APPLICATION OF MICRO-COMPUTERS IN SUPPLY MANAGEMENT

(GUIDE No. 10)

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INTERNATIONAL TRADE CENTRE UNCTAD/GATT
Application of micro-computers in supply management
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Manual on the application of micro-computers in supply management (tenth guide in a series on import management and procurement techniques) - describes the advantages and drawbacks of computerization; the programme of action (evaluation, difficulties; survey of systems; supply planning); desired applications; choice of desired system; choice of computer hardware; and the setting up of the system.

(Free to organizations of developing countries)

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INTRODUCTION

The role of the Division of Trade Services (DTS) is to provide, within the technical co-operation programme of the International Trade Centre UNCTAD/GATT (ITC), a comprehensive range of consultancy/research/back-stopping and related services in trade promotion functions and techniques.

The Division consists of three Sections:

- Functional Advisory Services Section (FASS)
- Section for Import Operations and Techniques (SIOT)
- Training Section (TS)

This paper describes the range of technical co-operation services of SIOT; and covers the various areas covered by the Section's work.

Enquiries to ITC on this specialization should contain the fullest

possible background information, and current problems and policies on the subject should be clearly spelled out. Requests for consultancy services or for an overall assessment of the problem often require a fact-finding mission in addition to written information. With a few exceptions, missions are financed by existing project funds or directly, in certain cases, by the governement concerned. Short-term specialized consultancy inputs, included in ITC's national trade promotion projects for individual countries, are financed either through the United Nations Development Programme (UNDP) or through trust funds made available by individual donor countries.

Preface

Objectives

This guide on the applications of micro-computer technology to supply management is intended for public and private purchasers in developing countries. It has been prepared for the purpose of pinpointing some important factors that should be taken into consideration before envisaging the computerization of functions connected with supply management and import techniques.

The success of setting up a computerized management system - in other words, the quality of its performance - depends largely upon the quality of preparation for the change in system. Many administrations and firms have experimented with computerized management systems; this guide has been prepared in the light of their experience. We have tried to define not only the elements essential for success but also the reasons for certain poor performances.

Micro-computers

In this guide we have confined ourselves to the applications of micro-computers, being of the view that in most cases, micro-computers as compared with macro-systems, offer the advantage of greater flexibility as well as that of lower initial costs. Recent technological developments have expanded the range of computer hardware available at reasonable prices. Although these devices are smaller and have a higher performance, they must still be regarded as a working tool. Computerization requires adequate preparation, not only as regards the choice of computer hardware but also, first and foremost, as regards the development of new working methods and the choice of the management system to be used. Such preparation must take account of the logical sequence of the supply cycle.

Applications

Computerization is not an essential precondition for up-to-date management. Rather, it should be viewed as an alternative in the choice of working tools. The tool has to meet certain requirements. It is pointless to think of computerizing an inventory of goods if the quantities of goods to be managed and their low monetary value cannot justify the necessary investment costs. Any decision to purchase equipment is normally based on the anticipated profitability, i.e., on the reduction in certain costs which the purchase is expected to bring about.

The decision to computerize must, then, be planned like any investment decision. The mere fact of using a computer does not automatically make an organization more efficient. The decision should not be governed solely by the wish to acquire the image of an avant-garde administration. The computer may prove a useful tool provided the change in working methods has been preceded by a thorough and rigorous study of the articles and conditions of sale, a programme of action drawn up in the light of the administration's or firm's objectives, a detailed elaboration of the management systems to be used, and a co-ordinated setting-up plan which takes into account the difficulties that may arise during the system's installation. Too many administrations or firms which have tried to computerize their supply management systems too quickly have run into unexpected problems whose solution has necessitated considerable effort and additional investment not always envisaged in the original plan. Thus, instead of achieving the anticipated cost reductions, the firm is faced with an unwarranted increase in administrative costs due to the difficulties encountered.

Let us not forget that the computer is a machine. It cannot think, although it can execute routines which are fed into it. In order to obtain the desired result you must select the appropriate software as well as the

hardware best suited to your purposes. Such selection presupposes knowledge of the objectives aimed at and the choice of a management system that corresponds to your needs. The change in working methods will entail a corresponding change in the knowledge and skills of the employees concerned. The quality of the setting up of a computerized management system will not depend on your choice of the hardware alone but also on the quality of the staff concerned and, above all, on the level of the staff's motivation and preparation.

The computer is a practical working tool for compiling data but it should also help the operator towards better decision-making. The information obtained very often relates to stock management, to the detriment of the strategic factors involved in the decision to purchase. In this guide we therefore discuss not only information required for stock control, whether qualitative or financial, but also information necessary for procurement decisions. The decision will always be the responsibility of the human individual; the computer must help him by furnishing pertinent information at the right moment.

Before we buy a motor vehicle intended for use under desert conditions, we take care to identify the essential components of such use, which is very different from, say, town use. Knowledge of the requirement to be met is a preliminary stage to the purchase of the article. The same is true of computerization: a knowledge of the requirements, a study of the situations as it is, are essential preliminaries.

The computer is a fascinating tool. People tend to admire it, to think of it as a clever instrument which can lead to appreciable personnel saving. In fact it generally entails increased administrative costs in the first few years. Another fascinating aspect is the great speed of technological development in this field. The race for artificial intelligence undoubtedly has many valuable spin-offs, but it also entails rapid obsolescence. This goes for computer hardware, software and auxiliary systems alike.

The supply cycle consists in a series of activities whose sequence needs to be examined before the computerization process begins. This series of activities is like a chain whose links follow one another in accordance with a strict order. Each link is more or less essential to the strength and the efficiency of the chain as a whole. From requirement planning to utilization, there is a series of activities whose importance will vary depending on the situation.

Computerization does not resolve the problem of failure to correctly identify the goods, nor the improper location of goods, nor the badly organized storage, nor the inadequate goods flows. With so many sources of error, how can a computer furnish accurate reports? So it is desirable to develop a good management system first, which may be computerized later if the circumstances warrant it.

The success of setting up a computerized management system will correspond to the quality of the preparation of working methods. It should be understood that a computer system cannot operate adequately unless the prerequisites have been established beforehand, taking due account of the logical sequence of events engendered by the computerization process. Computerization of a management system is not a goal - it is a means, a tool for attaining the goals of an administration or firm.

CHAPTER I

Preliminary considerations

Computerized management systems offer numerous advantages but they also have some drawbacks. Both are discussed in this chapter by way of guidance and in the hope of making the reader more aware of the computer as a new working tool. First, however, we must ask a few questions that have to be

considered before any thought is given to the computerization process.

1. Preliminary questions

First question:	Do we need a computerized management system, and why?
Second question:	If yes, what are the precise goals of computerization?
Third question:	Are we prepared to invest the time and money needed for setting up the new management system?
Fourth question:	Have we the financial means necessary to envisage a change in working methods and tools?
Fifth question:	Are we controlling our stocks efficiently at present? Should we improve or change our present methods of stock control?
Sixth question:	Has our staff been prepared for the possible introduction of a computerization programme?
Seventh question:	Is this the right moment in the history of our firm or administration to change the system?
Eighth question:	Should we invest in a centralized macro-system or in several micro-systems?
Ninth question:	What will be the new system's profitability? How soon will it begin to pay off?
Tenth question:	Will the new system help to reduce our overall supply costs?
Eleventh question:	What is the overall cost of the operation?
Twelfth question:	What are the hidden costs?
Thirteenth question:	At the overall cost indicated, will we obtain a memory capacity sufficient for our needs?
Fourteenth question:	What are the programming modifications that may be required, and how will they affect our present choice of software?
Fifteenth question:	Have we defined the frequency and contents of the reports required for ongoing decisions?
Sixteenth question:	Do we need a demand planning system?
Seventeenth question:	If we analyse the software market, will we find that we are obliged to make our own software because none is available to suit our requirements?
Eighteenth question:	Does the computer hardware we are envisaging correspond to the latest

technical developments or is it on the verge of obsolescence?

Nineteenth question: What exactly is a computer?

In this guide we shall try to answer these questions or at least help the reader to answer them.

A management system should not be thrust upon its users but, on the contrary, should be desired by them. The preliminary questions suggested above should therefore be answered by the decision-makers together with the future users.

2. The advantages of computerization

(a) Speed

One of the advantages of computerization is speed. Depending on its capacity, a computer can process thousands of data in the space of a few seconds. Sellers of computer hardware and management systems generally emphasize this aspect. Speed makes acquisition attractive at first glance. People are still astonished by performances which greatly surpass normal human capacity. Peformance therefore becomes a selling argument and is identified with efficiency, but the speed of execution does not necessarily mean efficiency. Of course there is some value in being able to obtain a list of warehouse stocks within a few seconds, but unless the data presented in the inventory report are accurate, efficiency will not result. Only if the basic data, as well as the computer inputs and outputs, are accurate will efficiency be increased. In this guide we propose to demonstrate the cumulative impact of efforts and their repercussions on decision-making.

