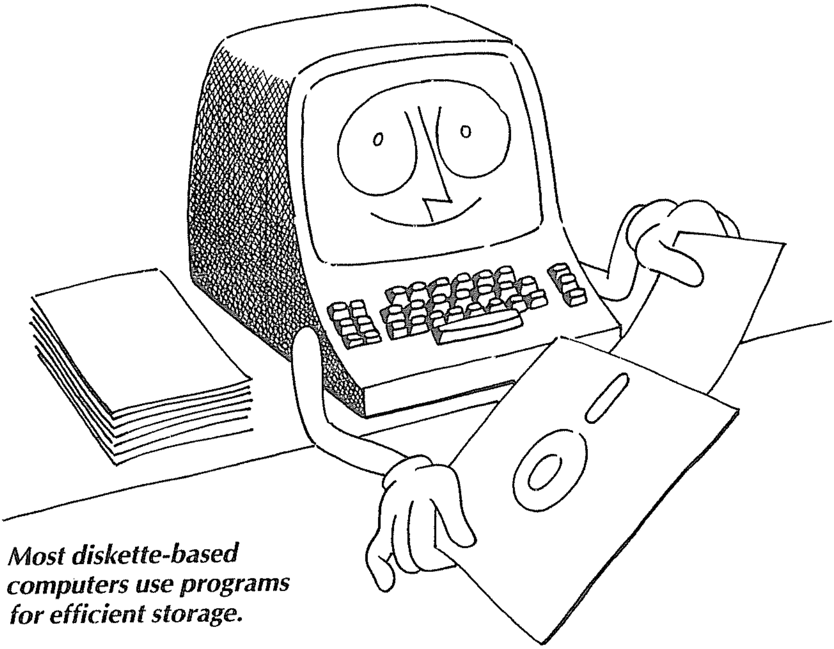
Also, the diskette is a random-access storage area (like the random access memory in the CPU). You can access data without a sequential passage through previous data. Let's take a closer look at this ability.

Random Access to Diskette Data

As we have noted, the diskette is a random-access storage area. The computer can record (write) data and locate (read) data anywhere on the diskette. It writes wherever it finds space for information. The access is "supervised" by the diskette-operating system. (Remember the DOS?) An efficient system will usually sprinkle data all over the diskette. Because the diskette is divided into tracks and sectors, the system can locate each piece of data by its address. The system may write the first few pieces of information sequentially and into contiguous sectors. However, when an operator deletes information, the system will delete and thus open up information "holes" on the diskette. The system may write new information into a hole, and if this information overflows, the system can "branch" and write the overflow into another hole on a different sector of the diskette.

The system remembers where the information comes from and where it has put it. This random allocation of data and access to it is wonderfully efficient. No matter how scattered the information, the computer can quickly find and retrieve it.

As the operator deletes and adds information, the holes get smaller and more widely separated. The system uses more and more branches to write new information. For this reason, most diskette-based computers use a special "utility" program that periodically packs the diskette, sorting out and reorganizing the data to consolidate scattered information. This packing also reduces the movement of the "head" of the drive that touches the diskette. Less movement and less contact mean less wear on the diskette.



Most diskette-based computers use programs for efficient storage.

Diskette Disadvantages

The first disadvantage of a floppy-diskette system is that for a conventional business application, you'll probably want *two* drives. Although you can perform most computer operations with one disk drive, many of the operations become very time consuming and somewhat awkward. Therefore, a system with at least two disk drives is recommended for business uses. Making copies of your files is especially difficult and sometimes impossible with only one disk drive. And, in business, making copies is a necessary day-to-day routine. So, unless you have very limited use in mind for your computer, don't consider a business microcomputer with only one disk drive.

The other serious disadvantage is the amount of data that a diskette can hold. You may find, for example, that your inventory control data does not fit on one diskette. You may have to spread some files onto two or more diskettes. Distributing files this way is an inconvenience if your system has only one disk drive. You can live with this, but you should examine the implications before you do. One solution is to expand the computer system with additional disk drives in order to keep more data available at any one time.

For most small-business applications, a dual drive double-density diskette system works quite well.

Diskette Care

In spite of the protection of the outer jacket, diskettes are subject to wear and possible destruction by mechanical malfunctions. Today's diskettes have high quality and wear very well. However, because of the potential for errors, electrical surges, power interruptions, or other "failures," you should have at least two copies of all important data and programs. Here's a list of diskette care don'ts.

Diskette Don'ts

X Don't bend a diskette.

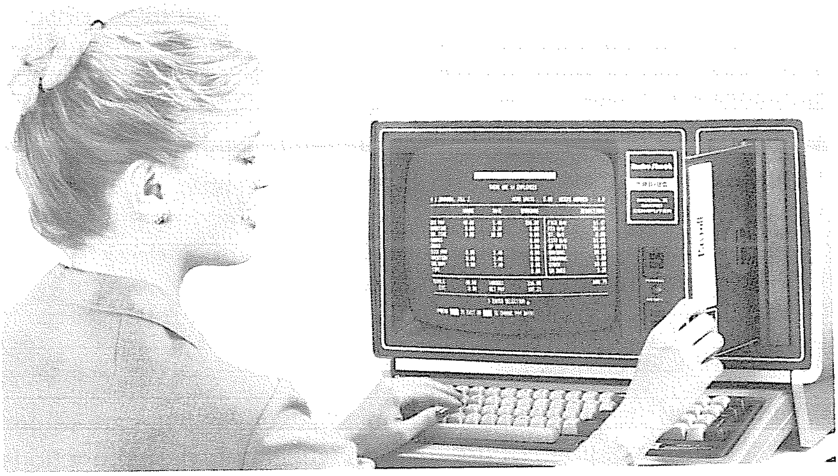
X Don't touch an exposed area or allow it to come into contact with any liquid or dirt.

X Don't remove a diskette from its protective paper jacket unless you are going to place it in a disk drive.

X Don't allow a diskette near anything magnetic.

X Don't write directly on a diskette. Write on label first. Then affix label.

- X Don't paperclip or staple a diskette.
- X Don't expose a diskette to extreme hot or cold.
- X Never remove a diskette while the disk drive is on. (This would be like sliding the needle across a phonograph record.)
- X Don't force a diskette into the disk drive. Insert the diskette carefully and close the door gently.



Inserting a floppy diskette into Tandy's TRS-80 Model II

Hard Disks: A Brief Comment

Not long ago, "hard" (rigid, not floppy) disks were for the large computer only. Now minicomputers and even some microcomputers are using them. Because the read-write head in a rigid-disk drive floats so closely over the rapidly spinning surface of the disk, the entire drive unit is usually sealed, and you cannot remove the disk.

These nonremovable disk units are sometimes called "Winchesters," and a small unit can hold 5 to 10 *million* bytes of data! These drives seem like "a natural" for the business with a large data base. And perhaps they will become just that. They cost more than diskette drives but are well worth investigating if you have a need to store very large amounts of data.

13

HOW TO TALK WITH YOUR COMPUTER

You must be able to communicate with your computer or it is useless. To do this, you use *input* and *output* devices, sometimes called *I/O* devices or *peripherals.* Input/output devices permit you to give information *to* the computer and to receive information *from* the computer. For a microcomputer, these are the primary I/O devices:

1. Keyboard
2. Visual display unit (VDU)
3. Printer

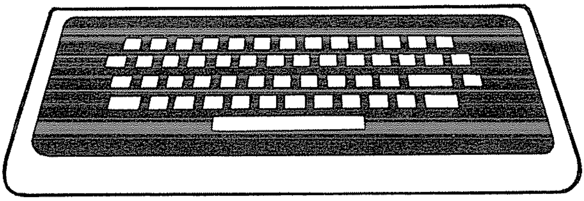
Keyboard

The most important input device is the keyboard. The keyboard looks like a typewriter keyboard. It features the familiar QWERTY arrangement of characters and has all the other keys found on a standard office typewriter as well as keys you use to instruct the computer.

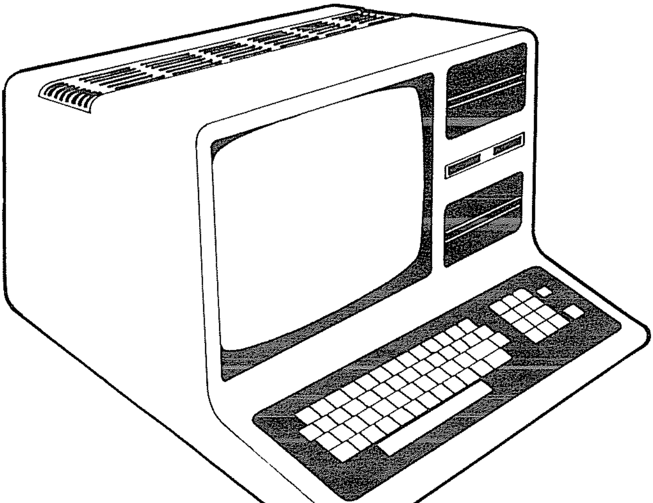
You use the keyboard to send the electrical signals that represent letters, numbers, or commands to the CPU. Some keyboards also have a calculator-type keypad. You can use this important feature for business applications that require the entry of large amounts of numerical data.

Some manufacturers build their keyboards into the CPU and a video screen. A keyboard is really a set of electrical switches built into a handtool. And this handtool can take as much wear as any industrial handtool you can imagine. Quality in a keyboard is essential. Remember that a keyboard has about 75 switches and thus 75 possible points of breakdown. If you buy an inferior keyboard, you may have to put up with malfunctions. Most businesses cannot afford this.

The keys must be able to take hundreds of thousands of strokes. When you judge a computer system, test the keyboard. Do the keys bounce back firmly without any suggestion of double bounce? Do the keys feel "live" under your fingertips? Is the pressure necessary to depress the keys too light or too hard? Is the pressure uniform for all the keys? A good keyboard is always a good investment.



Separate keyboard



Keyboard built into the CPU

Visual Display Unit (VDU)

What about the part that looks like a television screen? That is a visual display unit (sometimes called VDU or CRT for *cathode ray tube*). Let's call it the *screen.*

Screens are input/output terminals for the computer. An operator can see what he or she is entering into the computer by looking at the screen. The operator can then make corrections before sending the data to the CPU. Similarly, the operator can use the screen to see data from the computer's memory or from a diskette. The screens are sometimes *interactive.* That is, they can work with the operator during data entry. For example, if the operator is entering a zip code for an address and enters a letter by mistake, the screen might display the message, "Zip code must be numeric. Please rekey." This interactive capability makes the system very easy to use.

