Norman Eason's "Maintenance and Asset Management Information Systems"

Select the information to be collected according to the support that it provides for your goals

Chapter Three. Data and Information
Part 2.

The Data Necessary to Provide the Required Information

We can see that the effective management of assets depends upon monitoring appropriate **information** about the asset throughout it operating life. Here it is important to consider what we mean by **appropriate** information. This is where the attitudes of those operating an **asset management** strategy differ greatly from those operating a **departmental maintenance** strategy. The latter would expect to concentrate his information around the utilisation of his workforce and the management of his stores. An **asset manager,** however**,** will be interested in factors such as the quality, cost, efficiency, etc. of the product throughput and of the service to **his** customers as well as the parameters collected by his **departmental maintenance** colleague. Because of his roles as a **resource manager** and a **business manager**, it is essential that he concentrates on optimising the **effectiveness of the asset to the business** and not just the effectiveness of the maintenance team.

A very good example of these different attitudes occurred when I was taken around a manufacturing plant by one of my clients, a world class engine manufacturer. We saw a maintenance operative leaning against a milling machine and chatting with the machine operator. The maintenance man didn't move or try to look busy when the Plant Manager and I walked past, and I remarked on the fact to my client. He

Productivity is meaningless unless you know what your goal is.

Dr. E. M. Goldratt,
Author, 'The Goal'

responded by saying that, as they use information extensively to maintain their world class status, they were able to determine that approximately where the maintenance operative was standing was within a short distance of the most critical plant in the building. Therefore, he could reach the plant and start solving any potential problem quicker than if he were normally situated in a maintenance shop elsewhere in the vast operating area. Furthermore, he said they did not believe in occupying their maintenance staff with minor tasks just to keep their utilisation up - they had lower qualified operatives to perform these tasks - and were more interested in the skilled operatives' **availability** than their utilisation.

Here again we have a parallel between the availability and effective use of resources for maintenance and the availability and effective use of resources for production. Concentrating effort on what is important is essential for a competitive and aspiring world class organisation.

Collecting Information at the source requires negotiating skill!

Difficulty in Collecting Data

I have lost count of the number of organisations whom I have visited and been told that they do not collect data because it is deemed to be too difficult, so that these organisations end up with insufficient, inappropriate, and usually incorrect data. Difficulty – or perceived difficulty – in the collection of data is the most common reason for the lack of good and useful maintenance data. The collection of maintenance data is often seen as additional work for the tradesmen which they do not wish to carry out and which their supervisors, in an increasingly tight financial environment, feel they are unable to justify to themselves, their workforce, or their managers. This attitude is understandable, even if one would not wish to agree with it. The returns from the collection and analysis of data are usually long-term and have no chance of competing with the short–term pressures of most maintenance organisations.

An organisation that runs like clockwork is great
- if your goal is to run around on the same circle

Anonymous

An employee must always know the relevance of what he is being asked to do

Russell Varian,
Founder,
Varian Associates Inc.

The time has passed when strong union representation meant that additional work such as recording readings or fault conditions was considered to be clerks' work and not appropriate for an indentured tradesman. Now these tradesmen are probably demonstrably busy with tougher schedules than they ever had in the old days and both they and their supervisors see the difficulty in adding to their workload. Nevertheless, without measurement of the effectiveness of maintenance activity (rather than the efficiency of the workforce), there is no hope of improving the ability of the assets to deliver their product or service in an optimum or competitive manner. As we saw earlier, the ability to measure effectiveness is essential if an organisation is to be able to cope with changing requirements. It is insufficient to maintain the status quo.

It would be wrong to assume from the above that all maintenance operators are working flat-out and are justified in refusing to collect maintenance data. All readers will be able to cite many operations where this is far from the norm. Thus we have to recognise that motivation is a problem in relation to the collection of data. This area will be covered in more depth in Chapter 15. Suffice to say at the moment that the problem is not all one-sided. If the operation can benefit from the collection of appropriate and accurate data, then it is essential that the workforce is not only made aware of this importance but are shown how they fit into the picture. This would appear to be an obvious requirement for good staff relationships, but is often forgotten or intentionally by-passed as pressures mount.

Of course, it would be even better if the employee could be persuaded that his collection of data would not only benefit the organisation but would in some way be of help to him in doing his job. Tact is required to present this in a positive way and not take the easy route of defining benefit to the employee as the ability to keep his job! (A client of mine defined this as

Nothing creates more self-respect among employees than being included in the process of making decisions

Judith M. Bardwick, U.S. academic

representative of the traditional approach to maintenance, to which he ascribed a new Three Letter Acronym, in this case TCM – Threat Centred Maintenance!).

Achieving a situation where the workforce appreciates the need for the correct collection of data is far from easy. It requires knowledge and respect on both sides. Very often, the people with the **real knowledge** are those who spend every day of their working lives on the activity that management now wish to monitor. Without their active participation in the process of changing to the new requirements for collecting data and their ability to understand why this change is necessary, the activity is likely to fail. The effect of the change on their work tasks and on their jobs must be properly explained to them along with a clear and truthful explanation of its effect on the operation and on the company as a whole. Time must also be allowed for a discussion on the subject and for the reasoned response of the workforce to be noted.