(b) Storage

A computer can store quantities of information in its main or auxiliary memories; these quantities will correspond to the storage capacities purchased. Storage capacity is an attractive feature which, like speed, may justify acquisition. Storage capacity is limited by the capacities actually available in the hardware purchased. It is therefore essential to know what storage capacities are required in order to ensure that your requirements are adequately met and to provide adequate data processing in accordance with the software employed.

The purchaser of a computerized management system should estimate as closely as possible the storage capacities he is going to need. This applies in equal measure to micro-computers. Care should be taken to avoid purchasing computers which are too large, because their unused surplus storage capacity will represent an unproductive investment. On the other hand, a computer which is too small will limit the use of some software. Certain units have basic storage capacities to which auxiliary memories, useful for additional data storage, can be added.

There is a tendency to prefer a single centralized management system requiring phenomenal storage capacities. In too many cases this tendency corresponds to a wish to control everything that is going on. Such a level of control puts considerable power in the hands of the individuals in charge of the system. Micro-computers and data decentralization offer undeniable advantages in terms of flexibility and data accessibility.

Batch processing systems are available on the market. With these, data are compiled but are not inputted at preset intervals. This method limits data accessibility. Current developments in data processing have placed on the market a multitude of direct-access computers with which data can be used at several working stations simultaneously. The usefulness of a storage capacity can be defined as the possibility of storing information so as to make it accessible at the desired moment. The ideal is to be able to obtain

the data at any time and not to be limited by periodic batch processing. Direct access means data input at any time and data access at any time.

Obviously, some of the data may have different confidentiality levels. Users of the system will therefore be assigned an access code which will correspond to the level of confidentiality of the stored data and to their own level of responsibility and authority.

(c) Electronic intelligence

These days, we hear the term "electronic intelligence" more and more often. The concept is known all over the world, and large sums of money are assigned to various research centres engaged in the development of what is commonly described as electronic intelligence. A real race is taking place to develop "thinking machines". These research centres, whether publicly or privately financed, are working on micro-circuits capable of storing more and more data. Their goals are often military - piloting aircraft, steering all-roads vehicles capable of recognizing an environment, etc. Other fascinating uses are chess playing and recognizing the spoken word.

But let us imagine a four-year-old child: at that age, a child can recognize an animal on the edge of a forest at nightfall. In order to have the same capacity, a computer would have to store in its memory or memories every possible situation: species and breeds of animals, different colours and sizes, different lighting intensities for different parts of the animal's body and for different angles of vision ... Computer scientists have to overcome tremendous problems in order to match even a small portion of human intelligence.

Clearly, the systems on offer in the supply management field do not aspire to any form of artificial intelligence. However, they do include certain basic routines: mathematical operations, comparisons, compilations, and communications. It is advisable to acquire some knowledge of the technical aspects - hardware, storage capacities, basic software, uses of components, etc. Such knowledge is a prerequisite for choosing the system best suited to your requirements.

A veritable computer software race is going on in various parts of the world. The result is a multitude of products on the market corresponding to different needs and based on different approaches. This race accentuates development and daily opens up new horizons in data processing. If we took an inventory of all the products put on the market in the past twenty years, we would realize how this development is accelerating.

Before opting for a management system and a set of equipment, therefore, it is desirable to have a minimum knowledge of this very active market. Although an elaborate range of software is available, much of it offers compilation but not the elements that will help the operator in making decisions.

(d) Programming

Files of products, suppliers, nomenclature, coding, planning, programming, documentary credits, fixed assets, bids, purchase orders, expedites and re-orders - all these represent distinct programming possibilities.

The choice of computer software therefore assumes obvious importance, for it is largely through the choice of the right software that a firm may hope to reach the desired level of performance. It is often preferable not to try to computerize everything at once but to proceed by stages in accordance with an order of priorities. Let us not forget that the setting up of a computerized management system involves foreseeable difficulties whose solutions can be pre-determined at various stages of the setting-up process. If you cannot control the product flows with your present management system, you must

correct and re-test it. Do not computerize until you have achieved a satisfactory performance.

(e) Reputation

Some people seem to have something like a psychological need for a computer system. Point out a few advantages to them, and the purchase is made. Think of it: computers are the future! Today, we say "my computer" as we might say "my car".

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Having a computer is

...like entering another world

...being progressive, ahead of the others

...being a member of a new section of society

...belonging to the avant-garde, a demonstration of your competence.
))

Yet your first goal should be to exercise your administrative and management functions in an appropriate and realistic manner. If this goal can better be fulfilled with a computerized management system, then computerization may be justified. Many are those who have thought that the future of their organization or firm was predicated upon an intensive computerization phase. For some among them, this has proved to be the source, of not only greater efficiency, but also of enhanced reputation. But for others the experience has been a sorry one and has swallowed up large sums of money.

Even with the service of data processing specialists at their disposal, some firms or administrations have had difficulties in setting up a computerized management system, reaching an acceptable level of performance only after years of effort and after making many changes and improvements.

The success and reputation of an administration or firm does not rest upon the fact of computerization but, rather, upon the quality of the use made of the computer in the service of a well-prepared, well-planned management system in line with its requirements.

MANAGEMENT SYSTEM

APPROPRIATENESS TO REQUIREMENTS

PLANNED COMPUTERIZATION

The watchword is "prudence". The computer industry has put on the market a multitude of software in the fields of book-keeping, finance and budget control, but few programmes in the field of supply differ from the others in terms of performance. This situation is an incentive to produce your own software appropriate to your requirements. But making computer software is a highly specialized task. Yet the simplest programmes would seem to be the most effective ... Unless you have an expert close at hand who is prepared to give the necessary time to the job, calling in an outside expert is often inevitable. The development of micro-computers has been a severe shake-up for the conventional market in macro-systems.

In order to raise your organization's or firm's efficiency you will have to take the necessary time to analyse your requirements and the developing market in micro-computers. What you must look for is efficiency rather than speed, realistic programming rather than the most sophisticated software available. At the same time, you must make sure you obtain an adequate storage capacity.

3. Drawbacks

(a) Inappropriate programming

As we have said, the range of programmes available in the field of goods management is fairly wide. But in the wish to make their software accessible to organizations of firms with widely different requirements, various companies are producing multi-purpose software which is often too sophisticated and which does not necessarily meet particular needs. Rather than confine themselves to certain specific elements of supply management, these programmes offer everything at once. That is not necessarily a bad thing, but for clients whose management system have certain features of their own it may entail a number of problems which will make the software less compatible with the desired management system. To choose a set of software is to opt automatically for a certain system of management. It is preferable to chose the system first and then to computerize it.

Between requirement planning and the quasi-automatic issuance of an invoice, the supply cycle includes a multitude of activities whose importance varies from one organization to another.

Programming which is inadequate because it is not in line with the requirements will make the computerized system too onerous and so prevent the attainment of the organization's or firm's goals.

(b) Indirect access

The decisions that have to be taken in supply matters are many and urgent. In order to make sure that the right information is available at the right time, it is best to choose a management system and computer hardware that will allow direct access to the data.

The chief drawback of periodic data processing is that the report is transmitted to the decision-makers only at certain predetermined periods. Such data will have only historical value because they do not include transactions taking place between the request for data and the moment when the data were fed into the computer.

c) Overall cost

Many firms rush to computerize their management system without considering the total costs of changing the system. In this guide, these total costs are defined as "overall cost". Here is an incomplete list of the costs involved:

Cost of preliminary analysis of various management systems

Cost of replacing standard forms now in use

Staff training and advanced training costs

Cost of experts employed during the start-up period

Cost of computer hardware and its components

Cost of premises and functional conversions

Cost of after-sale services

Cost of software

Costs associated with the proving time,

etc.

We could continue the list by adding insurance and financing costs, currency exchange rates, out-of-guarantee costs, customs duties, government taxes, special paper, etc. Consideration of the overall cost before opting for a computerized management system will enable you to gauge the investment involved and compare it to the anticipated return.

(d) **A priori** credibility

Because of their admiration for the new technology, people often attach very great credibility to the information obtained from the system. It should not be forgotten, however, that the computer is only a machine. It compiles the data received and analyses them in accordance with instructions contained in the software. The quality of the data output by the system therefore depends directly on the quality of the data input. If the input data are wrong, the reports will inevitably be wrong too. Decisions taken on the basis of erroneous reports are unlikely to be optimal. A few minor errors accumulated at the input end can completely throw out the analysis results. For a computerized system, accuracy of input data is a matter of life and death.