Although they might look like television screens, the screens produce images that are much finer in resolution. Because VDU's display numbers and letters rather than pictures, the better resolution makes these easier to read. It also makes the screens more expensive.

When evaluating screens, the size of the screen is an important consideration. Screens range from one-line displays (on hand-held terminals or computers) to 66-line displays. The most common size is 80 characters across and 24 lines deep. The full-sized screen allows you to display a large amount of data and permits the best design for interactive procedures.

The Printer

Probably the most useful output device you can attach to the computer is a printer. A printer gives you a printed copy (called a *hard copy*) of the data, a tangible message that you can hold in your hand, write on, or send through the mail. And the printer is fast. The speed of a printer is usually measured in characters per second (cps). Thus a 25-cps printer prints 25 characters per second and a 60-cps printer prints 60 characters per second.

Early computers were attached to teletype machines. At 10 characters per second, they were slow; and they were also noisy, subject to frequent breakdowns, and printed only in capitals.

Today, all kinds of printers are available, some of them no larger than a standard typewriter. Some use thermal mechanisms, some squirt ink in tiny lines to create characters, some even use laser beams. But for a small-business application, you should be familiar with two types of printers categorized by the quality of the characters. These are *letter-quality* printers and *dot-matrix* printers.

Letter-Quality Printers

These printers produce a quality of print that is as good as the quality of the typical office typewriter. Most letter-quality printers use a *daisy wheel* printing element. A daisy wheel is composed of 96 to 124 spokes (plastic or metal) emanating from a central hub. At the end of each spoke (or daisy "petal") is a raised character. As the printer prints, it rotates the wheel at high speed. When the desired character is properly positioned, a hammer rod shoots out, striking the end of the petal and forcing it against the carbonized ribbon and onto the paper. Thus, each character is separately and clearly formed, giving the "letter-perfect" appearance.

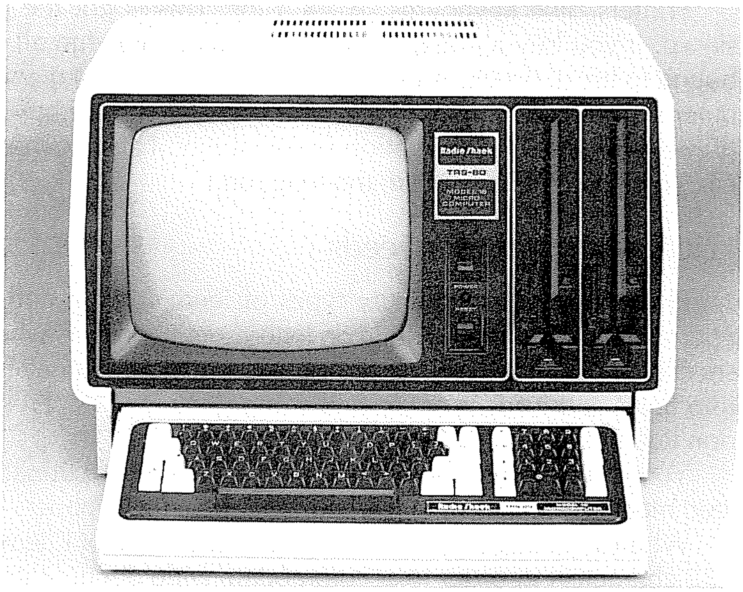
Letter-quality printers operate at about 25-50 cps and are relatively expensive. But for producing sales literature, letters with a customized look, or important legal documents, they are the better choice.

Dot-Matrix Printers

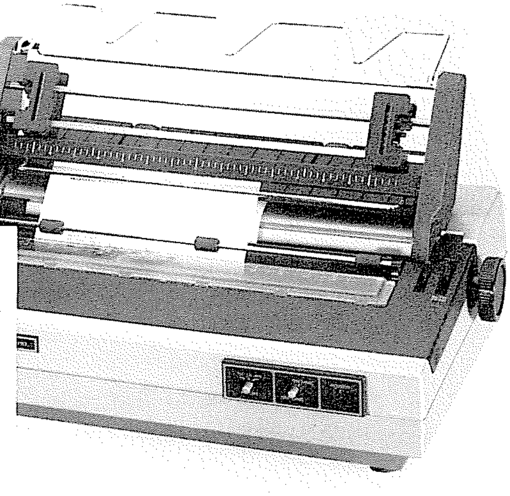
The alternative to the letter-quality printer with the daisy wheel is the dot-matrix printer. These printers offer high-speed printing but with a less attractive type of print. The characters are formed by dots. To create the dots, very tiny hammers strike the paper through an inked or carbonized ribbon. The density of dots is the measure of the quality of the printed character. Or, to put it another way, the more dots, the more solid each character appears.

Dot-matrix printers are normally faster than letter-quality printers. They print at speeds of 50-200 cps. They are also less expensive.

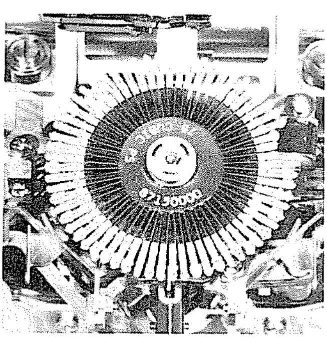
For preparing invoices, customer lists, packing slips, or for any other heavy-duty business use, a good dot-matrix printer will serve you well.



Keyboard and screen on Tandy's TRS-80 Model 16



Tandy's Daisy Wheel Printer 410



Close up: Daisy Wheel

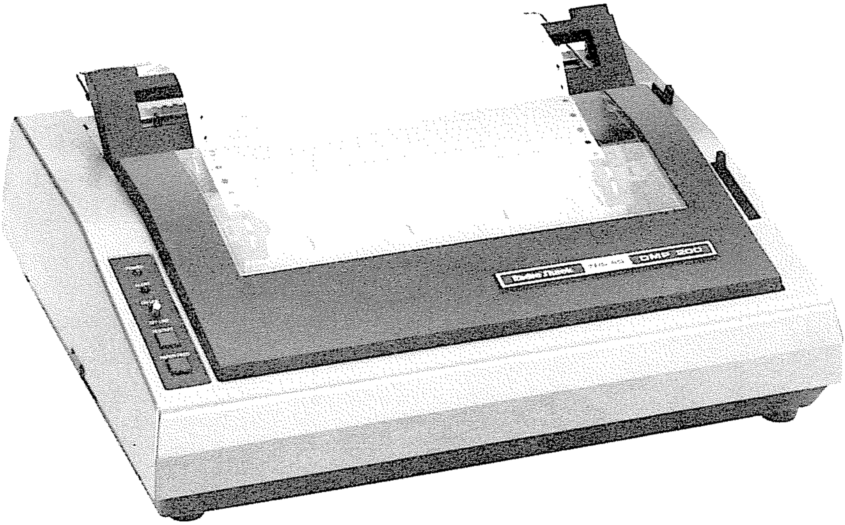
Printers, like keyboards, work a lot. This is not the place to skimp. If you buy a cheap printer and expect it to run all day, it's bound to break down. And when it does, a good deal of your computer system goes down with it. The best advice is to buy a sturdy printer with a strong reputation for reliability. False economy here can cost you considerably in the long run.

Friction and Tractor Feeds

Printers have two primary types of feed: friction and tractor. Friction feed is normally found on letter-quality printers where each sheet of paper is hand-fed. Tractor-feed printers use sprockets that fit into holes at the edges of fan-fold computer paper. As a result, you don't continuously load tractor-feed printers.

You can fit some daisy wheel printers with an optional tractor-feed mechanism in order to accommodate fan-fold paper.

When selecting a printer you should also look for line widths of 132 characters in order to accommodate wide documents such as financial statements.



A tractor feed printer from Radio Shack

A letter-perfect friction feed printer from Radio Shack

14

USER SOFTWARE

Imagine that you've selected and purchased all the hardware for your computer system. Out it comes from its boxes. A spanking new CPU with two disk drives. The keyboard and the VDU shed their packing foam and are ceremoniously placed in position and hooked up with connecting cables. The switch is turned on; the system hums. You're ready to go. Well, not quite.

A computer can do what you need it to do only by following a set of instructions called a user *program*. User programs are also called *software*. A program can represent as simple a task as keeping a customer list or as complex a task as running a complete accounting system. A user program tells the computer to store information, transfer it from place to place, do arithmetic calculations, make logical decisions about information, even play a game. Without a user program, all the shiny new hardware is just an expensive set of clicks and hums.

Hardware is what glitters; software is the real gold. It enables the user to apply the computer to a specific purpose.

Application Programs

User programs are written to take care of specific functions or, as we usually say, *applications*. For example, some are designed to control inventory; others, to do payroll; still others can turn the computer into a word processor.

Some large companies have unique applications. Many of these companies hire a specialist to write programs just for these applications. This is, of course, a very effective way to make certain that your computer does exactly what you want it to do. But it's also an expensive way.

A few years ago, obtaining reliable or suitable application programs was a problem. Computer manufacturers were rushing their hardware to market not knowing where the software was going to come from. A business that wanted to perform a particular task usually had to write a program or had to modify an existing one to meet any special need. But this situation has improved enormously.

Now the programs are better, and the user has a variety of off-the-shelf software packages to choose from. But some computers do not accept certain software. Be sure that you choose a computer that can use a wide variety of good, functional application programs available off the shelf. Never buy hardware for the sake of the hardware. Buy hardware for the sake of software. The hardware is only the medium that permits the software to work. Today, standard packages are available for:

- Order entry
- Inventory control
- Accounts receivable
- General ledger
- Payroll
- Word processing
- Business modeling
- Time management

Be certain that the hardware you select comes with a reliable collection of business application programs.

Interactive Software

Most well-designed programs are "friendly." They are interactive and will prompt the operator. When an operator sits down to use the program, he or she is usually presented with a "menu." The menu is simply a list of possible activities to select from. A menu is like a gateway into a program. When an operator has chosen an item from the menu, the program interacts and prompts the operator through the activity. For example, often a program will tell you not only *that* you have made a mistake but also *how* to correct it.