Consider the impact of data collection on employees

Because

Collecting irrelevant data demoralizes

This is not suggesting that the workforce should be pandered to! Too often, however, the opposite happens, resulting in alienation of the only people who have the capability to make any new system work. Bear in mind, though, that it is quite possible that the workforce have become entrenched in their attitude. If this is the case, then the explanation of why the changes should be made and how it affects their jobs had better be good, otherwise its chances of success are poor. And if the workforce know much more about the maintenance activity than the person trying to persuade them to change, then there is virtually no hope of making it work!

The difficulty in collecting data can be compounded by the process of change. As identified earlier, few organisations – even those that appear to be entrenched in old ways – remain entirely static in their real need for information. However, their processes may well have remained unchanged for several years, creating a ‘sameness’ in operation that deteriorates and becomes less relevant to the current operation. This

Specifying relevant data collection requires a Maintenance or Asset Management Strategy

encourages a 'What's the point' attitude and the more outdated the collection task becomes, the less relevant is any data that is collected. It is surprising how often this situation is allowed to continue. Of course, the effort required to audit the activity is invariably difficult to fit into a tight operating schedule. And it can always be left to a later date as the immediate consequences of not changing the operation now are small. Also, the activity (and the problem) is usually not visible at higher levels of the operation. But the time taken to enter unnecessary or incorrect data is, in effect, wasted time because it is no longer relevant or usable. This wasted resource is analogous to allowing a faulty valve to continuously leak steam or fuel without taking the necessary action to fix it. Here again we see the similarity between data and assets. In this case, both the data and the labour resource are poorly utilised because of the ineffective operation of their maintenance.

Of course, this brings up a more fundamental problem. That is the inability of some organisations to specify what data is required in the first place. Many organisations continue with the way that they have always done maintenance, relying on whatever improvements they can make on last year's figures (almost always **cost** figures) and do not seem to have the ability to define what they really want (or need).

This points to an inability to define a proper maintenance or asset management strategy that is related to the requirements of the business. I am continuously astounded that many organisations (including some very large and outwardly prestigious organisations) still operate without a proper maintenance or asset management strategy and procure information systems without such strategies in place. It is little wonder then that they have difficulty in specifying the data to be entered into their systems and in the motivation of their staff. This topic will be covered in greater detail in Chapter 14.

Returning to the analogy of data as an asset, we saw earlier that, as with an asset, the 'site' on which data is installed is

In the information society nobody thinks.

We expected to banish paper, but instead we actually banished thought.

Michael Crighton, Author, Jurassic Park

Where do you keep your data?

Location
Location
Location!

fundamentally important. However, as with an asset, the site may have been appropriate at the time that the original data was installed but as the years go by and requirements change, the site may become less appropriate and may in fact begin to act against the best interests of the operation. The best example of this is work records. Before computing became common in maintenance management operations, record cards were used to keep information on faults found and work done. These record cards were relatively easy to use for collecting data, but were extremely difficult and time-consuming to analyse. With the introduction of computers, these records were transferred to computer files and the activity of analysing faults and work done became so much easier. In the same way, methods of input are improving and it is now possible to validate data close to the source of the work, thus eliminating transcription errors, increasing the motivation of the workforce and ultimately improving the quality of the data. Thus **any** mechanism for easing and improving the data entry activity must be worth considering.

Data Quality

Data Management is a skill that needs to be developed

As we have seen earlier, there is a general lack of awareness in industry of the relevance and importance of assets, and consequently their health, to the operation of a business. It will therefore be no surprise to realise that our other asset – data – also suffers from the same malaise. The health of data is measured by its quality, and quality is determined, as for any other asset, by how well it is looked after. **If data is wrong, inaccurate or suspect, it is not worth collecting.**

The quality of data never improves. It can at best remain at the same level at which it was collected. It is the responsibility of its 'asset manager' to limit its deterioration.

Unfortunately, the management of data is not a skill that is common among maintenance managers. What experience they have in this area is usually associated with information related

to the utilisation of their workforce rather than plant performance. Correspondingly, accuracy of data is normally associated with consolidation of timesheets. As a generalisation, as long as the required hours are booked, then the data and consequent information are taken to be satisfactory. This, however, is far from satisfactory when data and information for **asset management** is being collected, stored and analysed. In order to minimise deterioration, it is essential that every step in the life cycle is managed. This starts with the entry of the data, the area that is most commonly neglected by many organisations.

Data Transfer is a danger point—be extra careful

As stated earlier, the data acquisition activity is sometimes set up with the best objectives and then allowed to deteriorate because of insufficient funding or management time. Other organisations don't even put this initial effort into the activity. I have seen many organisations spend millions on the acquisition and implementation of maintenance and asset management information systems and then allocate virtually no funds or effort to the data acquisition activity. This inevitably results in the deterioration of the data and information and a consequent deterioration in the respect of the workforce for the system. This ultimately results in a decision to replace the software (the software always gets blamed for the poor data quality!) and the cycle starts over again. I know of several organisations that have replaced their software on a five-year cycle. They never intended that this should be the case, but it is like a poorly maintained car; every so often it needs to be replaced, but much sooner than if it had been maintained properly.