(e) Non-significant stocks

The value and importance of various goods should be taken into account when developing the management system. Is a new data input necessary every time a nut or bolt is used? The item may be of insignificant value and the cost of inputting may be greater than that of the item itself. This is where the ABC classification system becomes really valuable. Non-significant stocks are those commercial value does not warrant their integration in the system. Special treatment may be justified, however, where the item can be identified in lots (e.g. a lot of 100 nuts). The cost of inputting must be justified by the importance of having the information and the impact of the item's monetary value on overall results. Efforts expended on computerizing non-significant data may make the system top-heavy and limit its efficiency.

4. Miracle solution

Computerization is not a miracle solution to all management problems. Data processing is one of the possible means of attaining an administration's or firm's goals. It is a working tool, not a solution in itself. This guide describes some essential stages in preparing for the setting up of a computerized management system.

Far from claiming to list all the advantages and drawbacks of such systems, this guide sets out to provide an aid to reflection. Its object is to sensitize potential decision-makers and operators.

CHAPTER II

Programme of action

1. Evaluation of the situation

Before developing a management system it is important to be thoroughly familiar with the relevant characteristics of the situation as it is at present. The following, for example, should be known about the range of items stocked:

(a) The value of the items

(b) Their importance according to the ABC inventory control list

(c) Items which are not purchased repeatedly

(d) Each item's consumption or utilization levels

(e) Possible equivalences between items

(f) Special difficulties in establishing the overall cost of particular items,

etc.

2. Difficulties to be surmounted

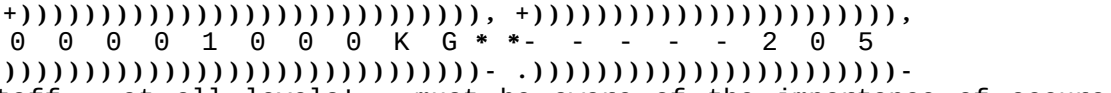
If the management system is to attain a certain performance level, you should be conversant with the methods at present in use so as to be able to envisage the difficulties involved in changing them.

(a) Forms

Working forms, order forms, stock withdrawal vouchers, etc., will have to be modified to fit in with the new management system. Ideally, all standard forms should be revised so that data input may be effected in an ordered manner. Possible difficulties can be surmounted by providing blank spaces to allow a clear presentation of the various codes employed. Coding of goods, locations, sequential numbers of bids, invoices, etc., should be simplified so as to minimize error and thereby maximize the system's chances of success.

(b) Accuracy

Data input requires a meticulous concern with accuracy. The correctness of reports will largely depend upon accurate input. The smallest error can remain in the system's memory. Common errors to be avoided are, say, entering 100 kg instead of 1,000 kg. The work thus demands a very high level of precision and must inevitably involve a priori checking. Another common error can be avoided by providing blank spaces for the measuring units: an item received from the supplier in pounds but which is entered in kilogrammes, or one which leaves the warehouse in bales but whose surplus is returned to the warehouse in pallets ...



The staff - at all levels! - must be aware of the importance of accuracy. Staff training and advanced training are therefore of the essence. Receiving clerks, dispatchers, warehousemen in charge of moving merchandize from one place to another, buyers' clerks, secretaries, buyers and book-keepers must be made fully aware of the importance of these little details.

(c) Procedures

Every stage of the supply cycle normally involves data input. The schedule of procedures must therefore be revised to meet the needs of computerization. Methods and directives for each stage must be clearly set out, if possible with examples.

When drafting new procedures you should indicate when data may be entered into the system, by whom, who must check the operation, etc. It would be useless, for example, to request a report when the relevant data had not yet been entered. A decision taken on the basis of an incorrect or incomplete report will not take into account elements which are not known and are therefore lacking. It is advisable to request a re-check in order to make sure that the requisite data have been included in full.

(d) Data availability

A computerized management system should not encourage the proliferation of papers. On the contrary, a direct-access system will help to reduce the volume of paper, although in supply management, where the purchasing documents have legal value, there is a case for keeping both sources of information (documentary and computerized). Where data are made available on display screens at several working stations, the volume of paper will be reduced.

(e) Correction possibilities

Some types of software are so designed that even the slightest modification entails heavy costs. Others simply do not allow for any modification at all. But even where the possibility exists, special technical knowledge is required in order to modify software. Because of the highly specialized nature of such work, the cost will be so high that the desired modification may no longer be justified. Before choosing his software, the decision-maker will be well advised to acquaint himself with its contents and with the correction or modifiable type. Of course it is best to get everything right from the start. Should a correction be desired, it is preferable not to be faced with total inflexibility. If correction turns out to be technically impossible, the users will be obliged to work with software less well suited to their requirements.

(f) Mathematical formulae

Supply planning software available on the market generally includes mathematical formulae, in particular for calculating the economic order quantity. We should remember that this type of scientific calculation based on projections should be handled with circumspection. One purchasing situation is so different from another that a single mathematical formula is unlikely to cover them all. Before applying such a formula, the operator should make sure he has grasped the underlying logic and, while taking into account the prediction elements employed, should recognize the limits of the formula's usefulness.

3. Cumulative error

Let us demonstrate what is implied by stock management involving fifty transactions a day. After two hundred working days, some ten thousand transactions of every kind will have been complied. For each input you have to enter the quantity, the unit of measurement and the cost price per unit, which means that the member of inputs is quadrupled. So you have 40,000 data. Should the situation analyses obtained prove wrong, checking 40,000 data may represent an extremely onerous administrative task. If you add the item code and the location, the number of data for 10,000 transactions will rise to 60,000.

Daily transactions : 50 entries or withdrawals of items

x

Number of working days : 200

=

Number of entries or withdrawals : 10,000

Elements per transaction :	1. Quantity	5
	2. Measuring unit	kg
	3. Price	10.78

4. Per measuring unit	kg
5. Product code	x x x x
6. Location	T T T T

As can be seen, the risk or error increases proportionally to the number of elements per entry. It is therefore recommended to employ the short and simplest codes possible, using the smallest possible number of digits and letters.

In the foregoing example there are 60,000 different elements that may be incorrect.

If 5 per cent of these elements are incorrect, there will be 3,000 errors to rectify.

If only 1 per cent of elements is incorrect there will still be 600 errors to rectify.

We should realize that a 1 per cent error level can throw out the conclusions of a report, provided the items concerned are significant. An accumulation of error can seriously reduce the credibility of your computer reports.

Let us proceed further with our calculations based on the same example. Each element of a transaction may involve four digits or letters. So the 60,000 elements have to be multiplied by four, which means that the member of digits or letters which may be incorrect rises to 240,000. The conclusion to be drawn is this: the longer and more complicated the coding system employed, the greater the risk of error will be.

Number of elements : 60,000

x

Number of digits or letters per element : 4

Total : 240,000 digits or letters

240,000 possibilities of error

Risks : 1 per cent of errors x 240,000 = 2,400 corrections

5 per cent of errors x 240,000 = 12,000 corrections

Such an accumulation of errors over a period of 12 months will make the reports unacceptable. The operators will undoubtedly feel discouraged. An a priori effort to ensure verification and control is essential to ensure a modicum of efficiency for your computer system.

To sum up: the best way to forestall future difficulties is to assess the situation as it is at present and compare it with the situation as it will be under the new system. It is useful to quantify the number of transactions, their nature, their importance. Try to identify the future system's weak points and to envisage preventive measures. Let us note, too, that the process of setting up a new system will deserve special attention if cumulative error is to be avoided.

A situation of 1 per cent of errors calls for 2,400 corrections. If these corrections are not made day by day, the credibility of the reports and, consequently the level of management in general, will suffer. Almost

inevitably, the level of the operators' motivation will also decline and, in addition to administrative costs being higher than planned, the number of poor decisions and opportunities for fraud will increase.

Situation; 1 per cent of errors	
Downward :	Credibility of reports Motivation of the staff Motivation of the management
Upward :	Number of corrections Opportunity for fraud Poor decision-making Cost of operation General discouragement

4. System analysis

(a) Mandate

It is often advisable to mandate one individual to analyse the desired management system. This individual will be responsible for proposing the best working methods while at the same time ensuring that the firm's or administration's goals are met. Given the probable extent and complexity of the changes advocated, the individual chosen for the task should be a highly qualified one, for his choices will have far-reaching implications. If someone of the required calibre can be found among the staff, the appointment will be made within the enterprise. If not, an outside expert will have to be engaged under a consultancy contract.

The mandate should normally define the goals of the system to be established. Some of the goals that may be specified are given below by way of example.