Here is an example of a menu from a payroll program. This message appears on the screen:

```
WHAT WOULD YOU LIKE TO DO?

1. CHANGE INFORMATION
2. RUN PAYROLL
3. ADD EMPLOYEES
4. RUN REPORT
5. MAINTAIN DATA BASE
6. END PROGRAM

ENTER SELECTION:____
```

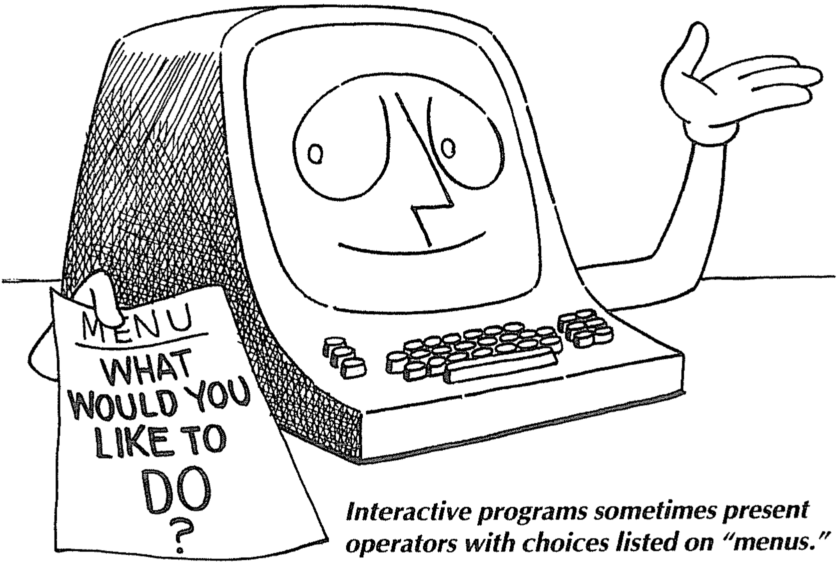
Let's assume that you are the operator. Now you choose the activity you want by typing in the number of the activity. Let's say that you want to CHANGE INFORMATION. So you would type in the numeral 1. Now the program automatically takes over and displays another menu:

```
WHAT INFORMATION DO YOU WANT TO CHANGE?

1. ADDRESS
2. JOB INFORMATION
3. DEPARTMENT
4. DEDUCTIONS
5. PAY BASE
6. END CHANGES

ENTER YOUR SELECTION:____
```

Again you would choose the activity you want. Imagine that the employee has moved and you want to change the address on the record. Again you choose item 1. This time the screen displays:

```
ENTER EMPLOYEE SOCIAL SECURITY NUMBER
ENTER NEW STREET ADDRESS
ENTER NEW CITY
ENTER STATE
ENTER ZIP
LAST ENTRY?  Y or N
```

If, after entering all the information, you indicate that this is the last entry (Y to last question), then the program will return to the original menu so that you can go on to a different activity. If this is not the last entry (N), then the program again displays the WHAT INFORMATION DO YOU WANT TO CHANGE? menu so that you can change the address for another employee.


MENU
WHAT WOULD YOU LIKE TO DO ?

Interactive programs sometimes present operators with choices listed on "menus."

As you can see, this interactive type of program is simple to use. An operator does not need special training (just a few days of practice). So when you look at a computer system, look long and carefully at the software available for that system. Be certain that it covers your application needs and that it is interactive.

Documentation

Documentation is the term used for information *about* programs. Documentation includes operating instructions and troubleshooting guides, as well as a general explanation of a program's objectives. Documentation is usually in the form of a *user's manual.* When evaluating software, you must also evaluate the quality of the documentation.

All software (and hardware, too) must have good, clear documentation. Never consider any program that is not well-documented. All the wonders that the computer can do for you will be forgotten the moment a problem comes up and the salesperson is not answering the phone. Good documentation should make a program easy to use.

Documentation Criteria Checklist

√ Is the documentation nontechnical? (It should include step-by-step information, from how to load the program through how each program feature works.)

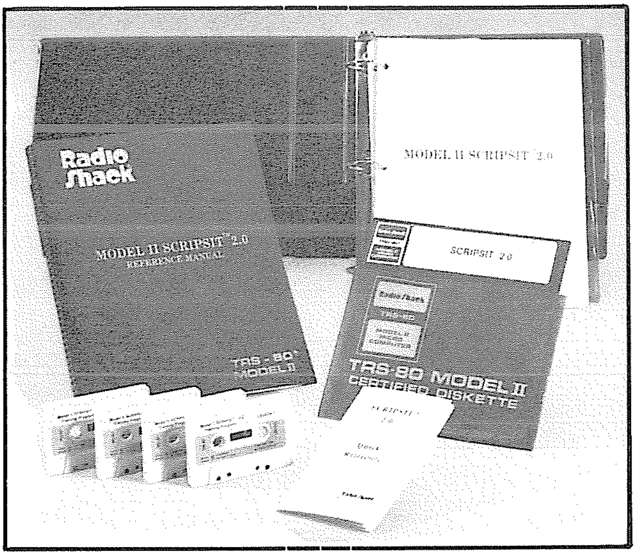
√ Does it include useful examples?

√ Does it include practice problems and solutions?

√ Does it include a list of common mistakes and how to correct them?

√ Is it easy to read and visually uncluttered?

The TRS-80 Model II screen shows the menu selection page for the Profile II program.



Radio Shack
MODEL II SCRIPSIT 2.0
TRS-80 MODEL II
SCRIPSIT 2.0
TRS-80 MODEL II CERTIFIED DISKETTE

User documentation for Tandy's Model II SCRIPSIT™ 2.0 word processing program

15

COMPUTER LANGUAGES

We learn to talk by making sounds that represent objects, actions, and ideas. We also learn to represent these sounds with graphic symbols: A collection of common sounds and symbols is a *language*.

It would be marvelous if our computers could talk with us in our own language. Unfortunately, they only understand electrical signals. So we have developed special languages to talk to our machines. Computer languages may seem like a forbidding subject. But there really isn't much that you need to know about them in order to work with the computer.

High and Low Languages

Most application programs are written in *high-level* languages. But high-level does *not* mean that the language is more difficult for the average person to understand. Quite the contrary. A high-level language is closer to a human language. *Low-level* languages are direct representations of the electrical signals understood by the computer. Machine language is low-level language. Most applications programs are written in high-level languages.

Popular High-Level Languages

You have probably heard about some of these languages, such as FORTRAN, COBOL, or BASIC. The following is a list of some of the most popular high-level languages and what their acronyms stand for.

ALGOL
ALGOrithmic Language. One of the most successful of high-level languages. It uses algebraic logic and is designed for scientific and engineering applications.

COBOL

COmmon Business-Oriented Language. Invented as soon as people realized that the computer might have business applications. COBOL is used mostly by large computer systems but is becoming increasingly popular with microcomputer programmers.

FORTRAN

FORmula TRANslation. Mostly a mathematical language. Some microcomputer application programs are written in FORTRAN.

BASIC

Beginner's All-purpose Symbolic Instruction Code. Devised at Dartmouth College, BASIC was intended to give science majors the use of the school's computer. Because it uses English-like statements, BASIC is easy to learn. BASIC and its forms are perhaps the most popular languages of the microcomputer.

PASCAL

Named after the French philosopher and mathematician of the seventeenth century, PASCAL was originally designed for business applications. More microcomputer programs will be written in PASCAL in the future.

What Does BASIC Look Like?

Here's an example of what a BASIC program looks like:

```
100 PRINT "PRINCIPAL ($)= ";
110 INPUT P
120 PRINT "ANNUAL INT. RATE (%)= ";
130 INPUT I
140 PRINT "TERM(YRS)= ";
150 INPUT T
160 X=P*I/1200
170 Y=(1+I/1200) (12*T)
180 M=X/(1-1/Y)
190 PRINT "MONTHLY PAYMENT ($)= ";M
200 END
```

This short program reads quite a bit like English, doesn't it? You can probably guess that you would use this program to compute monthly payments on a mortgage. Starting with the principal, the program figures in an interest rate, the number of years the mortgage is going to last (line 140), and so on. By filling in these amounts, the program computes the monthly payment rate.

Of course, not all programs are so simple. BASIC is basic only in that it is easy to understand and because it is English-oriented (not because it is simple or restricted to simple tasks). Complicated business applications can be handled in BASIC.

To sum up, a computer language permits us to give the computer instructions in the form of programs. High-level languages are the languages closest to human languages, and low-level languages are machine languages. BASIC, which is English-oriented, is a common microcomputer language.

16

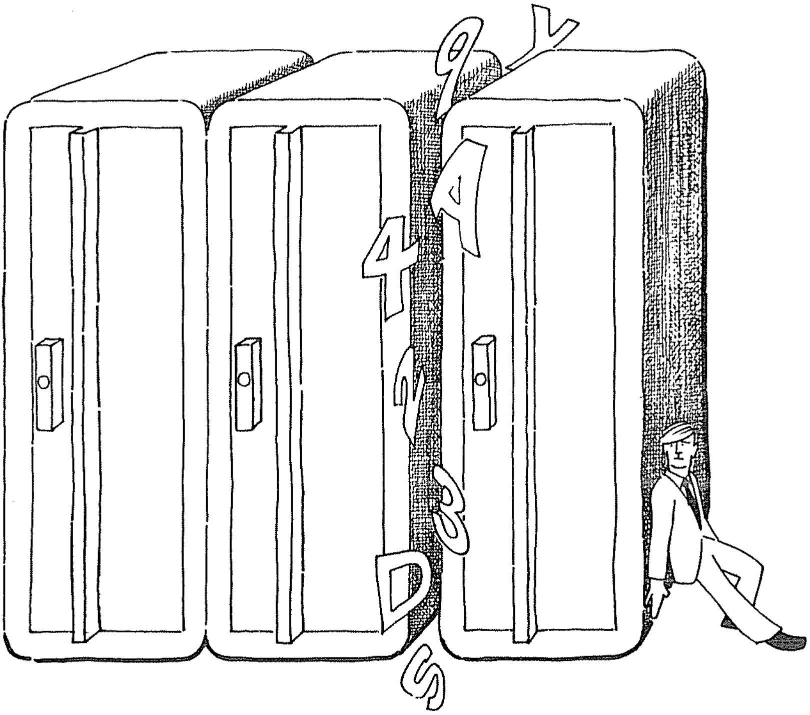
HOW TO BUY THE COMPUTER YOU NEED

We have already suggested some buying guidelines, but now we'll try to give you some more specific advice on how to judge which computer is best for your circumstances and how to get the most for your money. Even if the advice does not apply directly to your specific needs, you will be in a better position to ask a computer salesperson the right questions, and you will be more knowledgeable when listening to the answers.

When it comes to computerization, each aspect of your business is related to all other aspects. For example, if successful growth in your business activities depends upon instant access to information, then you need random-access mass-storage diskettes. Thus, you need a disk system and a disk drive.

Once you decide that you need a disk system, then you must determine the amount of information you need to store on a diskette. This figure will tell you whether you can use the less expensive 5¼-inch diskette or whether you should work with the larger 8-inch diskette. Even this is not as clear a choice as it might seem. For example, how should you organize (*integrate* or *segregate*) data? Should you record one kind of data on several minidiskettes, inserting them into the drive as you need data? Or should you have all of one kind of data on *one* diskette so that the operator does not need to switch diskettes in the middle of an activity? You must be sure you understand the relationship between the data flow and the work flow.

