MANAGERS — MANAGE OR BE MANAGED!

BY

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This Paper was first published in the American Society of Naval Engineers' Naval Engineers Journal *in August 1966.* *The Author is the President of Washington Engineering Services Company, Inc., which he formed in 1951 and which does support work for the Government in the development and implementation of various management and training systems. He is also Chairman of the Board of WESCo Information Utility, Inc., as subsidiary of Washington Engineering Services Company, Inc.*

What do Managers do?

Since most of the managers among the readers are associated with some real products, things one can touch, smell, taste, see or hear, we might ask that question in some real context. What do managers do to, or for, or with the hardware with which they are associated?

FIG. 1

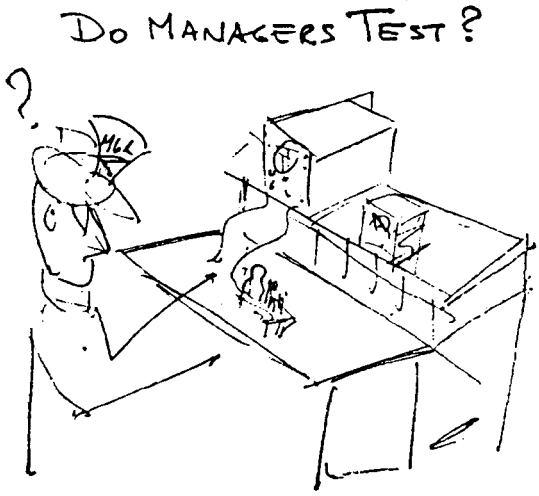


FIG. 2

Do managers of design actually get down to the drawing board and design? (See FIG. 1).

Do managers of production actually run a lathe? Assembly components? Test and qualify assembled products?

Do managers of reliability actually conduct life tests? Operate hardware in extreme environments? Conduct statistical analyses? (See FIG. 2).

Do managers of inventory actually store the hardware they order/bought? Pack the ordered units? Ship and deliver?

Do managers of maintenance actually diagnose troubles? Remove and repair faulty units?

If the answer to any of these is Yes, we would claim, I am sure, that the responder would be acting as designer, producer, test engineer, storekeeper, and repair man, respectively. These latter are surely respectable and important occupations. But none would be mistakenly included among managerial positions.

So, managing is something more than performing the functions necessary to ship, test, store, use, or repair hardware.

What does a manager do? To say that, of course, he manages, is non-responsive.

We would agree, I hope, that whatever other part he plays in this position, a manager's main concern is communication. And that communication, to come from an effective manager, should result in the right product from those managed.

The manager is concerned with one job—to accomplish his mission by communicating to those he manages. This mission is the delivery of a product—not the producing of it. Perhaps it is better to obtain an answer by continuing in this vein and eliminating the things that managers do *not* do.

A design manager delivers a design; his performance measure is not designing.

A test manager delivers test results; his performance measure is not the testing process.

An inventory manager delivers his product where required; his performance measure is not the ordering, storing, or shipping actions.

A maintenance manager delivers repaired items; his performance measure is not the repairing activity.

And so on.

If the measure of management performance were the activities that are required to produce the products, then the mere evidence of activity (time cards) would be the evidence of satisfactory management.

The manager's primary concern is the quality and quantity of products to meet his mission objective. If the resources available to him cannot perform so as to deliver the products in the required time, then, it is apparent, he will not meet the mission goal. One could very well maintain that this argument precisely defeats the impact of the earlier one, namely, how can a manager tell whether he will get his products on time unless he does manage the activity?

Perhaps there is a more fundamental question. What is the difference between management and supervision?

Please accept the notion for the moment that the manager is product-oriented only; then permit me to say that the supervisor is operations-oriented. The supervisor knows when the operation is being performed properly. He knows what to do to correct an improper operation. He knows what engineered work standards to apply to evaluate the efficiency of the work performance.