MANDATE OBJECTIVES

1. THE INFORMATION GATHERED SHOULD BE AVAILABLE TO ALL AUTHORIZED USERS AND TO THE MANAGEMENT
2. THE SYSTEM SHOULD BE EASY TO OPERATE SO THAT STAFF TRAINING COSTS CAN BE MINIMIZED
3. THE SOFTWARE SHOULD BE CORRECTABLE AND MODIFIABLE AT REASONABLE COST
4. STANDARD QUESTIONS AND ANSWERS SHOULD BE AVAILABLE BY DIRECT ACCESS AT ANY TIME
5. CIRCULATION OF PAPERS SHOULD BE REDUCED AS FAR AS POSSIBLE
6. DATA INPUT SHOULD BE EFFECTED ONLY ONCE AT THE POINT NEAREST TO WHERE THE INFORMATION ORIGINATES

etc.

(b) The supply cycle

What are the stages of the supply cycle that could be computerized? A short list is given below.

1. INTELLIGENCE CONCERNING THE SUPPLY SITUATION

2. DATA CONCERNING SUPPLY REQUESTS

3. QUALITATIVE DESCRIPTIONS

4. MARKET INTELLIGENCE DATA

5. INVITATIONS FOR BIDS (or private contracts)

6. CHOICE OF LOWEST BIDDER

7. GRANTING OF THE CONTRACT

8. FOLLOW-UP AND EXPEDITE

9. RECEPTION AND QUALITY CONTROL

10. TRANSFER OF GOODS TO STORAGES

11. DISTRIBUTION TO USERS

12. COMPILATIONS AND CHECKS

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5. Prerequisites

The following stages involve certain prerequisites, which are to be found in most purchasing departments:

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1. NOMENCLATURE OF PRODUCTS

2. CODING OF PRODUCTS

3. CODING OF STORAGE AREAS

4. IDENTIFICATION AND CODING OF POTENTIAL SUPPLIERS

(a) Nomenclature of products

This entails a detailed description of each item as well as a list of all relevant stipulations and of potential suppliers. Each item which is purchased is intended for a specific use; this basic link needs to be emphasized. Only if he is perfectly clear about the item's intended use can the purchaser decide whether the item purchased will be suitable. The same link can also be a valuable guide to choosing equivalent products and detecting obsolescence. Obsolete, defective or surplus items should be indicated as such so that action may be taken in their respect.

(b) Coding of products

A simple coding system (between 3 and 6 letters or digits) can eliminate sources of error at the input end, as well as simplifying the operator's task. A combination of digits and letters will help the operator to memorize the code, especially if the letters stand for a certain product (example: F for fruit, V for vegetables, ME for medical supplies, etc.).

FV = fruit and vegetables

13 = products which can be stored without refrigeration

23 = special code for potatoes

Potatoes : FV-13-23

(c) Coding of storage areas

Intelligence as to the location of merchandize is essential to the satisfactory performance of a management system. An item can be stored in several different places provided the locations are known. In planning storage space it is necessary to take into account the amount of space normally required for goods of a certain type. As the space required may vary depending on demand and between one period and another, it may prove useful to store goods in different places provided their exact location is known, so that they are accessible at all times. Setting aside 1 cubic metre of space for an item which requires 5 cubic metres should be avoided. Conversely, unused space unnecessarily increases the cost of premises. Rationalization of space and coding of storages are part and parcel of rational stock management.

(Identification label to affix to shelving)

ME 2179
ANTIBIOTIC NO: 18C PARKESU
LOCATION E-13-7
SURPLUS E-13-24

Reserve storage spaces (e.g. for seasonal surpluses) should be provided; knowledge of their existence and location and of the quantities stored are fundamental elements of management. It is often said that administration begins with planning. Space management is a form of planning. Ideally, each regularly used product should have its predetermined, identified and known place of storage. This will make for more efficient reception, distribution and inventory keeping.

Rationalization of space should also normally take account of handling and staff costs. Goods are normally classified in the following categories:

SECURITY	Goods requiring maximum security, to be stored under lock and key (munitions, firearms, explosives, medicines, toxins, etc.)
INTENSIVE FLOW	Goods distributed daily, to be stored as close as possible to the point of distribution
HEAVY HANDLING	Goods requiring large amount of storage space or necessitation the use of handling gear
OTHER	Goods requiring special climatic conditions, etc.

(d) Supplier files

A supplier file includes the firm's official name and address, the owners' names, the names of the principal agents involved (salesmen, credit officials, manager, etc.), the range of goods manufactured or distributed, the price and transport policies followed and any other relevant data.

Among the latter, mention should be made of a list of main competitors, which may prove very useful when inviting bids or in the event of a firm's inability to deliver.

An example of a supplier file is presented on page 20.

SUPPLIER FILE

Transaction in progress
Operator No. 61 C o d e 13
Vetting by: No. 3G

Name: Roberto Dusablon
Supplier's code: 13-DU-38

Address: Flower Street
Niceland

Owner: Martine Dusablon & family

Financial position: A+

Salesmen Credit Officer
After-sale service
Mr. O.K. Guy Ms. Cashdown M r .
Getthere Fast
Mr. I.M. Best

Previous volume of business in 1,000 CFA:
1983: 348 1984: 729 1985: 209 1986: 821 1987: 1302 1988: 1989:

Principal items purchased Notes on files:
Tomato concentrate AL 1832
Operator 35 (1983): Refuses inspection before
Potatoes FV 1323
loading. Agreed in 1984
Onions FV 1319

Operator 51 (1985): Dispute settled out of
court. Good business
relationship

Principal competitors 13-FA-16
13-MI-65
13-CH-03
Business bank: Modern Bank
13-AR-09
Niceland
13-RO-73
Account No. 1350-65-B

6. Supply planning

There are many methods of planning in existence. In this guide we have chosen to give a few examples of methods employed in management systems, both computerized and non-computerized.

The first consists in drawing up a list of goods required for a project. This method is attractive especially in the case of recurring projects. The second is that of minimum and maximum quantities, and consists in identifying a minimum quantity of goods to be stocked and a maximum that should not be exceeded. The third method is known under the name of "economic order quantity". Here, the quantity to be purchased is determined on the basis of annual consumption, the goods storage cost rate, the ordering costs and the item's price. Lastly, we give an example of the probability method of calculating demand, where future consumption is extrapolated by sets of averages from the demand registered in previous periods.

(a) By project

Where a list of goods can be drawn up for a specific project, specially a recurring one, it can serve as the basis for a sequential table of items in relation to the project activities. It should be noted that this method of planning does not necessarily involve data processing. The greater the number of items and of activities, the more useful it will be to use a programming method which enables activities and goods to be linked according to a specific pattern. The Perth and Gantt methods are good examples of this type of planning. Their advantage is that they identify, at an early stage, the demand for goods in relation with the activities' time schedules and the goods' availability.

This method is useful particularly for large-scale projects or for the recurrent production of product ranges. A first example is given below. In it, account is taken of the sequential order of activities and of the items actually required for each activity, as well as of additional products needed as a safety margin. The sum of the items actually required and those needed as a safety margin will be the total of the items purchased. Quantities on hand are deducted from this total. By adding the value of stocks on hand to be used for the project to the probable value of the stocks to be purchased we obtain the total cost of projects to be purchased for the project.

Transaction in progress
Operator No. 62
Vetting by: ????
Code 17

Project code: 17-FO-07
Title of project: Repair of blast furnaces

Activity	Deadline	Value	Required total	Product	Stocks	Purchases
Opening	June 1987			-------	------	-----
Repairs	July 1987	250,000	5000	Bricks M346	0	5000
				Cement M347	827	173
		120,000	1000	Stone M231	0	300
		70,000	300			
Finishing	August 1987	30,000	5000	Aluminium M181	0	5000
Closure	August 1987	7,000	500	Steel M823	830	-
				Steel M837	930	-
		6,000	200	Stainless steel M846	-	1300
		24,000	1300	Nuts M424	1340	-
		1,400	400	Paint M322 (on request)	-	-
	-	-	-			

Minimum/maximum method:

This method of planning presupposes that the level of stocks is maintained at a minimum threshold at all times in case of emergency, e.g. to meet an urgent demand for a quantity in excess of what was anticipated or to cope with a delay in delivery. It also provides for a maximum quantity which may not be exceeded and which corresponds to the firm's or organization's financial possibilities and its stock level policy. Such a policy can be defined from different aspects.

Number of days

Example of a stock level policy based on a maximum: average stocks may not exceed 60 days of use.

Utilization factor

Example of a stock level policy based on the utilization factor: average stock quantities must have a utilization factor of 5. The utilization factor is obtained by dividing annual consumption by the average stock level.