Another reason for poor data or deteriorating data quality is insufficient attention paid to the process of transferring data from an old to a new information system. This is a task that is often carried out without consideration of the effect it has on the eventual successful operation of the system. It is wrong to assume that all of the old data will be required by the new system. It is also wrong to assume that all the data can be passed over without first checking its validity and thus its quality.

However, this is an extremely costly and time-consuming exercise, which is a possible reason for neglecting it in the first place.

If the data starts off wrong, then it, and its resulting information, is always going to be wrong. So what steps can be taken in order to maintain the quality of the data and the information? Technology can play a part, but as stated earlier, this is always changing and so what is appropriate one year will be superseded by better methods as technology improves. This area will be covered at greater depth in Chapter 8. However, there are general facts and rules that apply no matter what technology is used.

The first fact refers to the transfer of data from work sheets into an information system. Even in so-called advanced systems, it is common for the work task, and the results of that work, to be communicated by means of paper or card-based work dockets. There may well be very good reasons for doing this, but there is a significant downside to this decision. This, of course, relates to the quality of the data that is ultimately entered into the information system. Recognising, as we saw before, that the quality of the data can at best stay as good as it was when acquired (and that in itself may be difficult to ensure), then the process of transferring the data from the work docket to the information system is the first major activity in the deterioration cycle.

Keyed-in data can, at best, have 0.5% errors – if the operators are knowledgeable and well motivated.

If this is not the case, error rates can be 10% or over.

If the error rate is over 10%, then how can you trust the data or its resultant information? In fact, why bother to collect it in the first place? You could save the cost of the data entry clerks, the workforce time taken to collect the data, and the analysis time to

prepare the resultant reports – and be no worse off! Yet organisations still operate in this way without questioning the validity of their activity.

The following rule for data entry is so obvious that it should not be necessary to state it, but is very seldom adhered to.

Validation effectiveness improves the nearer the data entry is to the asset and its work.

If you can check the accuracy of the entered data while you are beside the source of that data, then you can be as sure as you are ever going to be that the data is correct. If, however, you have to question the accuracy of the data – let's say the handwriting on the work docket is poor – at a data entry point remote from the asset, then the capability for accurately confirming the data is considerably reduced and the temptation to enter something – anything – that the system will accept is great.

This whole area is also greatly affected by the motivation of all those involved with the entry of the data – workforce, data entry clerks and whoever is tasked with checking and auditing the data. I once had a client who had so many errors in data entry that an engineer was assigned for two days a week to correct any errors – many of them with jobs recorded not only on the wrong asset, but on the wrong **type of asset**!

What they should have done was to correct the source of the problem rather than trying to correct the results of the problem. While I'm sure that the engineer was doing his best, it is possible that he was causing further deterioration to the data by his actions, especially as he did not go back to each asset to verify the details, but relied on his experience and memory to make his corrections. There is no substitute for using expertise at the time and place where the work was done.

There's never enough time to do it right, but there's always time to do it over

Jack Bergman, Jordache Enterprises, Inc.

Types of Data

It is some time now since data could be considered simply as one of two types – alphabetical and numerical. There is now a vast array of data types with collective terminology relevant to various uses of data. Multimedia has considerable potential for use in maintenance and asset management, but its use without the planning and care which have been demonstrably absent in 'ordinary' data systems would be potentially catastrophic. Dark Data – unstructured data such as word processing files, spreadsheets, image files, fax, voice and video – is present in all departments of all organisations. It is extremely useful, but with few exceptions exists as individual entities that cannot easily be combined or consolidated. We should expect to see considerable improvements in this situation and, of course, these will impact on the maintenance and asset management area. However, it is fundamentally important that the maintenance and asset management activities put in place appropriate mechanisms for improving the handling of the types of data which they currently use before attempting to incorporate more sophisticated types.

Key Points in Chapter 3

- An **asset manager** is a **resource manager** and a **business manager** with responsibility for **optimising the effectiveness of each asset to the business**.
- The workforce should be made aware of the importance of accurate data and how they personally fit into the picture.
- If data is **wrong, inaccurate or suspect**, it is not worth collecting.
- The quality of data never improves. It can at best remain at the same level at which it was collected.
- The effort and cost of transferring data from an old to a new information system can be extensive and is invariably underestimated.
- If data entry clerks are knowledgeable and well motivated, keyed-in data can have an error rate of 0.5%. Otherwise, error rates can be 10% or greater.
- Validation effectiveness improves the nearer the data entry is to the asset and its work.

