Computer based information systems for the small firm—Why? cost? caveats, functional needs, contracts

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ABSTRACT

The following article presents advice to the small business considering automation of information flows. Topics discussed are, why and when to automate, the costs of automation, how to avoid failure, how to specify functional needs, and what to expect from the vendor contract.

WHY COMPUTERIZE A MANUAL SYSTEM?

If a small business has annual sales of $250,000, it should consider the purchase of a small business computer to automate some of its information flows.

A computer system would allow a seasonal business requiring huge amounts of clerical effort in a short period of time to expand and contract while maintaining a small clerical staff. Volume of data input may vary, but input is only a small part of the total clerical effort required to process data in a manual system.

To reduce the complexity of manual accounting systems, a computer can integrate accounts payable, accounts receivable, general ledger, payroll, and job cost accounting in a system which provides one-time data entry. When data is entered, the system automatically updates the necessary files and ledgers. Accuracy and integrity of the firm's accounting system is enhanced by eliminating human processing of data.

To control day-to-day business, management may need more accurate and timely information. Once data is accurately entered into a computing system, it is processed with 100 percent accuracy at electronic speeds. Furthermore, the computer can be programmed to display the same data in a variety of ways to give the manager a better current perspective. For example, if a summary report indicates a problem area, a preprogrammed detail report can provide analysis of the problem area. Manual systems could provide the same information, but at the cost of high clerical salaries and precious time. Hence, small business managers tend to "fly by the seat of their pants," making decisions on "feel" and soft data. A computer can rationalize management.

A computer can provide small business management with the sophisticated management information available to executives of the large firm: cost and performance analyses by product activity, area or individual; controls over inventory that significantly reduce the number of dollars tied up in it; and analyses of sales, credit sales and purchases which define cash needs and cash availability and provide the basis for the wise use of credit. In short, a computer-based system can be a competitive advantage. Ongoing cost analysis aids pricing decisions and better control over inventory, and cash management can reduce overhead expenses.

THE COST OF COMPUTER TECHNOLOGY

A small business can now afford a computer because the cost of computers have been dropping at a 35 percent annual rate for the past 15 years. The main parts of a computer can be manufactured now for less than $100. (MITS, an Albuquerque, New Mexico computer manufacturer, sells computer kits to hobbyists for approximately $400.)\(^1\) Experts predict that by 1980 a computer equivalent in power to the IBM 7090, which sold for approximately $2 million in 1965, will cost $1 to manufacture! The implications are startling. Computers are used in ranges, watches, home environmental control systems and automobile fuel injection systems.\(^2\) The implications for factory automation are obvious.

But, if computers are so cheap, why do small business computers cost between $5,000 and $90,000? (A typical small business system costs from 20 to 40 thousand dollars.) The price of components of the system—data entry terminals, printers, and storage devices—has not been dropping as rapidly as the processor. Substantial price decreases occur only when manufacturing processes are totally automated. Although the computer can be manufactured on a single integrated circuit chip which eliminates hand wiring, manufacture of computer terminals still requires human handling at almost every step. The net result is that the cost of computing systems will continue to decline at a 10-20 percent compounded rate through 1980.

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However, the average cost of a purchased small business system has not decreased. The personnel costs of writing programs to tell the computer what to do have been increasing. And now, customers are buying more sophisticated peripherals and computer storage so that the system does more things faster. In fact, integrated business systems allowing small business management to automate information flows in a functionally integrated, on-line environment have only emerged within the last year and have yet to be announced by some vendors. These systems allow a clerk to enter the data once, the data is then made available to all hierarchical and functional levels of the organization. One result is that the functions of marketing, finance and production make decisions based on the same data. Hence, the classic goal conflict between production and marketing is eliminated. Information provides a synthesis of the goal of producing to meet customer needs at a competitive price and the goal of producing efficiently. Hence, merely providing information to disparate functions of the organization may eliminate the need for managerial control and provide more freedom for middle level managers. Information itself is control and the computer can provide a freer organizational climate in which participants direct their own behaviors to a greater extent. Hardware to provide this organizational climate is readily available, however, the integrated software systems are in their infancy of development and availability.