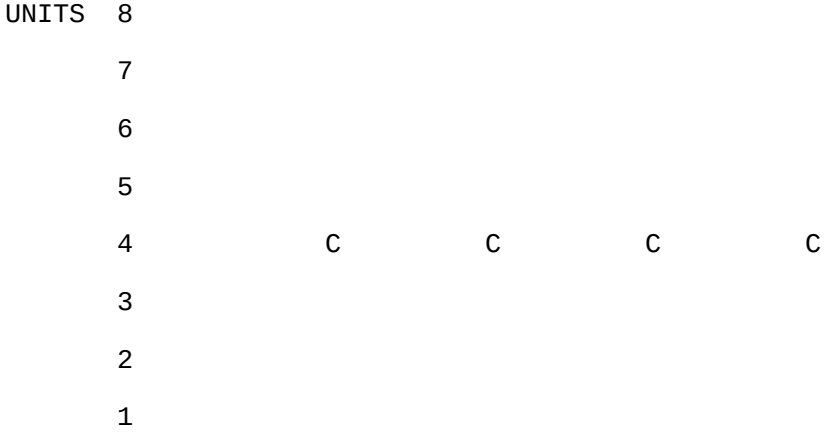
In a situation where the probable annual consumption equals 30 units and the average maintained stock level is 6, the stock level policy will have a utilization factor of 5. The average stock level is calculated as the sum of quantities in stock at the end of each month divided by 12.

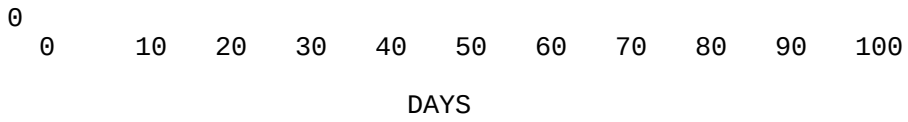
The above policies should be applied with discernment. The operator must also take account of the market situation. Moreover, such policies should be established for separate ranges of goods and not for all ranges together, since the market situation may differ for each product range, necessitating a different policy. Delivery times and seasonal demand fluctuations are only a few of the elements left out of account by a global stock-level policy. In addition, the operator should take into consideration any quantitative discounts offered and the impact of costs other than price, e.g. transport costs.

It should also be mentioned that a stock policy should take account of the monetary value of product ranges, depending on which the financial impact may be considerable or negligible.

Example:

The figure below exemplifies the minimum/maximum method of planning. In this example the delivery time is 20 days, the minimum stock level is 2 units, the utilization rate is 1 per 10 days and at the beginning the stock level is at minimum. The letter C indicates the moment at which an order is placed with a supplier.





(b) Economic order quantity

The economic order quantity is calculated on the basis of annual consumption, the unit price of the product, the costs involved in placing an order with the supplier (annual administrative costs of the supply department divided by the number of contracts placed) and, lastly, the goods storage cost rate in terms of monetary value and per year. The goods storage cost rate is made up of all costs pertaining to storage, including:

Cost of financing stocks maintained in a storage

Cost of warehouse space

Cost of insuring merchandise against loss or theft

Cost of wages of staff employed in handling or distribution

Costs connected with risk of breakage of goods during handling.

Transaction in progress

Product: FV1323

Planning

Operator No. 62

Name: Potatoes

Code 18

Vetting: ????

Measuring unit: 25 kg sacks

Minimum: 5,000

Maximum: 30,000

Order: 10,000

OPERATOR	Date	Transaction		Budget	Entry
Code	Withdrawal	Future Code	Balance	Code	
		balance			
62	20-06	Purch.10		A	
15,000	-	0	15,000		
62	24-06	Distr.15		C	-
5,000	-		10,000		
60	24-06	Distr.15		D	-
2,000	-		8,000		
64	30-06	Purch.10		A	-
-	25,000	-			
62	07-07	Distr.15		C	-
5,000	-		3,000		
67	15-07	Recep.19		A	
25,000	-	0	28,000		
67	17-07	Loss.23		A	-
300	-		27,000		

Example: For a situation where:

- Q = economic order quantity

- A = quantity consumed in one year, 900 units

- C = unit cost of the item, 1.00/order

- S = cost of placing an order, 2.00/order

- I = rate, per dollar and per year, of storage cost, 20%

The formula employed is: $Q = \frac{2\,AS}{CI}$

$$Q = \frac{2\,(900 \times 2)}{1 \times 0.2} = \frac{3600}{0.2}$$

$$Q = 18{,}000$$

$$Q = 135 \text{ units}$$

The economic order quantity is 135 units.

Once the economic order quantity is known, we can establish that:

NC = number of orders per year

$$NC = \frac{A}{Q} = \frac{900}{135} = 6.6 \text{ orders per year.}$$

DC = interval between orders

$$DC = \frac{365}{NC} = \frac{365}{6.6} = 55 \text{ days}$$

Accordingly, in this situation the purchaser will have to place an order every 55 days, totalling 6.6 orders for 135 units each in one year.

The reader will note the logic of this mathematical formula while bearing in mind that it fails to take into account certain constraints, such as:

Political, financial or social constraints, constraints as to the availability of space, of foreign currency, transport and delivery times, etc.

These constraints are so important that we believe the usefulness of the formula is limited to that of a guide to decision-making. It can be used freely when the goods are available in large quantities and nearby.

Let us also note that the calculation is based on an estimate of annual consumption (A). The result (Q) will therefore vary depending upon the degree of the operator's optimism or pessimism. These formulas are merely guides; decisions are taken by the operator.

(c) Probable demand

This method presupposes relatively steady demand, the calculations being based on previous demand levels. Here, planning for the future is based on information concerning the past. A steady increase in demand is assumed. Probable future consumption of an item is estimated from previous consumption.

Cement in 50 kg bags

1st quarter	2nd quarter	3rd quarter	4th quarter

1983	1024	743	3054	107
1984	1345	527	2010	0
1985	1816	640	4012	620
1986	1513	800	5500	860
1987	1700	930	4850	327
1988	?	?	?	?
1999	?	?	?	?

Total to date	ADD UP PREVIOUS CONSUMPTION PER QUARTER
Average	DIVIDE BY THE NUMBER OF YEARS
% growth	Average rate of demand growth

7. Methods of work

(a) Location of goods

A stock of goods has a certain value. An item of value, if it is to be preserved, must be kept in a place which is suitable, accessible and clean. The goods must be kept safe while remaining accessible. The concept of accessibility implies that the precise location of the goods is known at all times. The safe-keeping elements and the amount of space required have to be determined.

Example : Welding rod : Storage on solid shelving. Location indoors under lock and key, in a dry place.

Meat : In refrigerators or freezers.

Example of storage by warehouse sections (or outdoor storage areas)

Sector A	Sector B	Sector C
Traffic Aisle		
Sector D	Sector E	Sector F

Detail of sector E

1	2	3	4	5	6	7	8	9
6								
5								
4								
3								
2								
1								

Thus the location of the blacked-in space reads E-6-4

E = sector E

6 = aisle

4 = position in aisle

Storage by "families" of goods

FV = fruit and vegetables

DG = dried goods

ME = medical supplies

This method of coding has the advantage that users can immediately tell what "family" of goods they are dealing with. In addition, the code indicates the type of storage.

Example

FV	10	34
Fruits and vegetables	Without refrigeration. outdoor storage on pallets, cardboard packaging	Item: Bananas

(b) Identification of location in warehouse

The method of identification by pallet can be useful for inventory accounts and for rapid stock location. The warehouse label reproduced below is generally issued in two copies; one to be used for data input and the other to be affixed to the merchandise in a visible position.

WAREHOUSE LABEL		
No. of item M E - 0 2 - 77		
Name: ANTIBIOTIC PARKER No. 3		
Supplier: PARKER		
Date received	Order	
Quantity 35,000 Units GRAMMES		
Quantity inspected	By	Date
Quality inspected	By	Date
Location assigned	By	Date
Inventory	By	Date
Inventory control:		
LOCATION:		

(c) Checking of goods entries and withdrawals

One of the difficulties of computerized goods management is the number of possible solutions the system has to know. Many people think that an inventory involves only two operations, entry and withdrawal. Yet the reality is quite different: many types of entries and withdrawals are possible and

may affect the inventory's quantitative or monetary value.

The original programme should provide a different input code for each type of operation. The data processing staff must follow clear instructions, and certain elements should only be processed by duly authorized persons. Who has the right to enter what data? For each of the elements coded in the system a decision will have to be taken. No operations should be recorded in the system without the decision-maker being informed thereof. The system has a memory, but it does not necessarily have the capacity to provide decision-makers with data relevant to the decision: hence the importance of appropriate programming.

A few possible types of entries and withdrawals are shown below for purposes of demonstration.

Entries:

A. Goods received from a supplier following an order.

B. Goods received from a supplier as replacement for a defective batch.

C. Lost goods which have been found and relocated.

D. Goods whose location has been changed.

E. Goods returned by the user.

F. Double delivery by the supplier.

G. Goods received for experimental purposes.

H. Goods received on commission.

I. Goods re-entered in the inventory - to be returned to the supplier for credit.

Withdrawals:

A. By the requesting user.

B. Double delivery by us: to be returned by the client.

C. Return to supplier: goods to be replaced.

D. Return to supplier: goods to be credited.

E. Goods damaged by our employees through (a) unsuitable storage or
(b) faulty use.

F. Goods undergoing quality inspection, not available to users.

G. Goods transferred from a reserve storage to a regular one.

H. Unchecked goods lost or presumed stolen.

etc.

