Defining management’s information needs

by TREVOR JOHN BENTLEY
Tilling Construction Services Ltd.
Collingham, England

ABSTRACT

Before we can discuss Management Information Systems on a coherent and beneficial level we must know the needs of those at whom the information is directed. It has been said that a good salesman can create needs for his product and there is no doubt that this is what has happened in the development of computer based systems. It is time we found out what our customers’ real needs are and it is time that we admitted to ourselves that these needs may not always require the most sophisticated solution.

This paper describes a survey which sets out to establish management’s information needs by focussing on the decisions taken by the managers and the information necessary to provide the input for the decision process. This identification of decision points and the subsequent analysis of information needs is an essential prerequisite for the successful design of meaningful information systems. The steps to be taken are set out in detail together with my comments based on the practical experience of carrying out such an analysis. At this time the survey has not been completed but by June '76 results should be available for discussion.

THE PROBLEM

The problem to which this research addresses itself was clearly defined by James D. Gallagher who sets the following goal for an information system.

“The ultimate goal of an effective management information system is to keep all levels of management completely informed on all developments in the business which affect them. To do this, the data-processing personnel and those entering information into the system should know exactly what data to collect and which to tabulate, and management on its part has the obligation to be able to write down its actual requirements for internal information.”

The problem of knowing “exactly what data to collect and which to tabulate” is not new to management. Edward T. Elbourne recognized this in 1914 when he wrote.

“It is quite possible for the Management to collect more information than it can use to advantage, or which is more costly, or hinders production more, than the information is worth. This is a real danger that has to be guarded against continuously, for routine that serves a valuable purpose when initiated may cease to be useful by some later change in conditions.”

Information is the raw material which the manager needs to make a decision. Without information the manager is unable to carry out his function in the organization.

“The manager needs information to assist him to select courses of action i.e., take decisions, to control the implementation of action and to record the success or failure of the action taken. It is necessary therefore to define the decision making areas of each manager’s job in order to provide information which will be of help.”

The relationship of information to decisions is fundamental to the research and is clearly a vital consideration in the development of the right approach to the problem. The manager must then receive information related to his job, his responsibilities and the decisions which he takes. Such information can be broadly categorized.

“The manager needs several kinds of information:

(a) the objectives which he is to attempt to achieve;
(b) technical information about specific jobs, for which he is responsible;
(c) control information based on feedback of the results of decisions so that corrective action can be taken;
(d) background information about activities related to those for which he is responsible and of the company and the environment in which he is operating.”

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Some of this information will be available, some will not. It is obtained from both internal and external sources. Managers already have sources of information which they use for making decisions and the research must start from the present position and examine—

1. The information presently used,
2. The information needed but not available, and
3. The information which cannot be obtained.

"The manager will never be able to get all the facts he should have. Most decisions have to be based on incomplete knowledge—either because the information is not available or it would cost too much in time and money to get it. To make a sound decision, it is not necessary to have all the facts; but it is necessary to know what information is lacking in order to judge how much of a risk the decision involves, as well as the degree of precision and rigidity that the proposed course of action can afford. For there is nothing more treacherous—or alas, more common—than the attempt to make precise decisions on the basis of coarse and incomplete information."5

The research will aim to answer the following questions.

1. How can key decisions be isolated?
2. Can a decision structure be devised?
3. How can the information requirements of the decisions be assessed?
4. Can the utility of the information be determined?
5. How can the degree of risk be related to the availability of information?
6. Can an information system be designed to satisfy management's needs?

Information is a peculiar thing which varies depending upon when it is received, how it is received and who receives it. The same piece of information may be interpreted differently by different managers depending upon their attitudes and approach to the decision concerned.

"Like management itself, management information has vital human implications. . . . To demonstrate a point, then, let's consider the implications to various people of a train whistle penetrating the evening dusk.

To the saboteur crouching in a culvert it might signify the failure of his mission because the whistle indicates that the train has already passed over his detonating charge without causing an explosion. To the playboy it might presage the imminent arrival of a transgressed husband. To the fireman in the cab of the locomotive it indicates a drop in steam pressure and the need for restoking the furnace. To the lonely wife it means the return of her travelling husband. To the man with his foot caught in the switch down the track it presages doom. . . . For another (preparing to retire) it signifies time for prayer. . . . In brief, the nature and significance of any information are fundamentally and primarily functions of the attitudes, situations, and relevant responsibilities with respect thereto of the people involved with it. . . .