Now, then, if the manager has consulted with the supervisor in determining whether the proper products can be delivered on time with the resources available, then the responsibility for the work performance—as distinct from product performance—is the supervisor's, not the manager's. If, on the other hand, the manager on his own has determined that the proper products will be delivered on time, then that manager has acted as a supervisor. Such an expedient may be perfectly proper and satisfactory, but the manager in such a circumstance is only a part-time manager and a part-time supervisor. A schizophrenic. (See FIG. 3).

FIG. 3

Which brings us back to the question in another form—'*How* does a manager manage?'

We may now be willing to say that, in part, at least, he manages by communicating a requirement of PERFORMANCE in terms of specific deliverable products to be attained within a specified budget of resources (DOLLARS) and time (TIME).

If the terms of the PERFORMANCE, DOLLARS, or TIME may not be altered by the manager, and he thus is only a relay mechanism, then, who needs him? Without doubt, some recording machine can relay these instructions with less error, less fatigue, and less cost than a human. (See FIG. 4.)

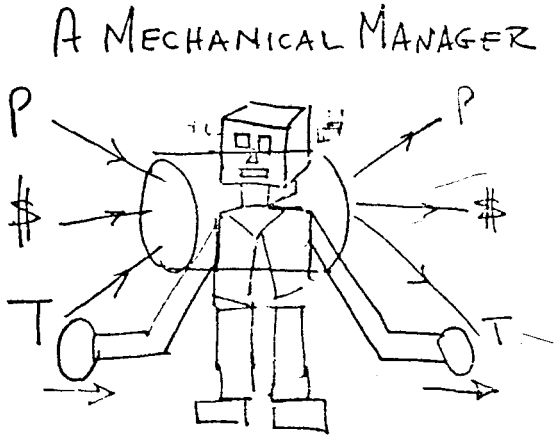


FIG. 4

We could then add to our notion of management an independence of action and conclude that managers do meet a mission goal by controlling the terms of PERFORMANCE, DOLLARS,

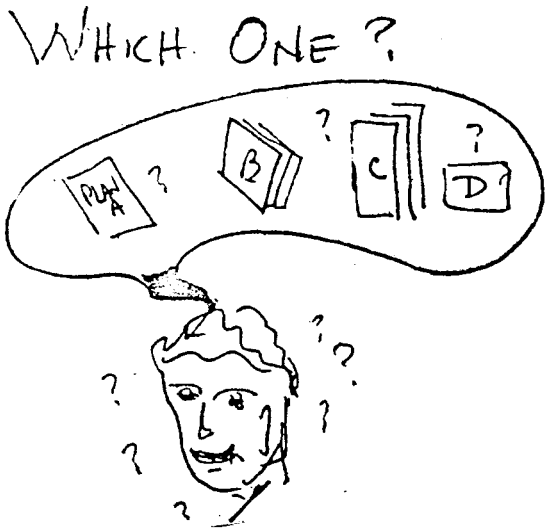


FIG. 5

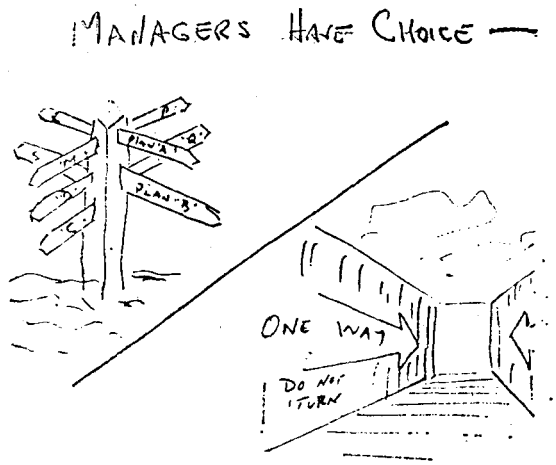


FIG. 6

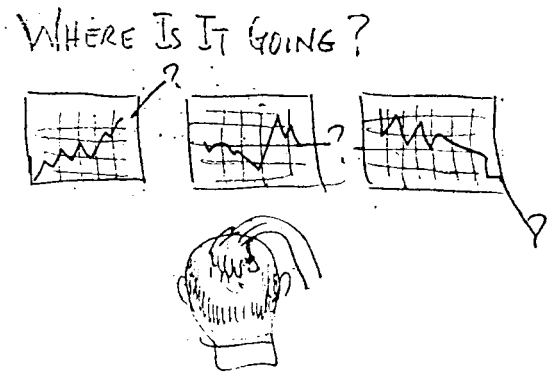


FIG. 7

and TIME for a desirable set of end products.