Each of these entries and withdrawals should be processed differently and a particular staff member should be responsible for processing each one in accordance with a clearly defined procedure to ensure that the data are correct.

Many firms have adopted systems of goods management control but are not satisfied because the results are inadequate and do not reflect the real

movement of goods. This is often attributed to lack of control at the entries and withdrawals level.

CHAPTER III

Desired applications

A number of various applications of micro-computerization are possible with the software available on the market. Some of the software offers inventory management, some, more comprehensive, offers the possibility of computerizing everything, from the identification of requirements to the moment of utilization.

It is reasonable to argue - and the view is a widely held one - that the stages of the supply cycle are inseparable and that, consequently, there is little practical point in computerizing only a few stages at a time. Others, however, think that computerization should be gradual and that its applications are so numerous and diverse that a selection needs to be made in the light of immediate needs. Some organizations in developing countries have opted for a comprehensive set of programmes and are introducing the various applications included on a stage-by-stage basis. Others compose their own programmes to suit their specific requirements. Yet others think that the volume of their transactions does not warrant the use of special supply programmes but can be adequately handled with word processors. Lastly, some do not regard computerization as a top priority and take the view that they must first develop an efficient management system and make full use of the developing skills of their management staff.

In this chapter we give a list of data processing applications so that our readers may identify and select those of interest to them. We also suggest a set of basic files which could be established with the help of computers.

Word processors

(Supply management applications)

Letters to suppliers

Indents

Invitations for bids

Various reports, including procurement statistics

Product descriptions

Standard clauses of import contracts

Reports to the management

List of suppliers (with addresses)

List of products (with qualitative descriptions)

Procurement procedures

Preparation of standard forms
Procurement policies

Staff training documents

Personal files of employees

Reports on requirement analyses

etc.

Computerized supply management applications

Stock-keeping

Management by project planning

Management by minimum/maximum stock levels

Management by economic order quantity

Management by probable demand

Direct procurement requests on cathode screens

Preparation of orders

Sending orders to suppliers

Automatic follow-up and expedite while orders in progress

Invoice checking

Invoice payment

Supplier intelligence:
- evaluation
- direct communications
- background history, business relations

Budget follow-up

Liaison with international data bank

Reception and distribution

Return of merchandise

Quality control

Production management:
- new items
- items in progress
- finished items

Management of forwarding operations

etc.

As will be seen from the above lists, many applications can be computerized to different degrees.

It is up to each organisation or firm to choose the applications which correspond to its specific goals and to the various stages needed to achieve them. To choose all the applications at once is possible but will require a very high level of competence on the part of all concerned. Few administrations or firms can justify such an array of applications or bear the costs of such an investment. Making the wrong choice should be avoided, of course, as should the example of certain firms which have discovered the possible applications one by one and have bought new software each time, ending up with a totally disjointed system.

The right choice between various computer applications should take account of real supply management requirements as identified by preliminary analyses.

A set of basic files is shown below by way of example.

SUPPLY MANAGEMENT

Programme:
- Programme sources (description/tools)
- Finished products = all files
- Sequence of supply operations
- A programmer's manual
- An operator's/user's manual
- Structure of each file
- Operations files:
  - collection
  - modification
  - query
  - printing
- Relation between files (operation and consistency)
- Demonstration: application of the programme on micro-computer
- Demonstration video
- Application

FILE No. 1

Title:
- Staff file

Utilization:
- Repertory of Supply Department staff (purchasing and stock management sections)
  - Identity - Career - Dates of entering and leaving the department - Title of post
  - Salary costs including insurance etc.
  - Level of programme access authority
- Overall salary costs by department, section and post

FILE No. 2

Title:
- Terminology file

Utilization:
- Repertory of identifications and definitions of all documentary media employed:
  - within the firm (or administration)
  - within the Supply Department

FILE No. 3

Title:
- Nomenclature and coding file

Utilization:
- Identification of all products, goods and services acquired by the firm (or administration)
- Permanent and updated repertory of defined and coded articles

Product code: - 1 code number per article and source (supplier)

- 6-digit coding

Additional coding for:

- Customs tariffs position
- Physical characteristics
- Usual suppliers
- Other (to be specified)

FILE No. 4

Title: - Suppliers file

Utilization: - Repertory of identifications and codes of the firm's (or administration's) suppliers, broken down under:

  - potential suppliers
  - current suppliers
  - suppliers struck off the list

- Classification of suppliers by country, products, monetary area, etc.
- Turnover statistics (3-year), overall and by product
- Latest purchase made
- Marking of performance
- Reasons for striking off list

FILE No. 5 (a)

Title: - Stocks file

Utilization: - Stock management (quantity and value) with continuous justification of stock movements

- Movement registration and monitoring:

Entries: by order; by transfer: nomenclature; by return

Withdrawals: by consumption; by transfer; by previous assignment

- Monitoring of destination for use: (Quantity and value)
  - production
  - commercial (sales)
  - transfers

(b)

- Stock situation (continuous), in quantity and in value:

- assigned stock
- stock on hand

- Monitoring of stock movement and stock situation by article:

- Permanent data:

  - Nomenclature and coding

  - Supplier(s) source

  - Usual purchasing conditions (quantity, packaging, transport, etc.)

  - Category of stock (ABC)

  - Consumption over the past 1 to 3 years

  - Security stock (reviewable)

  - Turnover rate (quantities)

  - Cover (importers) (over 6/12 months)

  - Physical address

(c)

Variable data:

  - Entries and total entries

  - Withdrawals and total withdrawals

  - Direct purchasing costs:

    - purchase price

    - accessory costs, broken down by type (transport, insurance)

    - (listing of purchase prices and accessory costs)

    - average weighted price

  - stock situation (physical and bookkeeping)

Average stocks (by...month period)

ABC analysis of stocks

State of losses due to damage (breakage or theft)

State of reimbursement of losses

(d)

Table of:

- By article: type of packaging
  packaging material
  weight

volume

- By article: (weight-volume-quantity)

Vetting of movement orders:

- Level of access and authority to intervene (threshold by article - quantity and value - authorized operator(s))

- Chronological recording of interventions (operators - date - time- place, etc.)

FILE No. 6 (a)

Title: - Supply planning and programming (SPP)

Utilization: - By article By source

(a) Preparation (supplier)

- Consumption forecast for the next financial year (quantity, value) (overall)

- Physical stock-on-hand situation

- Average delivery time

- Order(s) to be received

- Supply requests:
  (units). Deliveries: - from stock
  - from orders

- Budget opened (amounts, limits)

- Quantity to be ordered (quantity, value)

- Proforma invoice

- Supplier(s)
  - usual
  - other

(b) Execution

- Documentary credit

  - letter of credit: opening date, bank amount
    period of validity
    agios

  - listing of letters of credit (periods of validity)

  - total of credits opened and of agios

  - order voucher
    - identification No.
    - date
    - quantity
    - value
    - conditions

- vetting - checked editing (by level of authority)
- order follow-up

- financing

- reception
- quantities

FILE No. 7

Title: - Purchasing administration data

Utilization: - Periodic publication of the following data:

- Number of orders placed, by article and by supplier

- General total (number of orders)

- Total purchases of the same article from ( ) suppliers

- Total purchases of ( ) articles from the same supplier

- Classification of suppliers by turnover thresholds

FILE No. 8

Title: - Invitations for bids and markets overt

Utilization: - Follow-up of invitations for bids and checking of the execution of markets overt

FILE No. 9

Title: - Information and documentation (imports)

Utilization: - Repertory of documentation and information sources

- Follow-up of subscriptions (validity period and cost)

FILE No. 10

Title: - Supply Department expenses

Utilization: - Record of expenses:

- Rent

- Electricity, water, telephone, telex, telegrams

- Insurance

- Transport

- Total wages (cf. file No. 1)

- Financial charges (overdrafts, agios)

- Depreciation (infrastructure)

- Information on acquisition and storage costs

FILE No. 11

Title: - Storage

Utilization: - Storage management file:

- Storage No. (equipment inventory)
- Date and value of entries
- Department and place where item is to be used
- Depreciation record (net value)
- Inventory withdrawals

CHAPTER IV

Choosing the system you want

1. Data bank and files

Whatever the system desired, it will have to include files in which information relevant to supply management will be stored.

This information will subsequently be used in data processing. Data processing means making mathematical, statistical and historical compilations in accordance with instructions incorporated in the software.