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Chapter 4
Objectives of Maintenance and Asset Management Systems

In Chapter 2 we considered the difference between departmental maintenance and asset management, recognising that this difference is due mainly to the attitudes of the company management and the maintenance operation. Other factors also differentiate requirements and influence appropriate choice of system. Four such factors are discussed here:

Vendor Strategy
Computing Strategy
Organisational Culture
Data Storage Requirements

Vendor Strategy

The most obvious of the differentiation factors is industry type. As we shall see in Chapter 13, most vendors cover a wide variety of industrial users. They have increased the functionality of their systems over the years in an attempt to cater for the different functions that each industry requires and the many different ways in which these functions are required to perform.

Early vendors developed and improved their systems and competed with each other by adding more functionality in an attempt to address all of the potential market.

Two major factors precipitated the end of the progression of systems by the addition of functionality were the recognition that

(1) users perform similar functions differently and

(2) as more functionality is added, it becomes increasingly difficult to make the system easy to use.

This caused a change in approach by many of the vendors that produced so-called 'flexible' systems that did much to address the former factor but, as we shall see later, did little to address the latter. As computer technology improves and new facilities become possible, it is tempting for vendors to promote 'advanced'

The introduction of new features without relevant attention to the ease of their use is a SELLING rather than a PROBLEM-SOLVING approach

features, such as flexibility, as unique selling points of their systems. It is also tempting for prospective users to see these features as attractive and exciting to use. However, we saw in Chapter 3 that the introduction of multimedia as a data type would only be appropriate and beneficial if the necessary user environment had first been implemented. In fact, the introduction of **any** advanced features will only be successful if they are accompanied by an investigation of their effect on the workforce and the life cycles of data and information.

Each Industry Has Individual Requirements

Although the overall market for maintenance and asset management systems is, as we have seen, 'horizontal' (across all industries) rather than 'vertical' (contained to just one), within this broad grouping, there is a need to address the requirements of specific industries separately. This is as a result of the evolution of information systems for both maintenance and asset management.

Let us assume that a vendor has improved the functionality of his system and has recognised that for each user there are different requirements within each function and in the relationships of each function within a group. The vendor would then seem to be well placed to address virtually any type of user and would appear to be in a perfect situation for both the vendor organisation and the user. However, it is too perfect to be real. It is prevented from being offered in reality by the differing objectives of the vendor and user (see Chapter 5). This involves the business strategy of the vendor, his ability to handle different and parallel scenarios within his product, and the ongoing capability of his assigned expertise.

Consider he ability of the vendor to handle different and parallel scenarios within his product to meet your stage of development and future intentions.

With a wide variety of possible industries for his product and an increasingly knowledgeable user community, the vendor will have to decide at which industries to market his product.

A key vendor strategy is to select a few industries which will be targeted as key markets, others as secondary markets, and yet others which the product may be able to address, but with perhaps little previous credibility in the area. This strategy is reflected in the development of the product, with identified key industries being assigned the major portion of development. Thus vendors tend to be associated with particular industries and will be less well known in others. They should thus be able to demonstrate considerable capability in their chosen industries and would be expected to win most of their orders from them. However, even with this scenario, it is important for the prospective user to recognise a potential problem: the ability of the vendor to handle different and parallel scenarios within his product.

Some degree of compromise will take place by the user organisation to comply with the way that the standard software performs. There is, however, a limit !

Asset management information systems are in reality **management information systems**. While their pedigree is maintenance management packaged software, their role is now much more important and fundamental to the operation of the business. As we shall see in Chapters 6 and 10, it is essential that the installed system accommodates the initial structures and functional requirements of the user organisation and caters for each new structure and requirement as it occurs.

It is realistic to assume that some degree of compromise will take place by the user organisation to comply with the way that the standard software performs. There is, however, a limit to how much any organisation will be prepared to change its ways of working in order to use a particular software system. Addressing these differences in requirement by customisation is a natural approach, but as will be seen in Chapter 13, it is unsatisfactory. With an evolving system, a user organisation could reasonably expect that the vendor will anticipate many of its ongoing requirements, especially if the user is in the vendor's major industry grouping and the vendor has other, more advanced user organisations within the same industry in his customer list.

It is thus reasonable to expect the system to be capable of adapting to whatever new facility is identified by the user organisation. Thus **system evolution must be accompanied by predictability** on the part of the vendor, which will be reflected in his development strategy and thus in the capability of his product.

Can Industry's System Requirements be met?

Now we can see that the requirements of such products are enormous. Are these requirements unrealistic? Not really, when one thinks of the nature and importance of the activities at which they are targeted. Nor is it unrealistic when one considers these information systems as the foundation or 'site' of a user's major asset – its data. Is it unrealistic with respect to the ability of hardware and software technology to provide a satisfactory solution? Certainly not – both of these technologies are well beyond the point at which such solutions are impossible or even difficult. So when we consider the importance of the role that the software is performing (and the correspondingly high price that is being charged by the vendor) we can see that the user is entitled to expect ongoing predictive capability from the system and its supplier. This translates to **an ability to handle different and parallel scenarios** within the vendor's product. If this is not offered or possible, then the vendor cannot be considered to be serious and professional about the targeted industry or about the user's needs.