This concept introduces the most important consideration, CHOICE, among the management attributes. (See FIG. 5.)

By what criteria shall we judge the choices made by management? Let us rule out as totally incompetent, that manager who waits until the product is delivered late, or who knows that costs are more than the allocated resources before he exercises his options. (See FIG. 6). In addition, we would include in that special purgatory the manager who merely modifies his requirements and resource budgets as he sees what products are being delivered and at what costs. As for the latter so-called manager, we would classify him with that French Revolutionary who said, 'There goes my mob; I must see which way they are going so that I may lead them'.

A good manager, therefore, is a dynamic operator. He is continually probing to see whether the Performance, Dollars, and Time PROJECTED on the basis of present and past history will be within these goals. (See FIG. 7). The good manager is always examining options: can he reach the PERFORMANCE in a less costly way? Less timely way? If the PERFORMANCE of the product is not yet expected to meet requirements, can the present resources be redirected, regrouped, or modified (within the budgets of time and dollars) to up-grade the projected performance nearer the goal requirements?

Here, then, is where the manager's probing will be as effective as his familiarity with the way things are now done—and—more importantly—of the new way things may be done. What could the engineered work standards become with the introduction of a new technique? A new technology? A new management design? A new personnel policy, etc.? Would this yield the product in less time or at less total cost?

OPTIMUM MANAGEMENT

Directs - - - and Redirects - - - PROJECT ACTIVITY

so that

- Improved TECHNICAL PERFORMANCE can be obtained only by increased BUDGET (T/$)

AND

- Poorer TECHNICAL PERFORMANCE would result if BUDGET (T/$) were decreased

FIG. 8

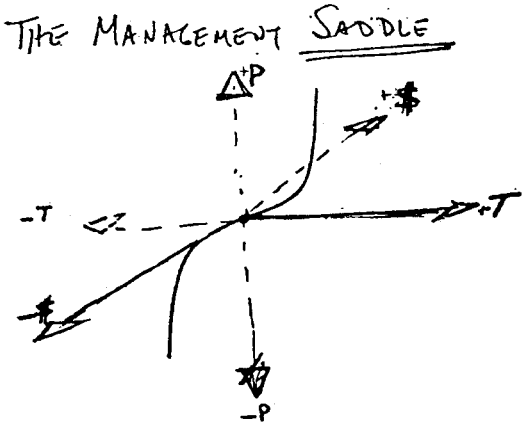


FIG. 9

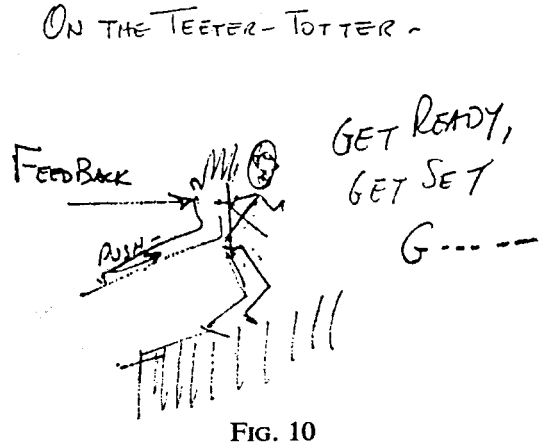
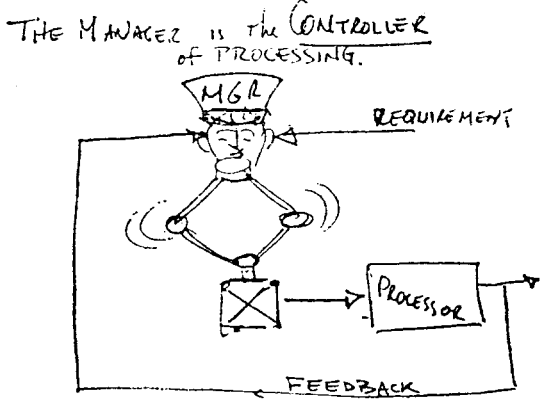