Compatibility, coherence and complementary are essential to the operation of these files, which may, inter alia, include the following:

Supply Department staff file

Terminology file

Product nomenclature file

Product code file

Stocks file

Cost price (by product) file

Appropriations file (by budget item)

Supply programming and planning file

Supply statistics file

Costs and fixed assets file

etc.

As we have seen in the preceding chapter, an efficient computerized supply management system does not necessarily have to include all these files. Some firms and organisations proceed by stages depending upon the urgency of the need for computerization.

Other files may be established; they must correspond to the requirements and goals of the desired data processing system. Among them we may note the following:

Surplus products file

Import quality-control clauses file

etc.

2. Vetting of data

In Chapter II we discussed the cumulative impact of errors in data input. We also mentioned the importance of simple coding and the need to design standard forms appropriate to computer use. Useful as these preliminaries are, it will also be necessary to provide for data vetting. This does not mean doing the work twice. A vetting programme can be incorporated in the basic programmes at the software preparation stage.

Such programmed vetting systems can point out to the operator that he has entered five digits for a transaction which normally has a four-digit code, or that the four-digit code he has entered is not valid in that particular product file. The software can ask for an operator check by requesting the individual's vetting code before storing the information. Such vetting programmes resemble the dictionaries incorporated in certain word processor programmes which correct errors of vocabulary, spelling mistakes, etc. They can be extremely useful in minimizing cumulative error.

Programmed vetting does not, however, check the accuracy of the information. Additional checks must therefore be provided from the input stage onwards. Such checks may be multiple, and may depend to a great extent upon the operator's aptitudes and skills.

In many cases provision is made for compulsory checking of data inputs by an individual other than the responsible operator. In others, a summary of the day's inputs is requested and the results vetted after some random checks by a responsible individual. It is better to check inventory levels by sampling than to discover huge discrepancies after twelve months of transactions.

3. Software

Machines do not think. A computer can, however, obey instructions previously stored in its memory. If you tell a word processor to print, it will print. But it will not stop unless the basic programme contains an instruction to stop in various circumstances: the text is finished, the paper has run out, etc.

4. Control points

Computerization can be envisaged when the administrative sector concerned has already achieved a certain level of control of its operations.

A computerized management system for a personnel service will have little chance of success if the service, although supposed to check the hours worked, does not have a system of time cards, overtime authorizations and so forth. A system which provides the service with the basic information it needs to perform its tasks should have been set up first, to be computerized later as required.

This is true in supply management as well. It is often illusory to envisage computerizing a system unless certain controls have already been established and are operating efficiently, e.g.:

1. Quantity control at reception
2. Quality control at reception
3. Control of acquisition costs,

etc.

(a) Inventory level checks

Periodic checking of inventory levels, whether computerized or not, is recommended under circumstances such as the following:

1. Before the end of a financial period

2. Prior to an important purchase

3. When a loss is presumed to have occurred

4. When there is doubt as to the accuracy of information on hand.

A computerized system can alert the operator in the event of certain situations perceptible to it. Here are a few examples:

1. The inventory balance is a negative quantity

2. A quantity which, in reality, has "disappeared" still appears in the inventory

3. A quantity remains unused for a certain length of time.

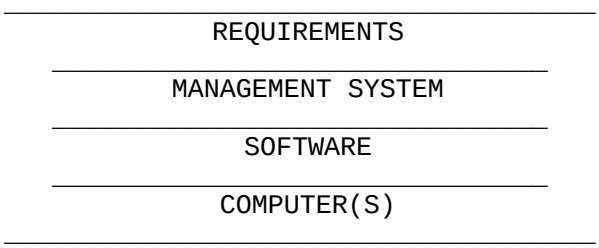
YOU'VE GOT TO TELL IT EVERYTHING...

In the early days of computer development, one of the worst mistakes you could make was to give a computer a programme without telling it when to stop. Unless the "stop" function was specifically included, the usual result was systematic emptying of the computer's memory.

(b) Quality of programming

Programming is of good quality if it meets the management's system requirements, which implies that what is desired and justifiable must be determined in advance. Many management systems will not meet your requirements because the nature of their programming is unsuitable.

The criterion for choosing software should be whether or not it corresponds to the requirements defined when preparing the management system. The computer will then be chosen depending on the software to be employed. Many people choose the computer first and the software afterwards; then they have to adapt their management system to such topsy-turvy computerization.



(c) Acquisition of the software

The acquisition of the software should include the following stages:

1. Preliminary analysis of the desired management system

2. Analysis of the existing management system

3. Identification of the problems connected with changing the system

4. Identification of the programmes required

5. Choice of management system

6. Looking for suitable software

7. Calculating the overall cost of changing the system

8. Justification of the change

9. Determining the moment most appropriate for the change

10. Final survey of the software market

11. Purchase of the hardware and software.

The programming can be so designed that these events, when perceived by the system, will be communicated to the decision-makers.

(d) Intervention codes

Each operator associated with a stage in the management process can have an identity code enabling him to intervene. Such a code will give him access to those transactions which concern him. In the absence of such a system, anyone will be able to intervene, and this may be used to cover up fraud as everyone will be able to present a theft of goods as a justified intervention.

Summary

In this chapter we have tried to show that computerization involves a major change in working methods. A certain level of performance and control should have been reached before introducing computers.

Where controls are non-existent or inefficient, computerization will not remedy a poor management system. First, it is necessary to devise and implement a management system which meets your requirements and which proves efficient in operation. Computerization should entail more advantages than drawbacks, and should improve your management system's performance instead of making it more unwieldy.

Remember: many organizations and firms have had to go into reverse because of inadequate preparation or poor choice of the hardware or software. Others have succeeded by dint of effort, time and money and of realizing that the process of computerizing a supply management system involves a number of stages, each of which must be planned in advance.

CHAPTER V

Choosing the hardware

The purpose of this guide being what it is, it would not make sense if we tried to offer an exhaustive list of techniques or of recent developments and improvements in the field of computer hardware. That task can be left to specialists. We do consider it worth while, however, to mention some aspects of data processing technology.

A. Binary language

You have to be able to communicate with the computer. Many computer languages have been developed and are in use in data processing today. All of them have to be "decoded" by the computer, whose electronic language is a binary one.

A micro-circuit is composed of microscopically small cells which may be positive or negative. Four of these small cells form a unit which is known as a "bit". A thousand "bits" form a "K". A memory capacity is measured in "K"s (2K, 10K, 100K, etc.). The four cells forming a "bit" can denote a letter in an alphabetical section or a digit in a digital section.

B. Basic routines

Every computer has its basic routines. These include computing routines, logical comparison routines and operating sequence routines.

Computing: The basic computing function is the same as that found in electronic calculators.

Logic: The computer receives basic instructions which enable it to compare two or more values. There are three possible results:

- smaller than
- greater than
- equal to.

This function is very important: it is this which creates the apparent intelligence.

Example: A multiplication of digits means that thousands of possible answers have to be reviewed. The computer will supply the only possible and permissible answer: the right one, "equal to". This is a comparison exercise and it takes 1 micro-second.

Example: University study results: A student obtains 75% in his exams. The pass mark is 60%

1st comparison: is the first figure "equal to" to second?

2nd comparison: is it "greater than" the second figure?

Answer: yes.

In such cases, the computer has in its memory an instruction to write: Congratulations!

It is because of this comparative function that the computer is known as a "thinking machine". But in order to be able to tell a table from a chair, one would have to store all possible shapes of chairs and tables in the computer's memory - because the computer knows nothing except what has been stored in its memory by a human being.

C. Operating sequences

All the operations performed by a computer have to be dictated to it in a basic routine. Everything is arranged in a predetermined sequence. You cannot issue an instruction which does not correspond to the predetermined operational cycle.

The computer mechanism is, in fact, no longer a mechanism. Even the printers have progressively become electro-mechanical, electronic and today, micro-laser.

The mechanical element has disappeared to make room for an extreme miniaturization of micro-circuits, thus making the micro-computer possible.

The technological race is on too, for additional capacity to miniaturize micro-circuits even further, to make them still more efficient and long-lasting, to equip them with still larger memories.

1. A first computer

If you want to buy a micro-computer and enjoy the advantages of the latest technology, here are a few things you should know:

If your only immediate goal is to cut down manpower costs, forget it!

If your bookkeeper, although competent, is driven nearly crazy at the end

of each financial year trying to understand what happened because the relevant documents are lacking, forget it!

If your manual management system is efficient and productive at lower cost than a computerized one, the computer may be an expense rather than an investment.

Too many administrators the world over have imagined that acquiring a computer will transform their small or medium-sized firm into a high-powered multinational.

Let us recapitulate the three traditional uses of computers and mini-computers:

COMPUTATION	(accounts, technical)
COMMUNICATION	(word processing, preparation of reports)
DATA STORAGE	(data bank)

One of the most classical uses is computing - bookkeeping, technical calculations, etc.