The absolute fundamental aim is to make money out of satisfying customers.

John Eagan,
Chairman,
Jaguar plc

It is easy to see this problem from the vendor's viewpoint. With a finite development budget, it may be possible to address the variety of requirements within an industry with a generic product (see Chapter 13). It is much more difficult, and inevitably costlier, to cater for the **ongoing requirements** of a user within a standard product, especially if that product is also going to be marketed to other industries. This difficulty and cost on the one hand, and fundamental requirement on the other, is a major area of difference between the objectives of the vendor and the user. It is extremely important for the user to recognise this and to satisfy himself that his interests are being considered and met.

Almost as important as the capability of the product and its ongoing effectiveness in relation to the user's business is the expertise of the vendor organisation in the user's industry. If vendors are really serious about a particular industry, and about each individual customer in an industry, then they will not only be able to prove their expertise to users, but will have dedicated staff assigned **only** to that industry. This is not overkill; it is an **essential requirement** if users are to be able to progress in their use of their system. No one would expect this expertise to come without cost, but it should be there! There is obviously considerable benefit to the user from the existence of this expertise in the vendor organisation. There is also benefit to the vendor from the ongoing close association with the user, and **the ability to share experience**. The value of such experience for other potential users will, of course, be obvious to the vendors!

Vending Strategy Evolution

This 'sharing' of experience – of understanding each other's problems – has resulted in another phase in the evolution of maintenance and asset management systems. This is the emergence of **vendors who concentrate only on one industry** and have evolved their product and developed their expertise to enable them to work very closely and knowledgeably with user organisations in their chosen industry. It is recognition by the vendor that they cannot – because of insufficient funds or a realisation that the resource required would be enormous – cover all industries and so must become very good at a singe one. Clearly, for the user, this has many advantages, not the least of which is the **convergence of the objectives of the user and the vendor**. Of course, it is conceivable that very large vendors could attempt to solve this problem by having groups of specialists dedicated to specific industries. Users in these industries would, however, need to satisfy themselves that the development of the product – which is usually under the control of a central development division – reflects this dedicated attitude with respect to their own industry.

Treat the customer as an appreciating asset
Tom Peters

Computing Strategy

Obviously, computing strategy will have a considerable effect on the procurement of a system. The existence of a computing strategy would normally be considered to be beneficial and essential. The absence of such a strategy is the basis for anarchy. However, three major factors should be borne in mind in relation to computing strategy.

The first of these is the necessity to ensure that the computing strategy is **relevant to maintenance and asset management**. This may seem so obvious that it should not need to be stated. However, a client of mine found that his proposed asset management system was constrained to operate within a network that was primarily designed for office automation (see Chapter 15). Maintenance and asset management are operational activities which may require communication with a wide range of operational equipment such as telemetry systems and condition monitoring systems. This client found that adherence to the corporate computing strategy was severely limiting his options in using his information system. Unfortunately, by the time that I was asked to go in and audit his system all the decisions had been taken and the 'standard' terminals had been procured and installed. This happens far too often in my opinion; maintenance and asset management operations are rarely considered when a computing strategy is being defined and they are often not involved in the 'technology' part of the selection of their own system!

The problem will not be resolved until there is a wider acceptance at board level of the role and importance of the maintenance and asset management activities. However, until then, procurers of systems should make it their business to ensure that their computing people understand the communications and access requirements of maintenance and asset management, and obtain written confirmation that the computing strategy will comply with these requirements rather than vice versa! It goes without saying that it would be of considerable help if maintenance and asset managers obtain sufficient computing skills to be able to ask the right questions and (equally important) question the answers!

Computer Strategy Evolution

The second major factor affecting maintenance and asset management systems is the **evolution** of the computing strategy. It is my experience that the implementation of these systems takes several years from the planning stage until a significant return is achieved in the form of useful,

Education costs money, but then so does ignorance

Claus Moser, German-born British academic

ongoing information, knowledge and wisdom. The acceptance of these systems by the workforce takes time, no matter how much effort is put into the task (this, however, is an area that is usually accorded too little attention). With the increasing pace of technology, prediction is difficult even for the corporate experts. Nevertheless, it is not uncommon for the computing strategy to change during the time that a maintenance or asset management system is getting up and running **without the involvement or knowledge of its operational personnel**. This invariably results in confusion and poor staff relationships and motivation. The only way to avoid this is to demand that you be kept informed of any changes to strategy that are liable to affect your system. As well as this, it is advisable to be proactive and keep asking about any changes. Here again it is important to learn the jargon and fundamentals of computing.

'Best of Breed' or an 'Integrated System'?

The third major factor is the decision on whether to go for a **'best of breed' system or an integrated system**. A 'best of breed' strategy means that, as far as maintenance or asset management is concerned, you intend to procure a system that best meets you specific requirements within the available budget. An integrated strategy takes this control out of the hands of the maintenance or asset management operation. It is a corporate decision covering all the major information areas within the organisation so that they communicate correctly with each other. This latter strategy has great benefit from a computing viewpoint as all the interfaces are seamlessly handled. It does, however, have two serious disadvantages. Firstly, it locks the user organisation into a single supplier. This can have its advantages, but, as with all single-path decisions, is a major step that should not be taken lightly. Secondly, the user is obliged to accept the structures and functionality of the vendor **for each application area**.