You may need to have more than one disk drive to have immediate access to all the data you need. Does the computer you are evaluating have the power to manage multiple drives? This power is, of course, related to the ROM capacity of the CPU. If currently you do not need additional disk drives but eventually might need them, will the computer allow you to expand the internal memory so that the CPU can handle the additional drives?



You can get many of the answers you need from computer salespersons, provided you know what to ask them! Here are five very important purchasing rules.

1. Buy retail.
2. Buy name brand.
3. Buy packaged software.
4. Consider a service contract.
5. Create a system description.

1. Buy Retail

Although an office products dealer may offer computers, the best place to go for your first computer is a retail computer specialist. Naturally, we feel that the Radio Shack Computer Centers are your best bet. There you will find a competent businessperson who can offer you expert advice and intimate product knowledge, as well as fast delivery, low system cost, follow-up consultation, support, and service.

2. Buy Name Brand

Computerizing your business is a big step. You must feel confident that the company that builds your computer is not going to disappear tomorrow. You also need to be certain about the availability of parts, add-on equipment, supplies, and continued support.

3. Buy Packaged Software

For the best value and performance, buy packaged, off-the-shelf software programs. Customized software is very expensive, and modifications to packaged software usually compromise the program. If you choose proven, field-tested, packaged software, you really can't go wrong.

4. Consider a Service Contract

A service contract is not an expensive frill. It's insurance for a very important component of your business. We strongly advise a service contract for the first year, at least.

5. Create a System Description

Before you enter into the sales arena, review what you know about computers and derive a general notion of the system that you think is appropriate to your business objectives. Compose an initial description. This description provides a common ground for sales discussions about components and their benefits. To arrive at this description, you must

1. Define the operation.
2. Define the numbers.
3. Define the components.

We will look at these definitions more closely later. But first, let's return to the Johnson Distribution Center.

JOHNSON DISTRIBUTION

Part 3. The Meeting

"Although some of the 'departments' here at the Center are one-person departments, each of you is a part of the management team." This was my opening comment at the general meeting that Judy and I had called. "And I thank you all for coming. We have called this meeting to discuss the problem of cash flow caused by slow operations and to solicit your thinking on the possibility of applying a computer to the problem."

I knew that I'd get a few oh's and a mumble, but I had decided to put the computer issue on the floor right off. It was not a mistake.

"Thanks to each of you, the Center has billed over three hundred thousand dollars during the last quarter. That's as much as we billed during an entire year just a few years back," Judy pointed out. "We are simply expanding too rapidly for our current methods of handling data and work. A computer is the solution, and I'm sure you will each see how it can help you with your job."

Judy explained that after considering time-sharing and service bureaus, we had decided to buy our own computer. She also explained that we had chosen a vendor – Radio Shack.

I pointed out that one of my major concerns was service and support and that Radio Shack has a solid record and a local Computer Center staffed with experts. I also noted that Radio Shack computers are expandable so that the system could grow with us.

At the meeting were Jose and Barbara (order-entry clerks), Mike (the stock clerk who handles the inventory and shipping), and the accounts receivable clerk.

"We need your help," Judy explained, "in deciding what computer system is best for the company. We need specific information about your areas of responsibility."

She went on to say that although her direct mailings would not be the first thing to be computerized, her requirements were important to help define the computer system we would need. She told the group that she mails out about 2000 letters a month to the bookstores in the area. And that if the letters are personalized (as opposed to form letters) and if each thus appears as if it were typed separately on an electric typewriter, she gets twice the response.

"This means that Judy's requirements have imposed three criteria on the new computer system," I continued. "It should have a letter-quality printer, it should be able to hold the names and addresses of two thousand customers, and it should make it easy to produce personalized letters in mass."

"Well, I take about ten calls per hour, up to a peak of about three hundred calls a day," Jose joined in. "It would be a help to be able to use information from the customer files while the customer was still on the phone."

"All right," I noted. "This need for instant information calls for a random-access storage device such as disk drive. Now we're getting somewhere."

Together, the group determined that each customer's record would take up about 1000 characters (1000 numbers and letters). With 350 customers, the data-storage device would have to accommodate at least 350,000 characters just for the customer file.

We figured that an 8-inch floppy disk would hold the entire customer file on one diskette so that Jose would not have to change diskettes as he received different calls.

So far, we had decided that we needed a letter-quality printer, a system that could run word processing software, and an 8-inch floppy diskette storage device.

Mike, the inventory clerk, pointed out that his inventory usually amounts to about 1200 different items. He also noted that it would be a great help to him if the computer could flag him when any one of these items slips under a certain level. "That way I can reorder in time to prevent running out of inventory," he said quietly.

The accounts receivable clerk added that he didn't care what kind of printer we used, as long as invoices were legible. He pointed out that he processes about 50 to 80 invoices a day.

"Thank you all for these numbers and requirements," I added when we had about finished the meeting. "I'll discuss them with the sales representative at the Computer Center."

I went away from this meeting uncertain about how much real planning had been accomplished. But I had the feeling that the overall context for computerization had been established. We had begun to define the operations, the numbers, and some of the components. This had been a valuable meeting.

17

DEFINE THE OPERATIONS, THE NUMBERS, THE COMPONENTS

What do you want to computerize? You may remember that we said that an operation is eligible for the computer if it is

1. Disordered, but logical.
2. Time consuming.
3. A bottleneck.
4. Producing inadequate data for decision making.

The list of operations that you may want to computerize should include not only those that currently meet the four criteria, but also those that may in the future meet them. To realize the full benefits of using the computer, you must plan for future applications. But first, let's define the present.

Step 1: Define the Operations

Begin with a simple list. Be sure that the entries are precisely termed. Then expand the list to include any future requirements. Put the list into an order of importance for the present and an order of importance for the future. The lists become the basis for general discussions with employees and computer vendors.

Here is a partial list of operations common to many small businesses and probable candidates for computerization:

- Office communications
- Inventory control
- Order entry
- List-keeping for direct mail promotion

- Accounts receivable
- Accounts payable
- General ledger
- Payroll

Rank the operations you want to computerize based on which operation you want to computerize first.

Step 2: Define the Numbers

Let's assume that your first priority is inventory control. Before you get involved with a salesperson, you should define some key numbers. These numbers will give you and the salesperson a better understanding of what hardware you need. These numbers will also enable the salesperson to tell you what kind of inventory control program you need. Let's assume, for example, that you have prepared the following figures:

- Inventory consists of 2300 line items.
- You buy this inventory from 124 vendors.
- You keep anywhere from 200 to 5000 of each of the line items to a total of 650,000 pieces.
- The most expensive item in your inventory sells for $4300.

Now, let's assume that you visit a Radio Shack Computer Center and tell the salesperson that you are in the market for a computer that can handle an inventory control system with the parameters you have described above. The salesperson will listen and then inform you that Radio Shack has an inventory control program called *Inventory Management*. Here is what you will learn about the program. It can manage

1. Up to 3000 inventory items. (You need 2300.)
2. Up to 200 vendors. (You need 124.)
3. On-hand quantities up to 999,999. (You need 650,000.)
4. Items whose selling price is up to $9,999.99. (You need $4300.)

The salesperson will also tell you that the Inventory Management program goes beyond "traditional" inventory control systems by projecting reorder needs based on "historicals" and sales trends. The program generates the following reports:

- Master Inventory List
- Vendor List
- Transaction Posting Report
- Suggested Order List
- ABC Code Analysis
- Physical Inventory Worksheets
- Physical Inventory Error Report
- Inventory Performance Report
- Performance Summary
- ABC Code Performance Summary
- ABC Code History Summary

Furthermore, this program provides you with the information you need to enter into the general ledger.

You are impressed by what this program can do. The price is also impressive: only $199. So you ask the salesperson a question: "What kind of computer do I need to run this program?" This is an important question to ask because the feasibility of any program is directly related to

- The size of the internal memory of the CPU.
- The type of system software.
- The type of printer.

For example, the Inventory Management program can be run on a TRS-80 Model II computer with a 64K internal memory and two disk drives. You must use 8-inch diskettes. A printer such as the 132-column tractor-feed dot-matrix printer is suitable. Thus you have a desirable configuration for your computer:

Computer model: TRS-80 Model II
Internal memory: 64K
Disk drives: 2
Type of disk: 8-inch
Printer: 132-column tractor-feed dot-matrix

After further discussion with the salesperson, you learn that this configuration can also support the following business software:

- Payroll (up to 200 employees)
- General ledger (up to 504 accounts)
- Accounts payable (up to 500 vendor accounts and up to 3000 invoices on file at any time)
- Accounts receivable (up to 750 accounts)
- Mailing list system (up to 3000 names)
- Spreadsheet (VisiCalc™)
- Time Management™

Thus, if you decide to purchase this particular configuration, you will also be able to obtain an entire library of application programs pre-packaged and right from the shelf.

If you want to write your own programs, this configuration allows you to use BASIC. Along with the system software, TRSDOS, this capability is included with every Model II computer.

Step 3: Define the Components

Let's extend our model of the sales event. Now that you know which computer configuration you need to control inventory, you are ready to decide on components. You want to settle on a configuration that meets as many of your current and future needs as possible. In your discussion, keep in mind the list you made in Step 1.

Tell the salesperson about your plans for the computer, both current and future. The salesperson will try to suggest the right components. He or she will ask you questions such as these:

> "Do you send out a lot of important customized correspondence?"
>
> "Does this correspondence have to look as if each item was typed individually on an office typewriter?"

If your answers are "yes," then the salesperson will probably suggest that you purchase Tandy's Daisy Wheel II printer. The salesperson will probably ask, "Will you need a word processing program to handle this correspondence?"

Often this kind of program comes only with dedicated word processors that cost more and cannot perform data processing. However, the salesperson will quickly point out that you can run a word processing program on your TRS-80 Model II. This program is called *SCRIPSIT*, and it has all of the advanced features of the most sophisticated word processing programs.

Your 64K Model II computer can handle this program, and you decide that you need the two disk drives. Add the SCRIPSIT program cost to the price of the Model II, the disk drive, and the daisy wheel printer, and for a very reasonable cost, you have assembled a powerful word processor in addition to a computer!

Let's try to put a better focus on the steps we have just outlined. We need to know more about how to collect pertinent statistical information and how to use it to describe the most supportive computer system.

18

SELECTING THE COMPUTER: A CHECKLIST

Here is a checklist and review of the information-gathering tactics that you should use before and during the selection of a computer.