**THE PURPOSE OF AN AUTOMATED INFORMATION SYSTEM**

Let us now examine how the formal information system develops in a corporation. When created, the business probably had one or two employees, the president and a close friend. The president carried accounts receivable, accounts payable, and inventory data in his head. As the firm grew, more people were added to handle the workload. The resulting specialization and fragmentation of the firm's memory among individuals require formal communication flows and reports to create the situation that once existed when one person possessed all the information. As the business continues to grow, data storage becomes further fragmented into functional areas as the number of specialized functions increases and the number of people in each specialty increases also. Under these circumstances, the problem is how to enable the firm to react to its environment as a single entity.

The answer lies in a computer-based information system in which the data is sensed and collected once and entered into a single database which can be accessed by any business function to obtain information. Because all functions base decisions on the same data, disparate functions like marketing and production are coordinated. Hence, total system optimization replaces suboptimization.

In summary, the purpose of an information system is to provide information to the management system for decision making. The purpose of automation is to increase the efficiency and effectiveness of communication channels within the business so that once again the firm can react to its environment as a single organism.

**WHY DO COMPUTER BASED INFORMATION SYSTEMS FAIL?**

The objectives for automation are simple and management is aware of the potential for coordinated operational control. Why then do some computer based information systems fail miserably while others are successful? One reason is a management structure that cannot control its current environment; another is the lack of top management involvement with the computer based system; and a third reason is software. Before the computer based information system can be successful, the management system must be well structured. A small company looking at automation for the first time usually has been growing at a 100-300 percent annual rate. Growth results in confusion within the management system that can only be resolved by restructuring management responsibilities. If the computer is expected to solve management problems, the result will most certainly be failure. Second, the prerogative to manage the system containing the valuable, irreplaceable data resource of the firm must never be delegated. Without top management involvement at every stage of implementation, the computerized system will fail and possibly the business itself.

Management participation must be educated. Management may already be expert in the selection, acquisition and use of machinery for its manufacturing or service business, but managers typically do not possess the same degree of competency with computers. Small business managers are ignorant of computer technology because they were not trained in the universities and/or because they have been too busy making money to educate themselves in the rapidly changing computer technology. Aggressive action often is not taken in an area where the small business manager feels insecure. The small business manager needs to become conversant in computer technology and its management to avoid the typical pitfalls and provide rational computer based information system management leadership. In many cases, the burden of responsibility for placing the nerve center of the firm on a computer is delegated to a technician. It is unfair to place such a burden on a technician and it is dangerous to the very existence of the firm that so much power and authority resides with a single person who is not intimately tied to the success of the firm.

A third and critical area is software. Very often a small business manager requires a computer system to conform to his firm's established procedures rather than change the firm's procedures to fit a preprogrammed application package. The process of finding a software package which feels comfortable to a firm with minimum change is the critical issue. Small businesses should not undertake to write their
own software systems. In general, they do not possess the software expertise and the tremendous financial resources that go into writing and documenting their system. Specialized software often ties the firm to hardware and the people who wrote the software. One small firm nearly went bankrupt when its data processing manager died in an accident. No one understood the programs he wrote which were undocumented and no one knew how to run the software on the computer! Standard software would have precluded the problem, since a large group of people would understand the operation of the software system. In general it is best if a small firm uses standard software packages. Modifications to the software should be made only after the firm has used the package for three months, often needed changes prove to be niceties the firm can do without.