FIG. 10



I would like to summarize the presentation thus far by defining Optimum Management. (See FIG. 8). It is the joint conditions:

(i) Better Performance may be obtained only by increased budgets of Time and/or Dollars, and

(ii) A reduction in either Time and/or Dollars will result in lesser Performance.

In a graphic illustration these joint conditions form a saddle surface. (See FIG. 9).

At any instant the saddle point is determined by the combination of P, $, T, and the environment including the state of the art, technology, management, politics, among others. Thus, since the environment is always changing in fact, the saddle point is always shifting. I believe an older proverb puts it: 'You can never dip your foot into the same river twice'.

The interest of management in regrouping his resource directions should, of course, be responsive to the feed-back in a REALTIME sense. (There have been many attempts to define Realtime, all leading to different interpretations and applications.) We mean by Realtime that the manager's need for triggering-type information does arrive in his hands in time to take the action needed to counterbalance any projected, undesirable results of current activities. It does not mean that our manager must be precariously balanced on the edge of activity, ready to leap at every microsecond. (See FIG. 10.)

Control system engineers will recognize this as a common problem of controlling the time constant and smoothing function on the feed-back path. A short time constant, and we react like a yo-yo, never having time to plan, and probably becoming saturated and driven to distraction, or worse, to the local 'Section 8'. A long time constant, and we are always too late with too little to do

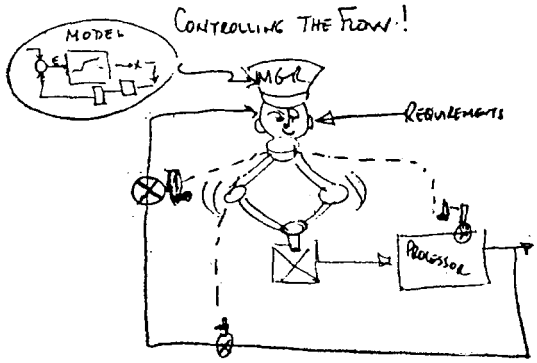


FIG. 12

So—a manager is really the controller in a feed-back-type information system. And, as in any feed-back system, the controller is a device for comparing the status of the controlled process with the requirements and producing a command signal according to some assumption about the process which will drive the controlled member into coincidence with the requirements. (See FIG. 11.)

This concept requires a dynamic interpretation as well as the static picture in the illustration, for the figure can only be an instantaneous picture of a continuously changing operation. The requirements are not fixed, and the environment in which the controlled operation takes place is certainly not a vacuum. For an inventory manager, the South East Asia impact on requirements provides no static directive. And for the production manager, a storm-caused power blackout cannot be classed among the 'planned' production activities.

To this notion of a dynamic operation we can add a new dimension. For not only is the input requirement a time-varying parameter, and not only is the production process subject to unforeseen variations, but the very concept of the control logic of management is itself undergoing a major revolution. This logic determines the content and timing of the information flowing in the organizational paths. It establishes the MODEL for the operation of the system. (See FIG. 12.)

It is precisely because the control logic is changing that many managers who cannot adapt to the new methods and system concept will find themselves managed. The resulting managerial dropouts has created, according to the lead item of the January 24, 1966, *Wall Street Journal*, a class of 'Obsolete Executives', whose ages are far from retirement.

The Impact of the Computer

Management is a decision-making process. It requires access to a store of data, and an ability to assemble the data into an informative pattern—not because the pattern describes history—but because the pattern is a useful one on which to predict the future events. And, it follows, that the better pattern is one which serves to trigger a management action with the least expenditure of management analysis.