Some firms manage their accounts without a computer. And manual systems are less costly than the cheapest computer on the market (including running costs) ...

(a) Looking for the right software

The development of supply management software is slightly behind that of other sectors. Still, purchasing know-how is today becoming an increasingly recognized priority for organizations and firms. Moreover, management of information flows is becoming essential to good supply management. Computer-assisted management can be a means, among others, of improving the management of information flows. In supply management, the purchaser is not the only intervening agent: he is not alone responsible for whether an organization's supply system is good or bad. This will depend on the quality of what is done by all the intervening agents and not merely on the act of purchasing. One of the software's functions should be to facilitate the dissemination of information to all the intervening agents concerned. It is not intended for purchasing alone but for all activities pertaining to supply, from requirement planning to utilization. This does not mean, however, that the software to choose is that which covers the largest number of supply activities. Let us remember that the software chosen should correspond to your management system. And what is more, the only really justifiable requirement is, perhaps, the requirement for software with which one of the activities, such as planning, can be checked.

(b) Data storage

Is your office floor about to collapse under the weight of paper? If so, think about data storage!

Are you located in the heart of a city where rents are high? If so, data storage may be the answer.

You do not install a computer for just a few files and a small quantity of supplies. Equipment costs are justified by the number of files and documents to be stored. Remember that, in the supply field, many papers have to be kept anyway because most of them are legal documents.

Before storing data, ascertain that it is essential to do so and for how long.

(c) Word processing

The preparation of contracts, letters to suppliers, quality control annexes and other supply documents generally involves a measure of repetition. Getting a word processor is often justified for this purpose.

(d) Buy or rent?

It all depends ...

If you are prepared to take the risk of obsolescence of the equipment, and if after-sale service is available, then you can think of buying, provided you have the means. If not, renting the hardware may be a solution to consider.

Let us not forget that acquiring a computer system is basically a purchase: the fundamental rules of purchasing must be applied, as with other goods.

The stages in the process are as follows:

A. Analysis: planning and understanding the requirements

B. Analysis of the functional value

C. Prospecting of the suppliers' market

D. Collection, processing and transmission of commercial information

E. Defining the purchasing criteria:

QUALITY

OVERALL COST

STANDARDIZATION

AVAILABILITY

GUARANTEE AND AFTER-SALES SERVICE

Before making the purchase, the following questions should be asked when prospecting the suppliers' market:

A) What are the buying and renting options offered?

B) Has the proposed system been tried and found successful elsewhere?

C) Have I checked with other users whether, and to what extent, they are satisfied with their choice?

D) Who is the supplier I am dealing with? A manufacturing company? An intermediary?

E) How many intermediaries are involved in distributing this equipment?

F) Have I really prospected the market and seen what software is available before making my choice?

G) Will I be able to modify the software? At what cost?

H) Will I be able to increase the storage capacity? Within what limits? At what cost?

I) Will I receive quality after-sale service at reasonable cost?

J) Who offers the guarantee? The manufacturer? The distributor?

K) What components do I really need? Printer, cathode screens, special paper, special cleaning materials, special furniture, etc.?

Additional components:

Not only are the software systems on the market more and more numerous and the micro-circuits more and more microscopic: there is also a flourishing market in components which may or may not be essential to the computer.

There is a multitude of components, from specialized furniture to telematic controls, for which the distributors have a captive market. These components become obsolete as quickly as the software and as the computers themselves. Prudence should therefore be the watchword in choosing them. Note also that some computers have become obsolete simply because the components essential to their operation are no longer available.

2. Looking into the future

A number of computerized management systems are self-destructible. We are not talking about a secret mission equipped with a self-destruction device. In this context, self-destruction is caused by:

A) Obsolescence of the hardware

B) Manufacturer's bankruptcy or disappearance form the market

D) Non-availability of competent technicians to ensure continuous operation

E) Staff not qualified an/or not trained to use the system

F) Inadequate software unable to meet the requirements

G) Unreasonably high expectations followed by disenchantment

H) Inaccurate data; data obtained too late

I) Lack of privacy of data stored.

CHAPTER VI

Setting up the system

1. A team

First of all let us consider some normal human reactions before and during the period of setting up a computerized management system.

POSITIVE REACTIONS	NEGATIVE REACTIONS
Need to develop	Fear of change
Computerization = the future	Computerization vs. the good old days
Hope of improvement of the quality of work	Possibility of job losses
Promotion possibilities	Possibility of becoming a slave to the machine

Given these probable reactions it is essential that the intervening agents to be involved in the future computerized management system should be

properly prepared and trained. A change of management system is a team effort. Future intervening agents should be involved right from the planning stage.

There is not much point in introducing location codes if the operators do not accept the logic of coding. Remember too, that the habit of carrying out a transaction by a certain method will not disappear without the necessary level of motivation. The human individual naturally resists change.

A warehouseman who has worked according to a certain method for twenty years may find it very difficult to understand and accept new working methods introduced because of a machine that merely complicates his life with new codes and new forms.

If you consult him from the start there is a good chance he will accept the change.

A management system is a matter of teamwork. It is in the decision-maker's interest to make use of the skills and opinions of the future operators, who are often the only people to be thoroughly familiar with the practical details that have to be known in order to set up the new management. Without positive participation by the staff, the planning, setting up, start-up and running-in stages may be severely jeopardized.

Staff training

Stage 1: Motivation

Unless the staff are properly motivated to welcome computerization, the results are unlikely to be satisfactory. A computer cannot work without a human operator. If the operator sees the computer as a source of better performance, you may hope to achieve success. Motivation will help the operator to cope with the problems that are bound to arise.

Stage 2: Demonstration

Data processing involves a multitude of new practices: learning the codes of products, locations and types of operations; using different standard forms; getting to know various devices, etc. The length of time it takes to learn all this may depend on the level of the existing staff's motivation, but, in any case, they will have to be shown how to do it. There are not many self-taught computer operators.

Stage 3: Correction

By correcting mistakes together with the operator who made them, you will help him to master the system. A particularly resourceful person should be put in charge of this training stage.

2. The time it takes

Another normal human reaction is to be satisfied with the mere possession of the new object. Someone who has just bought his first car will often not bother to become familiar with the engine but will only think of getting out on the road as quickly as possible.

Administrators often have the same reaction towards a new computerized system. They would like to see it in operation almost before it is delivered, without designing a management system first. As soon as the hardware is installed, they hope for immediate efficiency.

The setting-up period may not necessarily be long: what takes time is the period of preparation which precedes it. Training, too, may take longer than anticipated.

We avoid buying a car for which spare parts will not be readily available. The same goes for buying a computer. Computerization is a process requiring relatively long preparation and setting-up periods; it should therefore be regarded as a long-term investment whose results, in all probability, will also become perceptible only in the long term.

The true measure of a management system's performance can be gauged at the setting-up stage. Changes in this area, although planned, must involve certain unknown quantities. The setting-up period will include some stages of readjustment. This is when the unforeseen difficulties will come to light. A set of time limits for each stage of the setting-up process may serve as a useful co-ordinating tool.

3. The right moment

Knowledge of new supply management and import techniques is increasingly becoming a prerequisite for economic management the world over. The acceleration of this process has not by-passed the developing countries. Computerization is regarded as an important means of achieving better performance in the management field.

It should be recalled, however, that a recent (1986) survey of 500 leading French firms* revealed that 72% of the responding firms said they were not satisfied or only moderately satisfied with their data processing equipment, although 71% of these firms were using special in-house-designed software.

Such results may show that the software market in the supply field is still developing. The right moment to computerize will therefore depend on the availability of software corresponding to the desired applications or on the efforts supply departments are willing to put into producing software suitable for their own purposes.

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* Institut du management de l'achat industriel
Revue internationale de l'achat

Special issue. Achat assisté par ordinateur. Pages 10 and 11. March 1987.

CONCLUSIONS

Acquaintance with supply management and import techniques in developing countries can help towards better utilization of available resources. A better choice of markets, strategic control of the quality of products purchased, and more efficient stock management are among the priority goals in the supply field, especially at a time of economic crisis.

In business matters decisions are generally taken in the light of the risks and benefits associated with each investment. We hope that this guide may serve as a tool for operators interested in micro-computerization, helping them to quantify the risks and benefits involved so as to minimize the former and maximize the latter.

The industrialized world and the developing world do not have the same priorities. Their economic situations, too, are different from one another. Few existing models of computerized supply management systems could, we believe, be reproduced rapidly and indiscriminately in developing countries. However, acquaintance with several such models can help operators in developing countries to devise models of their own or to choose from among the existing ones the model whose application they may think useful in a specific context.

The establishment of supply management systems is essential. Computerization is a useful tool in some cases.