Thus, a system may have been procured primarily for its excellence in one or two key areas, say finance and personnel, and for its seamless communication between them. The inclusion of a maintenance package in its suite of applications may have been all the thought that the selectors of the system put in to the consideration of maintenance and asset management. Yet it is very common for these important operations to be obliged to use such a system! As we have seen in this and earlier chapters, there are far too many factors to be taken into consideration for such a decision to be taken lightly. Major vendors of maintenance and asset management information systems have so far been unable to cater for all industries, their individual variations and the evolution requirements of each user organisation; it is exceedingly naïve to believe that the supplier of a corporate integrated system can achieve this effectively. As a fundamental requirement, it would be necessary to establish whether the integrated

application package was aimed at departmental maintenance or at asset management. While interfaces between systems are a major consideration, maintenance and asset management users of integrated systems must recognise what compromises they will be forced to make by complying with this strategy. Of course, it is possible that the maintenance system supplied with such a system meets the current requirements of an operational user. Then all he has to worry about are his future needs!

Culture & Organisational Change

We have already touched on the subject of culture in Chapter 2, where we considered the difference between **departmental maintenance** and **asset management**. We saw that the difference between the two strategies depended on the attitudes and aspirations of organisations and their staff. We also saw that transfer from a departmental maintenance type of organisation to one that could truly be called an asset management type organisation could not be achieved merely by the purchase of an asset management information system. It was necessary also to change the way in which the organisation and its staff thought about their business and their relationship with each other. This was seen to be a necessary previous and parallel activity to the implementation and use of such an information system. It is also likely, if it were costed honestly, to be by far the most expensive part of the exercise, even allowing for the relatively high cost of asset management software!

Costly! But then so are the alternatives.

It is most important to stress that, as far as the move to an asset management scenario is concerned, this additional effort must be much more than just a directive from management and the implementation of training sessions on the use of a new information system. The above quote does not include the need to change mind-sets, procedures, methods of analysis and communication. We should therefore not consider this additional cost to be around twice the combined cost of the hardware and software; the cost, if honestly recorded, is likely to be **several times the combined cost of the hardware and software**.

While this seems scary and liable to put many organisations off the idea of asset management, it is important to consider the alternative. Undoubtedly, many organisations will be able to continue with their departmental maintenance operation for some considerable time and will be satisfied that they decided not to invest in an asset management operation. For some it will have been the correct decision – **at the moment** – and they will have

Control over computing belongs with users

Brandt Allen,, US academic

The hardware and the software are only a small part – certainly less than half – of the true costs of bringing PCs into the organisation.

Jim Seymour,U.S. syndicated computer columnist

By the time you have to adapt, you don't have the time to adapt.

In maintenance management, the difference between world class performers and the rest is not dependent upon age of equipment, types of equipment, if a computer is used, vibration analysis, wear particle analysis, infra red analysis, etc.

The difference lies in attitudes, commitment, skills and organisation of people… and these cannot be easily copied. You can let people into your worldclass organisation with a camera, but they cannot take pictures of what you are doing differently because what you do is not visible and not easily seen.

Christer Idhammar, Author,' World Class Maintenance'

the opportunity to review the situation at a later date. For others, though, the failure to recognise the importance to the business of an efficient and **corporately effective and aware** maintenance or asset management operation will affect their competitiveness, their ability to adapt and ultimately their balance sheet in the future. As we all know, life is not necessarily kind to those who fail to prepare for the future!

Culture, as far as any particular organisation is concerned, is a **given**; it cannot be changed quickly. It has the inertia of long-established principles, attitudes, methods of working and traditions. It can, however, be changed **over time**, but the change of a culture is a dangerous activity to pursue at the same time as the implementation of an asset management system, especially if it has not been meticulously planned!

Thus the **culture** of the user organisation is a differentiator with respect to the implementation of an information system. If an organisation's culture is different from that of an existing user – in the same industry - of a vendor's package, then **it cannot expect to use the system in the same way and achieve the same results**.

> **WARNING This is a major reason for the failure of maintenance and asset management information systems.**

Company cultures are people-based and thus people-dependent. An organisation that attempts to be progressive, competitive and world-class is **dependent** for the achievement of these goals on its people. Their employers can no longer demand their loyalty as a right; the time when this was possible has long passed. The relationship between employers and employees has become much more complex as organisations have become more competitive (or attempt to become more competitive). The success or otherwise of an imposed system is ultimately in the hands of the employees. This is why changes in culture have to be well planned, must be handled very carefully and are likely to be extremely expensive. Therefore, they must not be carried out at the same time as other complex operational initiatives.