In other words—the management analysis should concentrate on defining the model and the pattern of information significant for applying the model—not wasted on collecting the data and forming the patterns. Managers should not be the bean counters; they should define what bean counts are desired and then be told *only* when these particular counts reach a threshold that triggers them into action requiring a choice for subsequent directions.

Perhaps the most significant new element in this which changes the complexion of management is the computer. The advent and application of the computer capability does not merely speed up the processing of data, it introduces a wholly new approach to management planning and control theory and technology. Earlier data systems were bean-counting. They provided the accumulation of data for history. If today's computer is being used solely to accelerate these reporting functions, it is grossly undervalued.

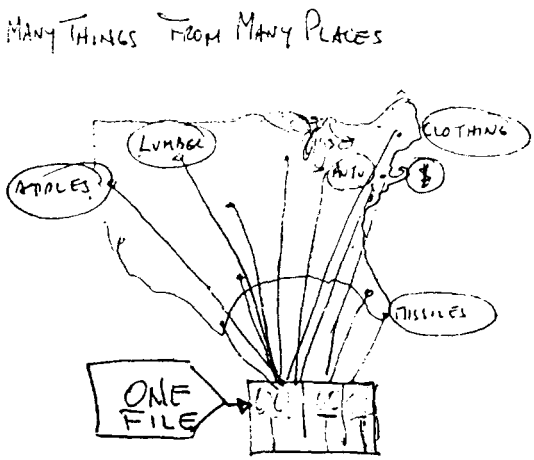


FIG. 13

The computer technology has provided a means to integrate the information developed from a common base—no matter how diverse in content or how geographically scattered. Thus, managers who previously had to accept as 'facts of life' the independence of decision-making that affected integrated functions no longer need excuse the uncoordinated actions. The design, production, test, inventorying, operating, and repairing of an item of hardware is an interdependent series of functions. Sooner or later the operations of one function will have their full impact on all the others. But that impact need not always be beneficial. If the information flow is not timely, there can never be any management action to head off the non-beneficial effects. (See FIG. 13).

Before indicating how the computer-aided technology can assist in this area, a simple example may be of value.

In the life cycle of hardware development, it frequently is necessary to modify a design after the early production has been in operation. Many times, of course, it is only after some period of extended use that the need for a design change becomes apparent.

For this example, let us assume that the change involves an impact on each of the following activities:

(*a*) In Procurement	A lead time changes
(*b*) In Production	Old tooling must be scrapped and new tooling made
(*c*) In Inspection, Acceptance, and Qualification	Training of personnel for new functions
(*d*) In Operation	Doctrine must be changed to use new capability
(*e*) In Inventory	Warehousing space must be changed in support environment
(*f*) In Overhaul	Jigs and fixtures must be built and distributed

(See FIG. 14.)

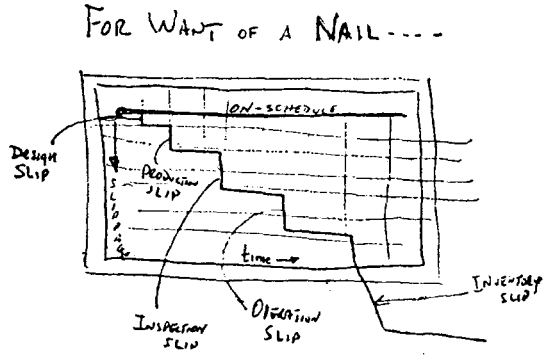


FIG. 14

The manager in each of these activities needs an information trigger in order to institute the necessary accommodations to the design change. Each delay or compartmentation becomes a cascading contribution to the cost in time and obsolete parts. Not only is there a costly delay in the introduction of the improvement, but until the word is passed, there is a continuing expense in the procurement of obsolescent materials. And there is always someone who does not get the word—poor soul!