Step 1: Define the Operations

Define the business operations that you think you want to computerize:

√ Apply the criteria from Topic 4.

√ Consult with key employees. Ask them to help develop the list. Entertain all suggestions. Ask for reasons.

√ Extend the list to a future based upon the successful introduction of the computer and continued operational growth.

√ Prioritize the list in a sequence from most to least important in the present.

√ Assemble all pertinent forms or documents involved in the operations.

Step 2: Define the Numbers

Define the key numbers associated with each operation, for example:

___ How many invoices are processed daily?

___ How many information items appear on each invoice?

___ How many customers?

___ How many kinds of records for each customer?

___ What is the average number of characters per record?

___ How many line items in inventory?

___ How much of each line item now in inventory?

___ What kind of information needed in inventory records?

___ How many characters in each record?

___ How many employees in this operation?

___ How many employees in the near future (a year from now, two years from now, etc.)?

___ How many vendors?

___ How many records maintained on each vendor?

___ What is the average number of characters in a vendor record?

___ How many accounts in your general ledger?

___ How many checks prepared daily?

___ Weekly?

___ Monthly?

___ How many letters or memos processed daily?

___ Weekly?

___ Monthly?

Continue compiling a numerical description of each operation under serious consideration. Eventually you should construct a numerical description for all operations and relate this information to your computerization plans.

Step 3: Define the Components

The numbers associated with the operations form the basis for outlining the right computer configuration. After your initial discussions with a salesperson, you should know the following facts and be able to explain why you are considering each element in the configuration:

- Model
- Number of disk drives
- Size of diskette
- Printer speed and type
- Costs for various options
- Available packaged applications programs that you can run on that configuration
- Programming languages supported by the configuration (so that you can develop your own programs)

Next, sharpen your focus on the details.

1. Select packaged applications programs.
2. Ask the salesperson to demonstrate the computer using the selected programs. Use simulated data (or your business data).
3. Refine the configuration to exact details.
4. Discuss costs.
5. Discuss service and maintenance.
6. Describe the environmental conditions in which the computer will be located.
7. Acquire the computer.

Now let's return to the Distribution Center.

JOHNSON DISTRIBUTION

Part 4. The Implementation

Applying all the information we had gathered and checking against a profile of needs, I decided to purchase a TRS-80 Model II, a dual drive 8-inch disk expansion unit, and a Daisy Wheel II letter-quality printer.

Now we faced our biggest challenge, converting from a manual to a computerized operation. The computer expert at the Radio Shack Computer Center outlined two implementation plans — the direct approach and the parallel technique. It was up to us to decide which plan to use.

The direct approach is a straightforward conversion from a manual operation to a computer operation. The direct approach would not necessarily mean converting all our operations to the computer simultaneously. As a matter of fact, the computer expert recommended converting one operation at a time. For example, we could first create a customer-file data base and then run simulated transactions until everyone had become accustomed to working with the computer and until the computer system and program had been completely debugged. Then we would begin to take orders using the new computer system. Only when the order entry was running smoothly would we begin to build an inventory or an accounts receivable file.

In short, the direct approach to computer implementation involved setting up the data base for each operation, practicing with simulated transactions, and then directly converting over to the computerized operation.

"I'm afraid this approach is too drastic for my liking," Judy had said to me at the time. "There's the possibility of dislocations and delays if the computer or Jose or Barbara have problems. If we directly convert even just our customer file and something goes wrong, anything, we have no backup. No paper records."

I had to agree. It seemed too risky, too much like all the eggs in one basket. We rejected the direct approach.

That left us with the parallel technique. As the Radio Shack expert had explained, the parallel technique helps a company to "smooth the way into a computer operation." Using the parallel technique, an operation continues to run on the manual method at the same time the computer is phased in. That means that while the computer is performing an operation, the same operation is being performed manually.

"So it costs us a little extra in manpower and effort for a while to duplicate the efforts," I said. "I think it's worth it."

Judy had to agree. So we decided to employ the parallel technique and to start with order entry. We arrived at four main reasons for using this approach:

1. By being able to compare results between the manual and computerized systems, we would develop confidence in the computerized system.

2. There would be less of a drastic break from our old ways of doing things; therefore, less dislocation in the flow of business.

3. It would help Barbara, the designated computer operator, become accustomed to working with the computer and the new pace of order taking. It would also give other employees time to become acclimated to the computer.

4. The computer system could be thoroughly tested in actual working conditions without endangering company operations. All bugs could be ironed out before the computer took over.

"Besides costing us more to run with both manual and computer systems during the break-in time, there are other disadvantages to this parallel technique, you know," I said one day to Judy as we awaited delivery of our computer system.

"I know. There's the possibility of confusion if the two systems are not clearly separated. And using the parallel technique delays the changeover."

But we decided that these disadvantages did not outweigh the possibility of disrupting business using the direct approach. So we went ahead with our plans.

Our TRS-80 came with detailed documentation. The Owner's Manual showed us how to unpack and set up the computer. It also showed us how to start up a program. Using this and the software documentation (and a few calls to the Computer Center), we carefully built a data base from our paper customer files, inventory files, and accounts receivable files.

Barbara trained on the TRS-80 for a few days and then we were ready to apply the parallel technique to the order-entry, inventory control, and accounts receivable operations. Jose took the incoming orders, while Barbara "mocked" the same orders on the computer.

They worked side by side, Barbara's work confirming Jose's manual operation. At the start, there were some discrepancies between the two procedures. Generally, these were caused by errors in the data base or by wrong keystrokes. But within a few weeks the results matched each other to the letter.

This is not to say that there wasn't a difference between the manual and computer operations. Barbara's computer system was faster, giving immediate access to the customer and inventory files and giving more up-to-the-minute data that reflected each order as an immediate deduction from inventory and from the customer's credit limit.

At the end of each day, Barbara merged the computer's customer file with the inventory file and the accounts receivable file. The computer then generated the invoices, packing slips, and shipping instructions for all the orders taken that day.

Jose, in contrast, had to write up each order on a slip and then later a clerk copied the order into the customer's paper file. Then the clerk typed out the packing slips and shipping information and the bookkeeper finally typed out the invoices. This was a long and repetitious process. Often orders were not processed until the day after they were taken.

We ran these operations using the parallel technique for a full month before we decided to rely solely on the computer. We then dropped the manual method and Jose began working on the computer for order entry.

So that's how my company computerized operations. We did it carefully and conservatively, but we did it. And I think we all are very glad we did.

19

FROM MANUAL TO COMPUTER: DIRECT APPROACH

Every businessperson planning to computerize an operation asks:

> "How much disruption of the business should we anticipate when we change from a manual system to a computer system?"
>
> "Will we lose business while we make the change?"

The answers to these questions depend on how you implement your decision to install a computer. If you develop a good plan and if you are methodical about implementing it, the business should not suffer during the change from a manual to a computer system. The situation allows two distinct approaches. One is called the *direct approach.* The other is the *parallel technique.* Both have advantages and disadvantages.

The direct approach is a straightforward conversion of a manual operation to a computerized operation. Perhaps the most important guideline is this: convert your data to support one operation or part of an operation at a time (the smaller the unit of activity, the better). For example, B. J. Johnson could have applied the computer to the order-placed payment-received path by implementing the computer system one step at a time in this sequence:

1. Convert the customer records to computer file.
2. Convert the inventory records to computer file.
3. Convert accounting records to computer file.

Testing

Before you commit a computerized file to a work situation, you should try to run a number of simulated transactions through it. Use dummy records and dummy orders. If these simulations are successful, you will develop more confidence in the computer system. For example, if you start with the customer file, prepare records for a dozen fictitious customers, each with a different credit limit and different bill-to and ship-to addresses. Check the performance of the computerized file by entering fictitious orders from the fictitious customers.

Then try another series of tests using actual files. Take, for example, the files of several of your accounts from last year. Run each operation through the computer and compare the results with your actual files from that time. Be certain that you are satisfied with the results before you commit any of your operations to an exclusively computerized function.

Implementing

If the tests of the customer file are successful, start using the file in a work situation on a day-to-day basis. Now start a testing series for the inventory file. Continue the testing until you are fully satisfied that the computer can manage your inventory control system. Repeat this operation for all files you plan to computerize.

As you grow more successful and confident, you may want to extend the computer to more operations. In theory, you can automate most of your data processing. In practice, you face two limitations. One is related to the computer. Another is related to the applications software.

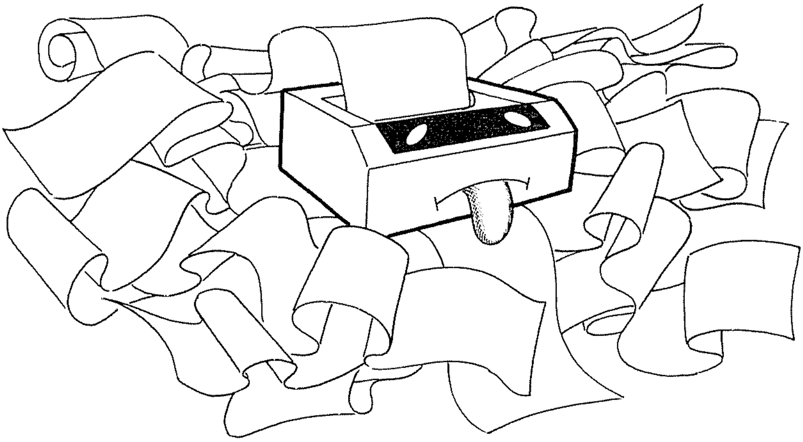
Hardware-Related Limitations

While a microcomputer is powerful, the volume of information it can process has limits. For instance, a large (mainframe) computer can perform inventory control functions for the biggest corporations. However, a microcomputer is limited to an inventory of one to three thousand items. And this figure depends on several factors, among them

- The amount of information that you must store for each item.
- The complexity of the data manipulation.

The more complex the manipulations, the more complex the program needed to perform them. If the program is more complex, then the computer must be more powerful and the internal memory and the external storage device larger. Normally, programs from a computer vendor will clearly specify limits, and you can relate these to your system.

The size and complexity of the data base influences the type and speed of the printer. If you want the printer to print large volumes and work long hours, you require a more expensive, heavy-duty machine.



Obviously, you must translate hardware alternatives into costs. Thus, you must compare computerizing areas of your business against budget restrictions. If you can, perform a return on investment (ROI) calculation. (Special programs make this kind of calculation easy.) For example, if an additional $1000 will enable you to automate your payroll and accounts payable in addition to accounts receivable, customer file, and inventory file, is it worth the investment of $1000?