> **FURTHER WARNING Do not be tempted to change your culture in order to use a vendor's system. If a change in culture is indeed seen to be appropriate, then seriously investigate the cost and time involved. If corporately agreed, then IMPLEMENT THE CHANGE IN CULTURE SEPARATELY AND BEFORE THE IMPLEMENTATION (OR THE ORDERING) OF THE INFORMATION SYSTEM.**

The subject of culture with respect to the implementation of maintenance and asset management information systems is not only complex and pervasive. It requires more in-depth treatment; this will be handled in Chapter 9.

The differentiators discussed so far will cause the objectives of maintenance and asset management systems to vary considerably from one organisation to another. We shall be considering the effects of these and others on the selection process in Chapters 5 to 12.

Data Repository

The most obvious objective of a maintenance or asset management information system is as a **repository for data**. It is effectively a filing cabinet for retaining all the data that is accumulated throughout the operating life of the plant. However, as we have seen earlier, while there is a temptation for **any and all data** to be stored, the real benefits will be obtained by considered and organised control of the way the data is collected and stored in the chosen information system.

The selection of the information system is important even in this basic role as a repository for data. However, everything 'downstream' in terms of the use and flow of data is ultimately dependent upon this repository of data. It is thus essential that it is secure, capable of handling the anticipated volumes, and accessible in whatever different ways were defined by the analysis of requirements that determined the need for the repository. This, however, does not take into consideration the essential feedback path of The Data to Wisdom Ladder. This requires that the captured data – and thus the mechanism for holding that data – should be able to be changed as a requirement of the improvement and change in wisdom.

Handling Changes in Requirements for Data

Here we come to a fundamental requirement, and a problem for many maintenance and asset information systems and their users. This is **the inability to predict the future use of the system and to handle changes in requirements**. This is a very large subject that will be covered in Chapter 10. Nevertheless, despite the size and difficulty of the subject, there is an obvious question that could be asked of any vendor in respect of the use of his system as a data repository.

How does the system handle changes in the requirement for data?

This is where many potential users make their first big mistake in their ownership of the system. Because they themselves have put little or no effort into predicting how the system will be used in two or three years, they are in a weak position when their vendor replies to the above question with another question.

The qualities that companies offered to employees of security and the qualities of loyalty they expected in return have been swept aside by global competition ... Old loyalties towards a corporation will tend to be replaced by new ones towards a group of colleagues.

Hamish McRae, Scottish journalist, Independent, 1995

What data would you like to change?

If the conversation is allowed to cease at this point due to the lack of knowledge of the potential user, then he will have to live with the data structures as delivered or pay for any changes thereafter. The correct answer to this second question is to bring the conversation back to the fundamental problem:

> "*I don't know how I will want the data to change, but I know that change is inevitable and so must you. Therefore you must have made allowances for this in your product and be able to show me how you handle change.*"

For the vendor to ignore this requirement is unforgivable, but at least an astute prospective user should be able to identify this failing and select a more aware vendor. For a prospective user to ignore this requirement is potentially much more dangerous. He could be left with a repository for data which is not capable of handling **the improvement in operation**, and the resultant changing requirement for data, **which is the basic reason for his procurement of an information system in the first place!**

Basis for Information and Knowledge

Having considered the most basic requirement of a maintenance or asset management system, let's move up the ladder in general and The Data to Wisdom Ladder in particular. Here we must examine the need to progress from the collection and storage of data to the transfer of that data to information, the accumulation of knowledge from this information and the development and use of the resulting wisdom. Now we have a very strange situation. Maintenance and asset management information systems are marketed as *information* systems. However, the majority of these systems are data repositories that give the user the capability to convert data into information but **provide few tools to achieve this and even fewer to enable the user to progress to knowledge and wisdom**.

There are, of course, exceptions to this and it is to be hoped that this situation improves as users become more demanding in their requirements. Undoubtedly, the information, knowledge and wisdom required by a user organisation will be essentially unique, depending as it does on the very many factors which were discussed earlier in this chapter. However, as we saw for data, the variety of possible ways of progressing up the Ladder should not be a reason for not providing appropriate tools. As we shall see in Chapters 13 and 14, after we have considered the diversity of functional requirements, it should be possible to handle uniqueness by enabling the user to select an appropriate combination of pre-defined tools. These tools should be the result

Information is part tale-bearer and part tumour.

Making it truly useful to decision makers required the invention of tools to sort it out, organise it, and communicate it in timely and pertinent ways.

Douglas K.Smith & Robert E. Alexander Authors, 'Fumbling the Future'

of the vendor's perception of the market requirements and experience with the requirements of more advanced users. To dismiss the requirements because the user cannot be specific regarding his future needs is no longer acceptable. Such an attitude results in stale data and information, poor relationships between users and vendors, poor return on investment and failure to achieve the ongoing objectives.