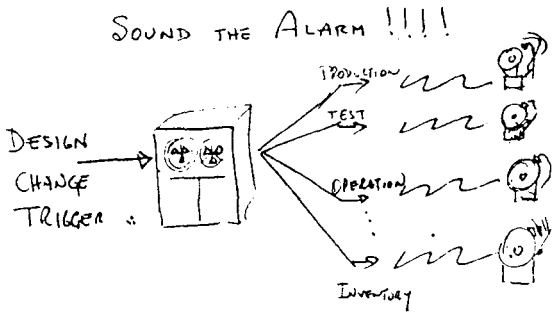


FIG. 15

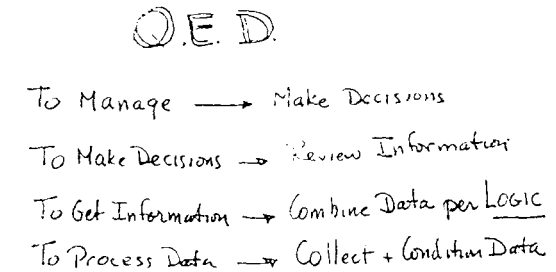


FIG. 16

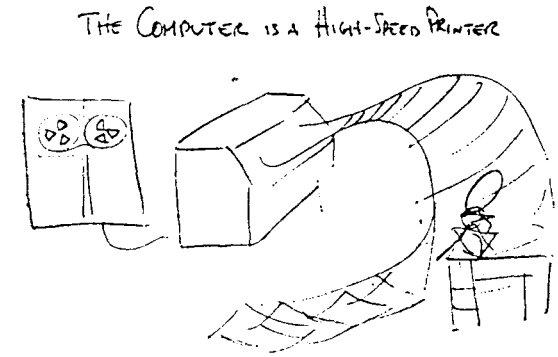


FIG. 17

If one considers the computer as a tool in the communication network, it can be programmed to identify all interested activities for each item of hardware. Then the introduction of a design change instantly provides the affected parties with an 'alert' at the earliest time. In fact, the network can be used to explore the effects of a change when first proposed—and to determine the lead times for each function so that the activity can be gated for most efficient and economic introduction. The results are not only in time-savings, but, more importantly, a significant savings in having inventories keep pace with the demands. (See FIG. 15.) It will no longer be necessary to procure for a worst-case lead time only to have stocks of parts and assemblies wait around until the waiting part arrives at the gating point.

The computer has the capability to permit the collecting of seemingly limitless minutiae about every item of design, production, distribution, and use, and, upon demand, to deliver a manipulation of selected portions of its immense storage. Prior to the introduction of the computer in this concept, complex organizations depended upon a host of middle-managers to assemble and sort pertinent data. But the computer has changed all that. Not, perhaps, immediately; and not totally. Not yet, that is. But, if we may paraphrase Murphy's Law, 'If it can be done, it will be done'. We are not talking here of doing some irreparable harm by misinterpreting an instruction, but of making a step-function improvement in spite of local opposition.

Which brings us to the theme of this paper.

The use of a new technology has given managers an extraordinary opportunity to raise the sights on their levels of management. Managers may now assume that the timely data can be collected from which they would like to develop the information for decision-making judgements.

The Manager's job, therefore, is to assume that the collected data supports his requirements for decision-making information.

To manage, a manager makes decisions;

Decisions require information;

Information requires:

Data + A logic model for processing the data (See FIG. 16.)

Once the model is defined, the data collected, and the information processed, the threshold triggers of the processed data are *all* that a manager needs.

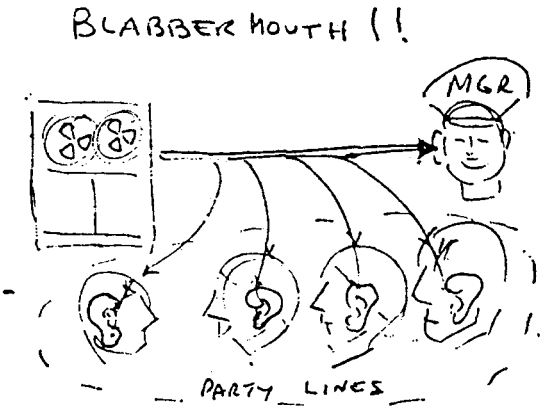


FIG. 18

With so much minutiae in the computer storage, a manager who does not become conditionally selective will be inundated with paper. His ADP will become a high-speed printer, inundating him with more paper than he has hours of the day and night to read. (See FIG. 17.)