. . . Information is management information only to the extent to which the manager needs or wants it; and it is significant to him only in terms of its relation to his accumulation of relevant knowledge and plans and to his personal responsibility."6

The problem being faced is therefore a complex and difficult one. There is unlikely to be a specific solution, but if a way can be defined to analyze and categorize information needs then the aim will have been achieved.

". . . There is a frighteningly common desire today to prove that incredible amounts of information can be developed with electronic devices by preparing business reports that are incredibly long, incredibly dull, and, all in all, just plain incredible.

Information alone is not enough. Try visualizing for example one of our big daily newspapers if it were presented straight off the wire in continuous columns, with no headlines, no attempt to avoid duplication, and no simple means of judging the relative importance of the various news stories or putting them in proper perspective. Would you even attempt to read such a paper? I think not. Yet management is frequently forced to hunt through a haystack of irrelevant information in its reports in order to find for itself the needle of pertinent fact. What is needed, obviously, is a planned system of business intelligence—or, as the
author of this report prefers to call it—a "management information system" which selects, rejects, edits, and headlines business information—in short, which turns it into business intelligence.'

THE SURVEY

**Meaningful information**

Meaningful information can be defined as follows:

(a) For data to be called information it must add to the manager's store of knowledge.

(b) To be meaningful the increase in knowledge must be relevant to the manager's decision-making activities.

For example there is no point whatsoever allocating overheads to cost centers when the cost center manager has no control over those costs. Neither control nor information will be improved by such arbitrary accounting conventions.

It must be realized that the majority of the data presented in monthly accounting reports does not fall into the category of 'meaningful information', as most of the data contained in the accounts is already known to the manager from whose activity it originated. It is certainly not new to him. It has simply been converted into misleading monetary terms. This is particularly so in a period of high inflation. It is quite clear that we must provide data in terms of quantities and hours and other inflation-proof measures.

**Defining management's needs**

It is vital that management's information needs are examined so that meaningful information systems can be designed. The System Designer, however, must not:

(a) Ask the manager what he wants; simply because he will not be able to answer, unless the question can be related to his decision areas.

(b) Tell the manager what he needs; this will and does cause resentment and leads to systems oriented managers rather than management oriented systems designers.

(c) Give the manager what is available; this is the most common practice and has, I believe, led to the paperwork explosion that is burying management in useless data. The computer has unfortunately added to the paperwork explosion by providing more information which is now more readily available, a good deal of which is irrelevant.

The systems designer and the manager working together must establish the following.

(a) The decisions taken by the manager.

(b) The information ideally required for those decisions.

(c) The information currently available.

It is probable that this analysis will result in the situation depicted in Figure 1.

Achieving the above is more difficult than it might appear, and unless a carefully structured approach is taken it will be impossible. There is no alternative to a detailed systematic analysis on the following lines.

Step 1: Determine decisions—This can only be done by spending some time with the manager and learning from observation and analysis the decisions he takes. It will be apparent from this that his decisions will fall into the following categories.

Routine: taken regularly; highly structured with easy access to the data required, e.g., raising a credit note for a pricing error.

Mechanical: taken less frequently, but still structured with known data requirement, e.g., producing a production schedule.

Complex: taken infrequently, unstructured, depending largely on current circumstances. Unknown information requirement, i.e., cannot be predetermined.

If the impact of these decisions on the managers' results can be assessed, then a Decision Grid can be completed for each manager. (See Figure 2)
Step 2: Information Analysis—For each of the decisions on the Decision Grid it is necessary to produce an Information Analysis Grid (See Figure 3), which records the information ideally required in the following sections.

Class: Available and used
Available not used
Not currently available

and

Category: Vital
Desirable—economic
Desirable—uneconomic

It is then important for the manager to assess the degree of risk if the information is not available. This can be recorded as HIGH, LOW, or by the use of probability scales.