Software-Related Limitations

In order to enable the computer to perform various operations, you need a set of programs. Thus the computer's ability is limited by the availability of software. Excellent programs are available from computer vendors, but you may want to acquire more specialized programs through other sources.

20

FROM MANUAL TO COMPUTER: PARALLEL TECHNIQUE

If you apply the parallel technique, you must branch the operation into two aligned systems. You continue to rely on the manual system even after you install the computer; for a specific period, you use both the manual and computer systems. The parallel technique helps you to develop accuracy in using the computer program and confidence in the results without relying entirely on the computer. After you run both systems for a while, you can compare results, correct problems, and then phase in the computer system and abandon the manual system.

Let's use the Distribution Center to illustrate the parallel technique. When B. J. Johnson applied it, this is how the activities triggered by the order-placed action compared.

Order Received (Phone)

Computer System (Barbara) Time: **00:00**	Manual System (Jose) Time: **00:00**
By typing a command, Barbara asks the computer to verify the customer's credit status. The screen shows the customer's complete record from the *customer file.* Time **00:20**	Jose checks paper files to verify the customer's credit status. Time **01:40**
By typing another command, Barbara consults the computerized *inventory file* to check the availability of the	Jose searches through the paper inventory records to determine the availability of the ordered item. Time **02:50**

ordered item, the price per item, and the total order value. The screen shows the complete record for the product. Time **00:30**	
If the item ordered is in the inventory, the computer multiplies the price per book by total number ordered, compares the result with the customer's credit limit. If the amount is below the limit, the computer processes the order and reduces the "quantity on hand" in the inventory file record. The new order is entered into the customer file. Time **01:00**	If the customer's credit is good and if the item ordered is in inventory, Jose writes up the order on an order slip and places the slip into the order file. Time **05:30**
By the end of the day (or sooner, if desired), the customer file is merged with the accounts receivable file to generate invoices, packing slips, and shipping instructions for the warehouse for all orders entered today! Time **24:00**	By the end of the day, a clerk transcribes the accumulated orders from the order file into the customers' files. Then, the clerk types packing slips and shipping instructions for the warehouse. The accounts receivable clerk types out and mails the invoices. It requires a separate procedure for each order received today. Time **186:00**

B. J. Johnson could continue this dual operation, while he compared the performance of each system. For instance, he could compare the performance of the two systems against the following criteria.

Order-Placed Payment-Received Path	Computer	Manual
1. How many orders entered per day?	**56**	65
2. How many invoices resulting from entered orders per day?	**56**	41
3. How many unacceptable orders? (Unacceptable if taken despite an improper inventory or credit status.)	**0**	9
4. How many invoices containing mistakes?	**0**	4
5. How many orders filled per day?	**56**	33
6. How many people employed in the entire operation?	**2**	4
7. What is an average cost to process an order?	**$3.00**	$8.00
8. What is average time between order entry and the invoice?	**6 hrs**	48 hrs

You can test the accuracy of your computerization by running every operation on both systems. Obviously, this would add time and thus cost to the changeover procedure. It is probably best to run only selected operations on both a manual and computer system during the "shakedown" period.

Advantages and Disadvantages

Here are some advantages of the parallel technique.

1. Instills confidence in the computer system because you can demonstrate results.
2. Permits a less drastic break with traditional methods, thus minimizing anxieties in the work group and dislocations in the business flows.

3. Gives you an opportunity to check out the hardware and software.
4. Permits you to test the system under actual conditions without endangering operations.

Here are some disadvantages of the parallel technique.

1. The company incurs the additional expense of running two systems.
2. Unless the systems are sharply separated, they can become entangled and create confusion elsewhere.
3. The changeover to the computerized operation is delayed.

21

DEVELOPING A SOFTWARE LIBRARY

This and the next four topics address some typical questions that you might have about buying a computer for your business.

"I've heard that there is something of a software problem with microcomputers. How can I be assured that I will have the kind of programs I need to help run my business?"

Without programs, the computer is a helpless servant. However, there is no shortage of good programs today. You can develop a collection of suitable programs, and you have several ways to do this.

Packaged Programs

You can buy programs already developed and recorded on floppy diskettes. You can purchase these programs from a computer store, through the mail from a mail-order house, or directly from the computer manufacturer.

Usually, off-the-shelf software programs for small businesses are good. They are inexpensive, well-tested, and usually well-documented.

In-House Programming

You can write your own programs. Most of today's microcomputers use a simple "computer language." Some of these languages, such as BASIC, are almost conversational in vocabulary and syntax.

You can obtain instructional books from your computer vendor and you can become proficient in writing your own programs, but only after a considerable investment of time. You can also encourage your staff to learn languages and to write programs limited to their areas of responsibility.

However, most of the business programs that you will use are quite complex and would require extensive study and effort to develop on your own. So, although you *can* develop programs from in-house sources, we do not recommend it unless you have unique requirements. There are simply too many excellent packaged programs widely available for small businesses.

Contract Programming

You can hire or consult a programmer specializing in the development of business programs. The programmer can write to your specifications.

However, this is a very expensive option. It is practical only if you have a very unusual application for which there are no packaged programs.

Proprietary Programs

Proprietary (or "owned") programs are the products of companies that specialize in developing and marketing special programs for specific applications. These programs normally remain the property of the vendor and, by means of a licensing arrangement, you buy the right to use them. Because of the popularity and increased use of microcomputers, the number of companies offering proprietary software is increasing, and you have a wide choice of programs. In some instances, the vendor can customize a general program to your precise needs or steer you to the best sources for what you need.

Quite frequently, computer vendors publish newsletters for users. In these, you can read about interesting and pertinent programs developed by other users. These programs are often available for a nominal charge or under a licensing arrangement.

Comment

Obviously, each alternative needs a different evaluation based on cost and usefulness. You must analyze these price tags and make a decision.

22

TRAINING AND THE WORK CLIMATE

"I'm worried about the training aspect of installing a computer. I'm also afraid it will confuse and threaten my people. What can I do to make computer implementation easy for my people?"

As any community, the work group is seriously affected by changes in roles. The installation of a computer system can create job insecurity and unproductive competition among those whose work routines are most directly affected. To manage a potentially harmful situation, you should create a receptive climate for change.

Involve Those Involved

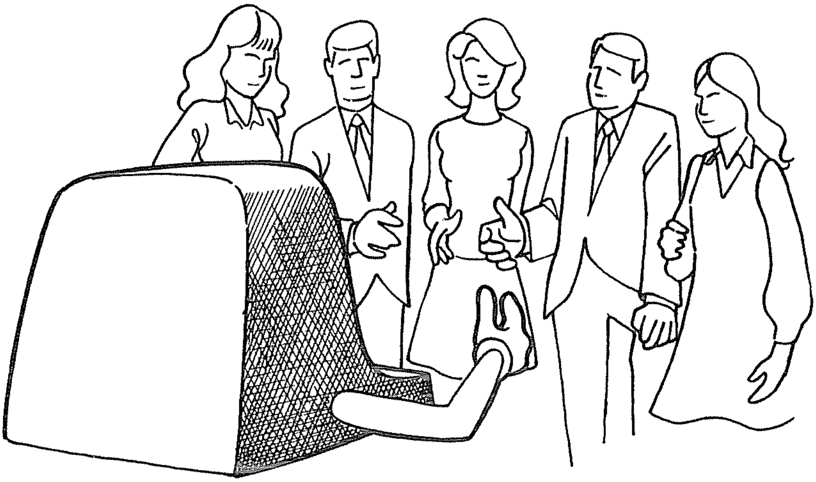
There are a number of ways you can help employees become receptive to the changes caused by computerization. However, the traditional remedy to the anxiety of the unknown is familiarity. Thus,

1. Get employees involved in the selection. Ask them to contribute suggestions and information. Take these suggestions seriously.

2. Get employees involved in other aspects of the decision process. Report to them periodically about progress. Make them feel that they are contributing and make use of their contributions.

3. Once the computer is installed, encourage everyone to spend some time with it. This familiarity will help employees become less apprehensive about it. (A good way to introduce a microcomputer to a small group is to try one of the many game programs. What could be less threatening?)

Even though you want all of your employees to become accustomed to the computer and the implications of it, you must, of



course, delegate authority. One (or more) employees must be primarily involved in applying the computer to the business. Be sure that these employees obtain the appropriate training manuals and time enough to familiarize themselves with the computer. Do not expect instant expertise. It may take a little time.

Respect the Machine

When introducing the computer to your staff, stress the following points.

1. The computer is a very logical device. If you use it logically, it becomes a very valuable work tool.
2. While the microcomputer can be used in a normal office and does not require a special environment (unlike larger computers), you must keep the area clean and orderly. For example, get rid of dust and irrelevant work materials around the computer. Do not drop cigarette, cigar, or pipe ashes around the computer. Don't leave beverages or coffee cups on nearby surfaces.

Comment

In short, don't make the mistake of alienating the computer from your people, or your people from the computer. It's simply a new office tool and needs people to make it useful.

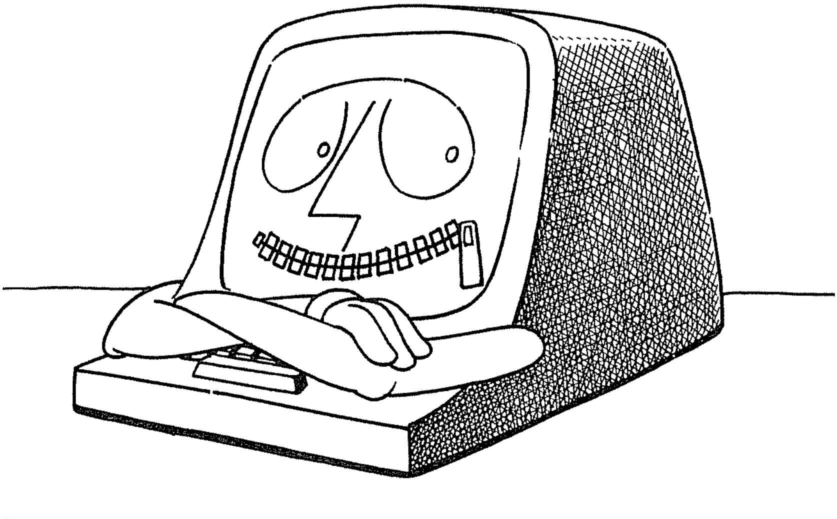
23

DATA SECURITY AND CONFIDENTIALITY

"Some of my files are extremely critical to my business. Their loss would be a serious blow to me. And some are rather confidential. Will the computer give me the kind of data security I need?"