However, if such triggers are automatic action starters, they do not need management involvement. As one ADP manager has stated: 'If it is logical it can be computed. If it cannot be computed, it is illogical'. And there are enough problems in this world of commodity management that need the illogic of analyses and judgement based on experience to waste the competent managers on mere repetition of the logical—once established.

Each of us is a manager at his own level in the organization. We receive the requirements from the level above us, and we communicate the directives to those levels below ours. It is our responsibility, at each level, to obtain the optimum mix of Performance, Dollars, and Time. The feed-back data which should indicate our progress towards this optimum is now available to all because of the 'blabbermouth computer'. At our own level, the feed-back data must continually be examined for the triggers to galvanize us into action. If we do not become the active managers to process this data, we can expect that someone else will. Not, perhaps, next week, month, or year; but, inevitably. The competition of the market place for efficient management will produce a manager—if not ourselves, then of ourselves. (See FIG. 18.)

And this is the theme of this paper: *Manage or* BE *Managed!* So—the process of *managing* is at least one of getting needed information—A MANAGEMENT REPORT.

A management information report is just as much a product as a piece of hardware or test equipment. Defining that product is a manager function in the same light as for any piece of hardware.

Now—to apply our previous concepts—the manager who needs the information must define his product performance characteristics: (these are the contents and formats of each report.) He must also define the time he wants each report, and must allocate the resources (Dollars) he wants expended for the report. Here, too, he does not manage the report generation, nor does he perform any of the processing to generate the report. His requirements usually become part of the mission of some other office.

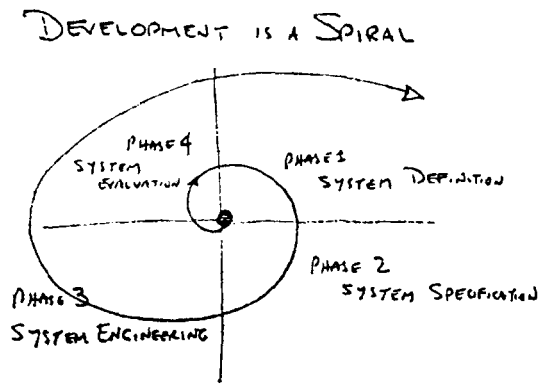


FIG. 19

The development of a managerial information report is much like the development of any other product: it is the result of an evolutionary process; not a revolutionary one. The time cycle for such an evolution is bound to be lengthened when a radically new technology is being introduced. The process, in any case, resembles a spiral and not a circle. (See FIG. 19.) As each new facet of the product (management report) is introduced, the performance of

that product is evaluated, and the resulting modification to the product cycles again—and again—until the optimum is approximated satisfactorily.

One further application of our management concept to this product development is of interest. If the manager waits until the allocated budget of Time and Dollars is spent before evaluating the item produced, there is no longer any room for manoeuvre. If the product is satisfactory at this first cycle—it will have been a miracle.

The manager's plan for management reports, therefore, must include a feedback of such increments as to permit the manager to *respond* to or *control* the report development. The request for an information system that does not include provision for incremental report deliveries gets exactly what it deserves —and deserves what it gets.

Usually, the spiral of evolution for each management information system covers the following phases in its cycle:

Phase 1: System Definition

Who makes decisions?

What info affects these decisions?

What data becomes info?

What logic relates data→info?

Phase 2: System Specifications

Form and content of data transactions

Form and content of reports

Procedures for generation, release, distribution, and use of data and reports

Phase 3: System Engineering

Pilot model implementation

Specific configurations of hardware, instrumentation, people, and data

Phase 4: System Evaluation

Requirements for refinement

Incremental evaluation of an information system may be accomplished in several ways.

It is in just this aspect of evaluating an information system that we feel, somehow, that we are being 'managed'; that we are on a treadmill, not the masters of our own fate.

The question is properly phrased: 'What are valid increments for evaluating progress of a management system?' Answers to this question, we are often told, are determined by the economics of the ADP programme development, adding somewhat to our feeling of helplessness.