COMPUTER ACQUISITION

Nothing can replace the computer educated, articulate manager in the computer acquisition process. However, a measure of security may be achieved by hiring a consultant knowledgeable in the small computer field to assist in the acquisition procedure. Computer sales people are, after all, trying to sell their product. They are an excellent source of useful information, but aggressive sales people will waste valuable time and often appeal to emotional rather than technical issues. A knowledgeable consultant, someone who is in the market every day, can serve as an effective buffer for the small business manager. The final equipment decision and responsibility must lie with the manager. He alone is responsible for the profitability of the firm. An incorrect decision could cost a small firm an amount of money far exceeding the cost of the hardware. A construction firm with which the author is familiar lost who is in the market every day, can serve as an effective buffer for the small business manager. The final equipment decision and responsibility must lie with the manager. He alone is responsible for the profitability of the firm. An incorrect decision could cost a small firm an amount of money far exceeding the cost of the hardware. A construction firm with which the author is familiar lost

1. If there is no computer expert in your firm, hire a consultant. The consultant should be able to provide you with references. The consultant should be able to understand your business problems and be an expert in the automation of business systems.

2. Generate functional specifications for your firm. These should include (1) the system objective, (2) a brief description of what is to be automated, and (3) parameters of the business, such as numbers of customers, inventory items, order volumes, etc. Examples of functional specifications tailored to the needs of specific firms appear in Appendix A.

3. The vendor should be asked to comment on (1) the number of similar systems they have installed and their length of operation, (2) their maintenance capability, and (3) the warranties and terms of purchase or lease.

4. Once the vendors have been narrowed to three to five qualified bidders, visit operating sites similar to the proposed system. During these visits ask questions in the following areas: (1) customer satisfaction, (2) installation delays, (3) length of installation operations, (4) major difficulties during installation, (5) system reliability, (6) service level, (7) modifications to system, and (8) scope and complexity of system.

5. Finally, in selecting the vendor, disregard salesmen's claims. Rely on: (1) facts from information gathered, (2) vendor past performance, and (3) evaluation of people you will work with in system development. Hire a lawyer familiar with computer systems to write an addendum to the vendor's standard contract. See Appendix B for some suggested clauses.

6. Additional system considerations:
   a. Specify a system that is CRT and keyboard driven, cards are costly and unwieldy for small systems.
   b. A cassette based system should never be purchased. Cassettes store 1/4 million characters of data that can only be accessed by searching the entire cassette for a particular piece of information. Floppy disks store the same amount of data that can be randomly accessed. A floppy disk system should only be purchased if the data volume to be stored is very small and its growth stagnant. A hard disk costs $10,000 vs. $4,000 for a floppy disk and provides substantial growth benefits.
   c. The critical issue is the availability of software to meet your specific needs. Concentrate on this issue. Hardware is in general not a problem.

APPENDIX A—EXAMPLES OF FUNCTIONAL SPECIFICATIONS;
CPA FIRM/SERVICE BUREAU

Software requirements

1. Payroll System—Approximately 50 clients, mode is 5 to 10 employees, five clients with 20 to 50 employees. System must have ability to prepare checks, year-to-date registers, payroll registers, labor distribution by cost center or department, and also prepare W-2's on demand as well as year-end W-2's and quarterly 941-A reporting. A vacation, holiday, and sick leave accrual system is a helpful addition. The payroll reporting subsystem must interface with the general ledger data entry processes to capture by-product payroll data and retain this data for quarterly and annual reporting.

2. Accounts Receivable System—Data entered via sales journal and cash receipts journals to produce statements and an aged trial balance.
3. **Accounts Payable System**—Fully integrated system for both cash and accrual based clients. Check writing capability, volume: 6,000 checks per month.


5. Availability of a standard data input editing capability to include data type field checks, range checks, account code and check digit, etc., and data output control checks is a plus.

6. The current system must be capable of handling 60 clients, having 40 accounts per general ledger account and be expandable in increments to handle 200 clients requiring A/R maintenance, payroll and all standard accounting functions.

**System requirements**

1. **On-line Interactive System**—Initially a single CRT station, modular and expandable to four to six CRT stations capable of simultaneously accessing system. Software protection of database update an important consideration in maintaining data integrity. Please specify cost of each additional CRT station.