Yes. Security is an important area that every new computer owner must consider. Who uses the computer and why? Security has two aspects:

1. Protecting data from tampering or unauthorized disclosure.
2. Protecting data from accidental damage or loss.



From Tampering or Unauthorized Disclosure

Diskettes that you use as data-storage devices hold data pertinent to the operation of your business. For example, this data might include

- A complete list of customers.

- A complete list of receivables.
- A complete list of payables.
- Records of employees.
- Formulas for products.
- Engineering designs.
- Budget drafts.
- Financial statements and other accounting data.

Obviously, you need to protect this kind of data from tampering or unauthorized disclosure. You can do this by locking up the computer files behind a *password.* You can also simply vault the storage devices when they are not needed.

Probably the easiest way to protect files is to restrict access by using a password. Only users who know the password can access the files. When you apply this method, the system will ask the user to type in the password before it will allow the user to access the protected file. If the user types in the correct password, the file or part of it becomes accessible. If the user types an incorrect password, the files remain closed. The program permits you to change the password as often as you like.

You can also lock up sensitive files when they are not needed. When an employee needs to use the file(s), he or she can sign for it.

From Accidental Damage or Loss

Information is vital to any business. In a computerized operation, vital information is stored on a magnetized surface. While diskettes are very reliable, accidents do happen. Electrical malfunctions or physical damage to the media can partially or totally destroy valuable data. Also, exposure to any strong magnetic fields, such as those produced by heavy electrical machinery or X-rays, can damage magnetic files. So part of protecting data is to provide a safe environment.

Make Back-up Copies

And of course, diskettes eventually wear out. Therefore, you must frequently make back-up copies of every file that contains important data. This way, if the original file is accidentally damaged or destroyed or if the diskette wears out, you will be able to use the back-up file in its place, and you'll only have to reconstruct or re-enter the data you have entered since the backup was created.

Many people keep one set of backups "off-site" in case fire, theft, storm, or some other catastrophe strikes the business location.

Make Hard Copies

A "hard" copy is a printout of the information recorded on a diskette. Make a hard copy of vital files or every significant transaction. The hard copy will serve as an additional backup for important information.

Label Storage Devices

Whatever protection methods you use, be sure to properly label the storage devices. It is next to impossible to run an efficient operation if the disks or other storage devices are poorly labeled.

Protecting Data Checklist

√ Lock it out. Use a Password.

√ Lock it up.

√ Make a back-up copy of each important diskette.

√ Make a hard copy of critical information.

√ Label storage media accurately and precisely.

24

THE COMPUTER ENVIRONMENT AND ELECTRICITY

"I've seen the computer rooms in larger companies and they seem to include dust-free air-conditioned environments. Does a microcomputer require a special environment?"

Mainframe computers and some of the larger minicomputers must operate in a special temperature- and humidity-controlled, dust-free environment. But a microcomputer does not require a special environment. And you simply plug it into the normal electrical current. However, you must keep the computer area clean and organized, and you should be alert to abrupt changes in temperature or the flow of electrical current, for these can harm the equipment.

The Environment

Protect the computer from abrupt changes in the temperature of the working area. Be sure that the computer is not exposed to excessive heat or cold. Also try not to locate it in an area that tends to attract dust or that is subjected to strong vibrations. Here's a rule of thumb for the general environment.

Temperature:	Normal, "comfortable" office range
Humidity:	50% (or above)
Vibrations:	Minimal

You may wonder why the 50 percent or above humidity. The reason is *static electricity.* If the air is too dry, any movement on a carpet, or even the sliding of your clothes on your body, can create static electricity. These electrical charges, however small, can damage magnetically recorded data on disks or tapes. If the charge is large, it can interfere with the computer's internal memory and wipe out programs stored in it. This event would, of course, interrupt whatever operation the computer was performing at the moment. Therefore, try to keep the humidity at 50 percent or above. If necessary, use a humidifier. Don't use carpeting in the room where you keep the computer. Place an anti-static floor mat under the computer's table and the operator's chair.

Electrical Conditions

Since most electronic equipment, and especially the computer, is sensitive to power fluctuations, you must give some thought to the "steadiness" of the power supply (i.e., to the fluctuations in voltage and current coming out of the wall socket).

Normally, fluctuations in the voltage and current depend on the time of the day and the time of the year. During the warm months, an unusually heavy power demand caused by a heat wave will drive the voltage down below its usual value. This is normal but should not affect the computer. However, what happens if the electric power fluctuates past the normal limits? This fluctuation can erase the information in the computer's internal memory, and you will lose the programs resident in the memory as well as any data being manipulated by the CPU. The following table summarizes some of the causes of power fluctuation and the methods for dealing with them.

Dealing With Power Fluctuations

Reason	*Remedy*
Heavy electrical equipment, such as a copier, a freezing unit, or a lathe, is on the same line as the computer. The equipment turns on and off with some arcing in its switch.	Repair defective switches. If this is not enough, isolate the power going to the computer by 1) installing a separate circuit, 2) installing a line filter, or 3) both.
Power-line "spikes" (transient surges of very high voltage lasting a fraction of a second).	Add a good "constant voltage transformer" to your line.

Brownout (periodic drop to a lower line voltage).	Add a good "constant voltage transformer" to your line.
Power is lost on a regular basis.	"Save" your programs and data as they are being developed by 1) copying the diskette, 2) making regular "hard copies" of data.

25

SUPPLIES AND FURNITURE

"What kind of supply inventory will I have to maintain for my computer?"

Your inventory of supplies depends to a large extent upon the type of peripherals in the computer configuration. For example, different printers require different kinds of paper or paper feeds. In general, you can classify supplies into two groups: computer-related and printer-related.

Computer-Related Supplies: Diskettes

As you know, diskettes are magnetic storage media used to store programs and data. Purchase diskettes on a name-brand basis only. Cheap or unproven diskettes can be poor economy.

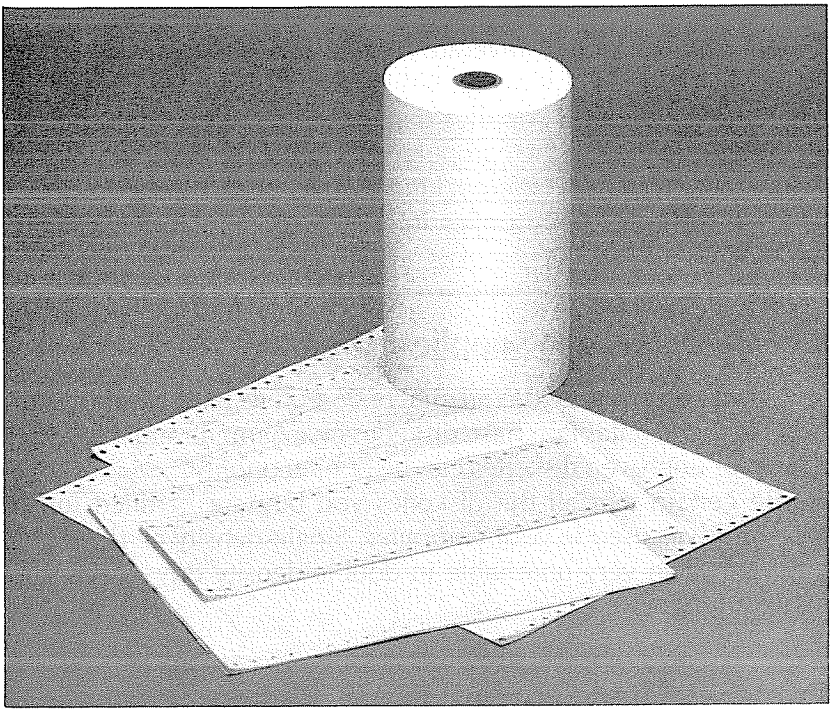
Be certain that all the diskettes you buy are certified for the type of drives used in your computer. Single-density certified diskettes are often very unreliable in double-density drives. Ask your dealer's advice.

Printer-Related Supplies: Paper, Ribbons, Printwheels

The printer will require a supply of one or more types of paper. Lined or unlined computer paper normally comes in a "fanfold" package. For letters and other quality-sensitive materials, you can use normal bond or your own letterhead. For large mailings, you can buy rolls of envelopes. The printer prints out an address on each envelope as it moves past the printing mechanism. (The envelope "peels" off the roll.) You can also purchase fanfold paper with mailing labels going across and down the paper. With a suitable program, the printer can prepare a large number of mailing labels very quickly.

The printer also requires a periodic replacement of ribbons. The type of ribbon you need depends on the model of the printer.

If you have a letter-quality daisy wheel printer, it has the ability to change printwheels to a different typeface. These daisy wheels are part of your printer-supplies inventory.



Representative paper supplies

Furniture

"Can I really put my computer on a desktop or should I consider buying a work station?" The microcomputer industry has always claimed that its computers can be set up on a desktop. This is more true today than ever. Separate keyboards, VDUs, and disk drives often appear as a single-unit microcomputer, where the CPU, disk drives, VDU, and keyboard are all contained in one compact desktop unit.

Some computer manufacturers also offer custom desks for their products. This special office furniture is not only decorative, but also functional. For example, a specially built desk can protect a computer from the shaking and rattling it may receive when the printer operates.

You may wish to explore the possibility of a special printer stand designed to absorb shock. This also protects your CPU from printer rattle. Or you may be attracted by the design and function of a custom work station made just for the computer system you are considering. Whatever you choose, think about where and on what furniture you are going to set up the computer.

A printer stand from Radio Shack

JOHNSON DISTRIBUTION

Part 5. The Outcome

It's been three months since we installed the TRS-80 Model II, and both Judy and I are pleased with the changes in the working conditions around the office. For one thing, it's gotten a lot quieter because the long phone conversations with customers are shorter, and the bang of filing cabinets has been replaced by the click of the computer keyboard. Additionally, Jose is the only order-entry clerk. Barbara has a new position: she is responsible for the computer.

Here is how a typical day at the Center goes. Between the hours of 9 a.m. and 4 p.m., Jose takes phone orders using the computer. As each order comes in, he calls up the customer file to the video screen by using either the customer identification number or name. What he sees on the screen is the complete customer record: name, address, credit limit, outstanding balance, billing address, and shipping address.

If the customer's credit is good, he proceeds with the order. He keys in the code number of the book ordered and sees the latest inventory status. This information comes from the inventory file. Jose then enters the order and the computer automatically subtracts the ordered amount from the amount available. The computer also knows the price of each book. So it automatically multiplies this price by the number of books ordered. Once this is done, the computer then goes back to the customer file and compares the total dollar amount of the order with the customer's credit limit. If the customer is within the limit, the order is confirmed; if not, Jose tells the customer. All this happens while the customer is on the phone.