Other Objectives

So, having established that a maintenance or asset management system should provide a **flexible** repository for data and tools to enable that data to be converted to information, knowledge and wisdom, we must now consider what other expectations we have of such systems. How is the knowledge and wisdom going to be used? What is its purpose and how does it relate to the objectives of the organisation? As we saw earlier, the answers to these questions will depend upon the maintenance strategy of the organisation and whether it has a departmental maintenance or an asset management approach. However, irrespective of the approach or the existence of a maintenance strategy, for most organisations their maintenance or asset management information system will become the basis of their operation. It will be used to record what maintenance should be carried out, to plan the maintenance, to instruct the maintenance operatives, to record the effect of maintenance and the condition of the assets. Finally, it will be used as the basis of all analysis related to the assets, their roles, their maintenance and their replacement.

Thus, whatever mechanisms were previously utilised to perform these functions, whether they were performed collectively on a previous software system or were in part or in total manual and paper operations, almost everything in the maintenance or asset management operation is recorded on, and thus dependent on, the information system. Now this heavy dependency should not be taken as a reason for rejecting all such systems and remaining with older, but perhaps better-known systems. It is, however, a reason for going into the procurement of a new system with a clear understanding of what is expected from the system at the moment of purchase and the possible scenarios resulting from its use. It is also a reason for asking the right questions and being determined not to be fobbed off by woolly or evasive answers. The procurement of such systems is now a much more serious activity than it was ten years ago. Not only are the prices much higher, the implementation costs are higher. And this trend is likely to continue. The capabilities of the systems are higher, but so also are the expectations. **And getting it wrong didn't used to be a dismissal offence!**

A computer will not make a good manager of a bad manager. It makes a good manager better faster and a bad manager worse faster.

Edward M Esber
US CEO of Ashton Tate

So we can now begin to see the importance of the procured system to the procuring organisation **and to the procuring individual or team**. The ultimate objective of the system is to **enable** the management of the company's assets and to provide the data, information and knowledge environment to assist the appropriate manager in ensuring that these assets are fit for purpose. The system should also help to determine the useful life of the assets and facilitate their replacement. Ultimately the system should contribute to improving the profitability and effectiveness of the overall organisation. As was stated earlier, such systems should no longer be considered as application software packages. They are much too important for that designation. And the data, information and knowledge that they accrue are even more important and essential to the organisation. These systems can accurately be called **management information systems** and should be procured with the same rigour that other management information systems are procured. However, it must be remembered that they are **information systems for management** and not management systems themselves. You cannot blame the computer or its software for lack of management capability or strategy. Neither can you ultimately blame a vendor for an inappropriate structure or strategy.

So we see that the objective of a maintenance or asset management system is the provision of a set of flexible tools that will enable the effective management of assets according to the defined maintenance strategy. These flexible tools must be capable of relating to, and changing with, the overall business objectives of the organisation. There are very many ways in which business objectives can be achieved, and even more ways that require action because of their non-achievement! Consequently, an enormous amount of capability will be expected from maintenance and asset management systems. Unfortunately, many of these systems have failed to live up to these expectations in the past. Although much of the blame can be placed on many of the vendors for raising the expectations of prospective users of their systems, the users cannot be considered to be entirely blameless. As we have seen, the lack of effective strategy and unwillingness to define long-term objectives on the user's part can easily result in perceived failure of the system. We shall see in Chapters 13, 14 and 15 how the agendas and objectives of vendors and users work towards or against a successful implementation and on-going relationship.

Key Points in Chapter 4

Users perform similar functions differently.
As more flexibility is added to a system, it becomes increasingly difficult to make it easy to use.
The introduction of any advanced features will only be successful if an investigation of their effect on the workforce and the life cycles of data and information accompany them.
A vendor who claims to major in a particular industry would be expected to provide system evolution accompanied by predictability.
A system from a vendor who claims to major in a particular industry would be expected to have the ability to handle different and parallel scenarios within that industry.
Vendors who claim to major in a particular industry should have in-depth and dedicated experience in that industry.
An increasing number of vendors are concentrating on a single industry. This facilitates convergence of the objectives of the user and vendor.
Computing strategy must be relevant to maintenance and asset management.
Maintenance and asset management personnel should make it their business to understand the jargon of their computing fraternity.
Computing strategy can change without the involvement or knowledge of maintenance operational personnel.
Integrated computing systems must be considered with respect to how they solve the maintenance and asset management problem and what constraints they place on the operation.
The move from a departmental maintenance organisation to an asset management organisation must be separated from that of the implementation of an asset management information system.
The move from a departmental maintenance organisation to an asset management organisation can cost several times the combined cost of hardware and software for an asset management information system.
By the time you have to adapt, you don't have the time to adapt.
Systems selected because another organisation in the same industry uses it are prone to fail if the cultures are not the same.
The success or otherwise of an imposed system is ultimately in the hands of the employees.
The mechanism for storing data must be able to be changed as a requirement of the improvement and change in wisdom.
Vendors must be asked how their system handles changes in the user's requirement for data.
Improvement in operation, with its resultant changing requirement for data, is the basic reason for the procurement of a maintenance or asset management information system.
Maintenance and asset management information systems are **information systems** and not management systems.
Asset management information systems are as important as any other corporate management information system.