2. **Line Printer**—Low speed, 64 character set, reliability critical.

**X-BAR FLYING SERVICE**

1. **Data Processing Requirements**
   - Processing: The system shall be capable of meeting X-Bar’s immediate accounting needs with a fully integrated on-line A/P, A/R, G/L, payroll, inventory, software package.
   - Input: Input will be on-line, single item entry with editing capability.
   - Output: CRT and line printer (100 to 200 lines per minute).

2. **Future System Requirements**
   - Processing: The system shall be capable of software expansion to meet future management control information needs. It must be possible to easily access and restructure data to provide for new management information requirements. It must be possible to process data from at least four separate companies simultaneously; that is, the data may be updated and accessed by remote terminals in at least four different locations. Input/query capability from several local and remote locations. Some terminals may be connected directly to the system while others are connected by a leased telephone line.

3. **Modular Expansion**
   - The system must be expandable in modules of hardware, applications software, and operating systems software. Each perspective vendor is expected to quote the basic system and then show how the system can be expanded to meet the future system requirement.

4. **Maintenance**
   - Maintenance must be Albuquerque based with one half day response.

5. **Backup**
   - An Albuquerque based backup system fully compatible with X-Bar’s specified system must be available. Excess time (current and projected) on the backup system must be available.

6. **Training**
   - Local training support must be available and easily accessible.

7. **Availability**
   - Only a “try before you buy” philosophy will be accepted. Each vendor will be expected to demonstrate the basic system with X-Bar data to satisfaction of X-Bar before purchase. In addition, the vendor must demonstrate a currently operational expanded system that would meet X-Bar’s future needs. The system shall be available in 30 to 45 days after the order is received. A similar system and sufficient system time must be available to affect immediate conversion from X-Bar’s old system to the new system.

8. **Guarantee**—The vendor must be willing to include a penalty clause and/or initiate an escrow account to cover possible loss to X-Bar due to the system not meeting specifications. The vendor must agree to submit to arbitration should a vendor-buyer disagreement arise.

**APPENDIX B—THE STANDARD CONTRACT**

The standard vendor contract is not immutable, though that is often the impression presented by the vendor representatives. The truth is that the vendor contract is written to favor the vendor, hence, is inequitable and should be modified to be fair to both parties. The data processing manager and the company executive staff have definite wishes regarding:

1. Delivery date commitment
2. Documentation requirements
3. Trade-in options
4. Reporting requirements (on a software development contract)
5. Performance test requirements
6. Service commitments

They, however, do not have the expertise necessary to translate these requirements into contractual language. A lawyer, on the other hand, normally does not have the expertise to determine what is required. Together the DP manager/corporate executive and negotiating lawyer form a symbiotic relationship. Every vendor will renegotiate a standard contract, if pressed.

Initially, the corporate staff should decide what the
critical contract objectives are. For example, if reliable service is the most important consideration, then attention should focus on warranty and maintenance provisions. These contractual objectives must be articulated and translated into appropriate legal language by an attorney.

Some contract considerations follow:* 

1. Warranty—Will the equipment function according to software and hardware specifications?

2. Terms and Price—Specific conditions under which title the computer and/or software passes to vendor. In a lease contract, who pays the property taxes? Is the lease renewable? Is there an upgrade/downgrade penalty clause?

3. Delivery and Installation—Delivery dates should be designated with penalties for late deliveries. Provision should be made for damage in shipment.

4. Acceptance Testing and Maintenance—Under what terms will the vendee accept the equipment? A minimum acceptance period is 30 days. A maintenance clause should specify the maximum response time for service calls.

5. Training—The type and duration of training should be clearly specified.

In summary, every conceivable event should be included in the contract. Do not accept the verbal agreement with a vendor official, he can be overruled later, or be powerless to follow through if the agreement is not in writing.

REFERENCES