Step 3: Decision Analysis—With the above information it is now possible to complete the Decision Analysis

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**KEY DECISION GRID**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Minor</th>
<th>Important</th>
<th>Vital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**INFORMATION ANALYSIS GRID**

<table>
<thead>
<tr>
<th>Vital</th>
<th>Desirable</th>
<th>Degree of Risk if Information is Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available and used</td>
<td>Economic</td>
<td>Uneconomic</td>
</tr>
<tr>
<td>Available not used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not currently available</td>
<td></td>
<td></td>
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</tbody>
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Figure 2

Figure 3
(See Figure 4) which is the master document for the design of the system. On the Decision Analysis the information requirement is split into the four main types of information—

- Objectives (Plans)
- Technical
- Control
- Background

This will be used to define where the information comes from, the frequency, content, accuracy level, etc. All important points for effective systems design.

Step 4: Providing the Information Required—Re-
ferring to Figure 1, Action should be taken to—
(a) produce the information required,
(b) eliminate the information not required.
Producing the required information may take some
time to achieve as it will call for the amendment of
some systems and almost inevitably the re-design of
other systems. A good deal of useless information can
be dropped fairly quickly and this should provide some
relief for the inundated manager.
The above steps are implemented in the following
way.
(a) The managers concerned are invited to a sem­
inar which explains the relationship of infor­
mation to decision making and its importance
to their individual performance.
(b) Following the seminars the managers are vis­
ited and interviewed by the researcher who
assists in the completion of the Decision Grid
and Analysis Sheets.
(c) The researcher then analyzes the results and
presents a report covering:
(i) The decision points.
(ii) The importance of each decision.
(iii) The information required.
(iv) The existing source, if any.
(v) The basis of the new system if one is
required to provide information not cur­
rently available.
Throughout the above the researcher must act only
as an adviser and analyst, it is imperative that the
manager assesses his own information needs related
to the decisions which he takes.

BASIC INFORMATION SYSTEM CONCEPTS

When the manager's needs have been established the
kind of Management Information system which is
most suitable for the circumstances must be examined.
It is fatuous to think that the existing system is of any
use whatsoever until the comparison between what is
needed and what is available has been made.

There are three principal categories of Management
Information Systems.

(a) Data Bank
All data is recorded for every transaction and
placed on file. It is then available for answer­
ing questions.
(b) Systems Basis
Information flow designed to accept and proc­
ess data as a management tool. Leads to ex­
tensive systems with complex programming.
(c) Combined Systems/Data Bank
This is a Decisions Based System approach and
provides systems for certain areas oriented to
decision making and a data bank for others
dependent entirely on management needs.

The most applicable approach for the majority of
companies is that indicated in (c) above, namely a
combined systems/data bank approach, the reasons
for this are as follows:

(a) Complete data banks are impracticable, in that
much of the information is obsolete before it
reaches the file and even when it is there it can
be very difficult to retrieve. Questions cannot
be sufficiently pre-determined to allow for an
adequate questioning sequence to be built into
the file. Some of the underlying concepts of
this approach are not acceptable e.g., all data
is not valuable and generally it depreciates with
time. In addition to which the form content and
frequency of information should not be dictated
by the systems, but by the needs of the decision
making process.
(b) The total system approach requires extremely
complex systems designed on the basis of how
information can be used by functions and the
understanding of the flow between functions and
processes. This makes the whole informa­
tion network system oriented, inflexible and
too complex to be understood by the manage­
ment using the information.

Decision based systems have several advantages.

(a) It is necessary to identify decision areas and
then ensure that resources are available.
(b) Management's information needs must be
clearly defined and it is usually established that
less but more relevant information is required.
(c) Information is directly related to the task and
thus ensures it is available in the right quan­
ty, of the right quality, and at the right time.
(d) More efficient use of computer hardware is pos­
sible when it is directed towards management
needs.
(e) The production of relevant information for
making decisions should lead management, if
they use this information correctly, towards
making better decisions.

COMPUTERS AND MANAGEMENT
INFORMATION SYSTEMS

The term Management Information System is linked
in most people's minds inexorably with computers.
This link is understandable as all current literature
on Management Information Systems concerns itself
exclusively with computer based systems. It is not, of
course, necessary to use computers when discussing
information systems, they do have their place and it
is part of the System Designer's function to recognize
when to use computers and when not to use computers.
The computer's main strength lies in three areas.