At 4 p.m., we stop the order-taking operation, and Barbara takes over the computer. Although you might think we are losing an hour of order taking, we have found that we can take up to three times the number of old, manually handled orders using the computer this way. And virtually all of the orders are valid.

Every day at four, Barbara takes the customer file and merges it with the accounts receivable file. The computer picks up the new orders from the customer file and, using the receivables file, generates invoices, shipping papers, and packing slips. This is an enormous time saver.

During this hour, Jose has become the shipping supervisor. He and a part-time shipping clerk fill the orders. They attach the packing slip and the shipment is ready to go. Most of the time we can ship all orders the same day they are taken. As a result, our cash flow problem has turned around.

In the meantime, Barbara puts the invoices into new envelopes with windows. No labels to type.

I have begun to use the computer after hours. I bought a VisiCalc program, which I have used to project our cash flow for the next two quarters. According to computer predictions, if things continue to go as they have been, our cash flow will continue to improve until it will stabilize in about six months.

I have also used the VisiCalc program to confirm that we don't need to add any new employees during this period, even though the business is growing. Since the computer has eased operations, new help is unnecessary for the time being. However, the VisiCalc program did indicate that if we added a sales representative in the field, we would get a good return after only eight months.

Judy has also used the computer after work in conjunction with the customer file and the word processing program to make her monthly mailings. Her 2000 pieces of mail took only two sessions to handle, and they looked great — each letter personalized.

In time (not too long I think), I will buy a TRS-80 Model III, which we will dedicate to our mail campaigns and office correspondence. The Mod III will use the Daisy Wheel printer we originally purchased, and Mary will get a tractor-feed line printer for the accounting and clerical work.

Besides, with the addition of the Model III, I won't have to wait until after hours to work with the electronic spreadsheet, or to try one of those time manager programs I've heard so much about. The second computer will be right here in my office, where it can do the most to help me manage my business.

COMPUTER TERMS

ALGOL Stands for ALGOrithmic Language, a high-level computer language used in science applications.

Alphanumeric Describes a set of characters consisting of letters and numbers.

Application Task to which we apply the computer. For example, inventory control, accounts receivable, word processing.

Application program Computer program designed to perform the task to which we apply the computer. (Sometimes called *user programs* or *software*.)

Back-up copy Duplicate of a diskette. Made to safeguard the information on the original in case the original is damaged or wears out.

BASIC Stands for Beginner's All-purpose Symbolic Instruction Code, a computer language easy to learn, easy to use, and very popular.

Bit Binary digit (1 or 0). Eight bits make one byte, which is normally used to encode one character.

Bug A fault or error in a computer program, system, or piece of hardware. Thus, "debugging" refers to removing mistakes and correcting malfunctions.

Byte Unit of data, usually one character containing 8 bits. The stored letter a is one byte of data.

Cathode ray tube (CRT) Terminal that looks like a television screen. The CRT displays both input and output.

Central processing unit (CPU) "Brain" of the computer. Causes processing to occur by interpreting instructions, performing calculations, moving data, and controlling the input/output devices.

Character Letter, number, or symbol. For example, a 2 +

Characters per second (cps) Measure of data-transmission speed or printer speed.

Chip Tiny piece of silicon (or other semiconductor) on which an integrated circuit is imposed.

COBOL Stands for COmmon Business-Oriented Language, the most common computer language for business applications.

Command Computer instruction. For example, PRINT is a command.

Computer Electronic device that we can program to execute a sequence of logical operations automatically (that is, without human intervention).

cps Stand for characters per second. A line printer may print 220 cps while a letter-quality printer may print 45 cps.

Cursor Moving or blinking symbol on a CRT. Can be positioned to indicate where the next keying should take place.

Daisy Wheel Printer Letter-quality printer that uses a printing wheel with type elements emanating out like daisy petals from a central hub.

Data Describes all types of information.

Data bank See *Data Base.*

Data base All the data used and produced by one or more computer programs. For example, a data base for a payroll can include tax tables and each employee's personnel information.

Data processing General term relating to all aspects of computer-assisted manipulation of data.

Debug Locating and correcting errors in the software or hardware of a computer system.

Dedicated Computer equipment designed for a particular task. For example, a dedicated word processor is designed specifically for word processing (text editing).

Desktop Compact computer system that has most of the components built into one console. Usually contains a VDU, a keyboard, disk drive, and a printer.

Disk drive Peripheral device that houses the diskettes. It is usually designed in the form of a compact, self-contained unit. On many small computers the drives can be built into the same console as the VDU and the keyboard.

Disk operating system (DOS) Permits the computer to operate and work with one or more disk drives. The DOS provides internal computer-operating programming, acting like an orchestra leader directing the activities of a computer system.

Diskette Magnetic storage device for data, roughly resembling a 45-rpm record in a paper envelope. (Sometimes called a *floppy* diskette.) The diskette rotates within the disk drive. Diskettes come in two general sizes, 5¼ inch and 8 inch.

Documentation Written information about a computer or computer program. Includes operating instructions, troubleshooting, system or program philosophy. Documentation is usually in the form of a manual, and the quality of documentation is an important consideration when evaluating a computer.

Dot matrix Array of dots that forms a character. A dot-matrix printer is an impact printer that prints characters composed of many dots. For example, a 5 x 7 dot-matrix printer prints characters with a dot arrangement 5 dots wide and 7 dots high.

Down time Time when the computer is inoperative because of a malfunction.

Duplicate To copy so that the result is in the same form as the original. You can duplicate a diskette, but if you print the data from the diskette, the result is not a duplication but a "hard" copy.

Electronic Spreadsheet Computer program that enables us to create a financial statement or statistical document. When we change a figure on the spreadsheet, the computer automatically changes all the related figures. This type of program literally replaces the pencil and calculator for preparing such business documents as profit and loss statements. (One example is called VisiCalc™.)

ENIAC Electronic Numerical Integrator And Calculator, the first fully programmable automatic computer built at the University of Pennsylvania in 1946.

External memory Data stored on disks, tapes, or other medium, outside the computer.

Fan-fold paper Sheets of paper joined along perforations and folded in a zigzag fashion. Used to print long documents because it can be fed into the printer without operator supervision.

File Collection of related records.

Firmware Fixed device storing instructions in the CPU ROM.

Floppy disk Small flexible diskette used for data and program storage.

Flowchart Diagram that uses symbols and lines to show the logic and sequence of an operation or computer program.

FORTRAN Stands for *For*mula *Tran*slator, a high-level computer language particularly suitable for scientific and engineering applications.

Hard copy Data printed up on paper. For example, a list or report.

Hard disk Disk composed of a magnetic coating applied to a rigid surface, such as aluminum. One variety is called a Winchester disk. These hard disks are used for mass storage of data because they have a much greater storage capacity than floppy diskettes.

Hardware Computer equipment. For example, the CPU, printer, disk drives, and VDU.

Head Read/write device in disk drive. The head touches the magnetic surface of a disk recording or reading data, just as the head in a tape recorder records or plays back sound.

High-level language Computer language not very dependent on the type of computer (unlike machine, or low-level language, which is specific to a particular machine). High-level language is closer to human language than low-level language is. Examples are FORTRAN, COBOL, and BASIC.

IC Stands for integrated circuit, a circuit imposed on a silicon chip.

Interface Device or software that can make two systems cooperate.

I/O Stands for input/output.

K Stands for 1000 (more precisely, 2 to the 10th power, or 1024). Often used to describe ROM storage capacity. The higher the K, the more powerful the computer.

Keyboard A typewriter-like device that the operator uses in order to enter data into a computer.

Large-scale integration (LSI) Computer chips characterized by more than 1000 circuits (and often 100,000 or more). LSI is used to make today's microprocessors.

Letter quality Refers to high-quality appearance in the output of a printer. For example, as in a daisy-wheel printer.

M Stands for mega, or 1,000,000.

Megabyte 1,000,000 bytes.

Memory add-on Additional memory that we can plug into the computer to increase its existing internal memory and thus increase its power.

Microcomputer Compact and low-cost computer.

Microprocessor Central processing unit on a silicon chip. Microprocessors are used in cars, microwave ovens, electronic games, watches, computers, and many other devices.

Modem Device that provides the interface between a communications link (like a phone line) and a computer.

Output Results coming from a computer.

PASCAL High-level computer language for business and other purposes. Named for the French mathematician and philosopher Blaise Pascal (1623-1662). Becoming increasingly popular in microcomputer programs.

Password Code that permits an operator to access a computer. Passwords are used to prevent unauthorized access to computer files.

Peripheral Device that works with the computer to complete a computer system. For example, keyboards, disk drives, and printers.

Printer Peripheral that can make hard copies. The two major types of small printers are dot-matrix and letter-quality.

Program Set of instructions used to operate the computer system for a specific task.

QWERTY Standard arrangement of letters, numbers, and symbols on typewriter/computer keyboard.

RAM Stands for random access memory, a type of memory that provides quick access to any storage location.

Read To sense recorded data.

ROM Stands for read-only memory, a special memory that we can only read, not write into. The size of ROM is often used to indicate the power of a computer.

Sector Section of a diskette track.

Semiconductor Solid substance that conducts electricity in only one direction. For example, silicon. These materials are used to fashion microprocessors.

Service bureau Organization that provides data processing services.

Silicon See *semiconductor.*

Single/double density Refers to the amount of storage on a diskette. In any given area, double-density diskettes store twice the amount of data as single-density diskettes.

Software Programs used to apply a computer.

Spike Sharp-peaked, short-duration voltage surge. Spikes can damage computers.

Terminal Device that is used to access a computer. The computer could be in the next room or in another country.

Time-sharing Method whereby many terminals can share access to the same CPU and mass-storage devices.

Track One of the rings defined on the magnetic surface of a diskette. A diskette might have 77 tracks, numbered from 0 to 76.

VDU Stands for video display unit (CRT and associated equipment).

Winchester Disk drive with a nonremovable hard disk inside. Winchester hard disks vary in capacity from several million bits of information to hundreds of millions.

Word processing Typing, editing, formatting, and storing of text by means of computer equipment. Word processing is a popular business application.

RADIO SHACK, A DIVISION OF TANDY CORPORATION

U.S.A.: FORT WORTH, TEXAS 76102
CANADA: BARRIE, ONTARIO L4M 4W5

TANDY CORPORATION

AUSTRALIA	BELGIUM	U. K.
91 KURRAJONG AVENUE MOUNT DRUITT, N.S.W. 2770	PARC INDUSTRIEL DE NANINNE 5140 NANINNE	BILSTON ROAD WEDNESBURY WEST MIDLANDS WS10 7JN

PRINTED IN U.S.A.