It is the nature of this 'ADP beast', the argument goes, that the programme development proceeds along fairly well-defined routes:

(i) Defining the structure of the File Accumulator of Data

(ii) Developing the ADP programmes to enter new Data into the File

(iii) Developing the ADP programmes to update File Data

(iv) Developing File retrieval programmes for Data entering a report

(v) Developing the processing programmes for the retrieved data

(vi) Developing programmes for Report preparation of processed data.

It is to be expected that the most economical development of the ADP programmes results from a gating that eliminates false starts. We are then told, for example, that the File Structure should be completely defined before programming data entry is started; that the File update should be complete before retrieval is begun; that report preparation should be started only after the prior steps have all been completed. Therefore, the argument goes, the first useful management report increment is ready not much earlier than the last.

This is a deception spawned on conceit!

No manager of consequence would claim that he has to wait until all subassemblies are fitted together and tested as a whole before determining the progress. It certainly would be far cheaper to eliminate tests of incomplete or early-design units and wait until the whole is available, provided the tests of the whole do turn out successfully. There would be no need for intermediate trials of a Polaris, an Apollo, an aeroplane wing, or an automobile suspension system, if the first apparently acceptable design does work when tested in the whole system at final assembly stages.

But we are willing to accept nature's law of uncertainty, and we do pay for the added cost of system checks by building incremental outputs—as an insurance against the prohibitively expensive cost of a major redesign. I am not willing to admit that ADP programme developers are so much superior intellects that their first successful efforts in any one phase will be the last effort needed in that phase before delivery of the final product.

I insist, therefore, that the incremental end product of a management system is a useful report; that it requires the planning of a development route that proceeds through the logical steps above with far less than a complete file structure, updating programmes, or retrieval programmes. The successive trials of a more up-to-date design will point out some things we tested and subsequently had to change. This will cost more than an error-free system development will cost—but the error-free system development is as remote as perpetual motion.

Moreover, the error-free ADP programme development, if ever attainable, would be a characteristic of a static environment. Its development would have to proceed from the assumption that management requirements, once defined, never change. It may turn out that the investment in programme development is so great by the time the total system is ready to be checked, that any modifications required by management become excessively expensive and would be discouraged. So a system is born—late—aged—and already obsolete because it was not conceived in a dynamic environment.

The manager who accepts this argument is indeed *managed.* He settles for the report that is available—and not the report he wants. He is the one who says 'Give me the report and tell me what to do with it', or, 'I know what I want is in this mass of data—so give me the whole file print-out and I'll get the meat of it myself'. And then is inundated with paper.

The functional operational manager who is responsible for a mission must accept the obligations of that assignment. He must manage. He must—

(i) Set his goals, objectives, plans in unambiguous terms as events

(ii) Establish the time sequence for the events—some in series—some in parallel

(iii) Provide logistic support for accomplishing ($/skills/resources)

(iv) Establish the paths for feed-back of necessary data

(v) Determine the Management Report Requirements

(vi) Provide ground rules for local option.

In every one of these areas the manager can get invaluable assistance from—
The Systems engineer
Operations analyst
Statistician, Mathematician
Information System designer
ADP Analyst.

But the buck stops here—
Once accepted,

(*a*) The events are the Manager's responsibility
(*b*) The time sequence
(*c*) The logistic resource support
(*d*) The feedback path of info for decision
(*e*) Management Report
(*f*) The ground rules for local action are all his (not the aides).

This, then, is my message—
Managers,

We have a golden opportunity to exercise our profession (art) (science), unfettered by the lack of data

We can put our years of professional experience and training to use by exercising the judgements that can be made only in terms of this unique, individual resource

We can find the time to extend our horizons to developing the models—or plans—of how things should be, and

We can set up the decision points in this model where we must become involved with all that illogical judgement at our command.

I am confident that the 'heat of this kitchen' will sooner or later eliminate the cooks who can't manage. They will join the ranks of the *managed.* It is a challenge we cannot duck.

I am sure you managers are equal to this task!