(a) Routine Data Processing.
(b) High capacity fast access storage and retrieval facilities.
(c) Mathematical models for simulation.

Routine data processing is mainly concerned with accounting procedures and related analysis for information purposes. This is still the major application area, particularly in the U.K. The computer's ability to handle large volumes of routine data extremely quickly in batch mode has led to the wide development of such routine batch processing applications. They are not as glamorous as the so called "Integrated Management Information System" applications few of which exist.

The use of high capacity, fast storage and retrieval facilities has led to the growth of on-line and real-time operating systems, which however effective at controlling airline bookings, do not provide much if any management information. A large UK holiday company used real-time systems for booking control, and then batch processed the data for accounting and information purposes. Unfortunately the company went bust.

Simulation models are undoubtedly a valuable management tool and can aid decision making. However, their development requires a high degree of mathematical competence, and a profound understanding of the business problems. Attributes rarely possessed by the same manager. If models are to be used effectively then they must be—

(a) Small and relatively simple,
(b) Used regularly, and
(c) Built by managers.

One of the risks of using computers in decision making is that the model builder will attempt to construct programs containing value judgments, and it is here where failure must occur. In addition the social aspects of decision making cannot be programmed.

"Since no computer programs have yet been written which pick from an open-ended range of possible selections, it is now impossible to arrive at 'managerial' decisions by automatic process."

The systems designer must first assess the problems before he attempts to develop any single approach to the solution. I personally believe that the computer specialists have for too long been offering management a solution in search of a problem.

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It would be of great benefit to most companies if the systems designer obtained answers to the following questions before computers were included in the plans.

(a) Is the existing non-computer system the best possible?
(b) Is there any other way?
(c) Do the system requirements fall within the strengths of the computer?

(d) Five reasons why a computer must be used over any other system.
(e) The importance of the system to the company.
(f) What will the company lose if the system fails?
(g) What are the benefits in £p from successful implementation?

STAGES IN DEVELOPING THE MANAGEMENT INFORMATION SYSTEM

As we have already seen the systems designer is faced with three major problems in designing a decision based information system.

(a) Obtaining an understanding of information and its importance to the managerial function.
(b) How to establish what information any particular manager requires in order to meet his decision making needs.
(c) The means by which this information can be collected, stored, processed and retrieved.

At the beginning of this paper I suggested a means of establishing management's information needs. The systems designer, by using the approach indicated, should have obtained answers to the following questions.

(a) What are the key decision areas at each level of activity?
(b) What information is required to make the decisions?
(c) What information is lacking?
(d) How can it be obtained and at what cost?
(e) Does it require amending existing systems or introducing new ones?

A systems framework can be established which will indicate what work has to be done to provide the needs of management. Existing systems cannot be withdrawn and replaced overnight, so a plan has to be formulated. Rationalizing existing systems based on this framework will produce the most immediate benefits. This is done in two stages:

(a) Prepare improvement program indicating the priority areas.
(b) Simplify existing procedures.

The flow of information from computer based systems must be examined to ensure that the files hold data in the most useful form for meeting the information requirements of management. The conflict arises as follows and limits the effective use of the computer.

(a) Files are designed to hold information in the sequence most appropriate to the operation of the computer systems.
(b) Information required is seldom needed in the same sequence that facilitates rapid operation on the computer.
The possible solution is to create files based on information needs and secondary files or improved systems to handle the operational data needs.

The provision of an information system for management must be tackled slowly with the development of individual subsystems linked together by the decision-based reporting system.

Developing new systems should be one of evolution for the following reasons.

(a) Too many activities to be absorbed at one time.
(b) Human effects of change.
(c) Complexity of changes.
(d) Limitation of available man hours for effective systems design.

CONCLUSION

I am convinced that the provision of—

the right data, at
the right time, in
the right place, for
the right reasons,
is the principal aim of the systems designer, however, he cannot achieve this aim without a close involvement with management and a deep understanding of management decision making processes.

REFERENCES