

An Introduction to Asset Management

A simple but informative introduction
to the management of physical assets

By Robert Davis



Recommended

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Foreword

As the serving President of the Institute of Asset Management, I am delighted to recommend this short book.

As a past President of the IAM, Robert brought to the subject of Asset Management his wealth of experience in business management and marketing. This helped enormously in developing the IAM and the field of Asset Management, from a purely engineering and technical focus to one that recognises the need to engage across disciplines. Asset Management is increasingly well understood by the business community as a strategic and business led discipline, where the value of assets is their contribution to achieving explicit business objectives.

If you are encountering Asset Management for the first time, this book should be a helpful introduction to the key topics. It should also highlight the benefits which are there to be gained by understanding and applying the fundamental principles. Of course, if you become interested or need to know more there is a great deal to be explored and I look forward to welcoming you into our community!

We are very grateful to Robert for making his book freely available and we would encourage you to pass it on to anyone you think might benefit.



Stephen Morris
President of the Institute of Asset Management

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A simple but informative introduction to the management of physical assets

By Robert Davis

We are all asset managers. The last time you had your car serviced or decorated your house, you were managing an asset!

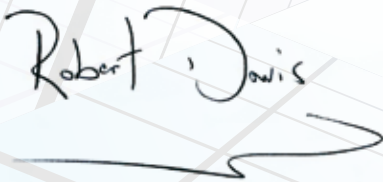
This book explores the discipline of Asset Management and demonstrates how it can be used to make better investment decisions.

Do you work for a company that owns or manages physical assets? Would you like to work for a utility? Or have you just heard the expression 'Asset Management' and want to know more about it? If the answer to any of the above is 'Yes!', then this book is for you.

Why does Asset Management matter? Why is it useful? How does it improve organisational effectiveness? How will it help me as an engineer, accountant, operational manager or director? This book will address these issues and signpost you to sources of information which can deepen your understanding and help you on your Asset Management journey.

In writing this book, I have benefited from the wonderful intelligence and experience shared with me during my years as President of the Institute of Asset Management by a number of world leading experts in the field, as well as drawing on my twenty years plus experience of managing property, plant and equipment assets.

I am indebted to the people who have generously given their time to edit this document, including Paul Barnfather, Tom Elnor, Madi and Deb Davis and Jo Parker.

A handwritten signature in black ink that reads "Robert Davis". The signature is written in a cursive style and is positioned above a horizontal line that ends in a decorative flourish on the right side.

For more information on the Institute of Asset Management, go to **www.theIAM.org**

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Introduction

The management of physical assets is like any other evolving management discipline. It suffers from terminology overload. The newcomer to the subject may struggle to understand the basics. This is partly because of the unfamiliar context, but also because there are still relatively few people around to ask! This book will give newcomers a starting point from which to develop their knowledge. For those just past the starting point, it might give some structure to their understanding. For the well-seasoned asset managers out there, I hope it provides either a feeling of satisfaction, or better still, grounds for a good discussion!

Managing assets effectively for utilities is not optional these days. Across the globe, every society is faced with a significant asset management challenge:

- Emerging economies are trying to identify the lowest cost / highest return investments to achieve maximum immediate benefit
- Rapidly developing countries are faced with understanding the life cycle costs of their infrastructure
- More mature economies are trying to find ways of extending the life of their infrastructure and also meet major global challenges like climate change

Asset management thinking can provide structure to assist in all of these scenarios. It can improve the quality of life for millions of people. It is an important cog in the big machine of our evolving civilisation.

Done well, it impacts positively on the well-being of the planet and everything on it.

What do we mean by 'physical asset'?

1. Dictionary Definition of Asset

"Any item of economic value owned by an individual or corporation"

2. Why 'physical' asset?

We **ARE** referring to items such as buildings, utility infrastructure such as electrical cables, water pipes, rail lines and metro tunnels, and industrial assets such as oil rigs, chemical plants and process plant conveyors

We are **NOT** talking about financial assets, human assets or personal assets, as referred to in their normal context but we may be talking about non-physical things that affect these physical assets: skills, data, systems and software, for example

3. Other features of a 'physical' asset include

- Its value may be represented on a corporation's balance sheet
- It may be listed in a register (asset repository, see glossary)
- Its value normally depreciates over time
- Its condition normally deteriorates with time and / or use
- It is likely to benefit from good stewardship
- It plays some role or has a function in the delivery of a process or service
- There are often lots of similar items around the globe which can benefit from similar management

What Asset Management is....and isn't

1. Asset Management:

- **Is** a mind-set which sees physical assets not as inanimate and unchanging lumps of metal / plastic / concrete, but as objects and systems which respond to their environment, change and normally deteriorate with use, and progressively grow old then fail / stop working / die!
- **Is** a recognition that assets have a life cycle
- **Is** as important for those working in finance as it is for engineers
- **Is** an approach that looks to get the best out of the assets for the benefit of the organisation and/or its stakeholders
- **Is** about understanding and managing the risk associated with owning assets

One of the challenges with managing an asset is that it is not sentient. It does not keep management edicts. It does not respond to the economy or politics. But it does respond to how it is treated and used. This creates a challenge for management. How do you get the right behaviour from an entity that won't listen?



A key principle in Asset Management is **LINE OF SIGHT**...that means:

- An approach within an organisation that looks to line up the work that is done directly on assets with the objectives of that organisation
- A discipline which recognises, accommodates and aligns the risk of owning a particular asset with the goals of the organisation that operates the asset

Some Examples

Eg.1. A good 'asset management' decision might be to purchase *an expensive, high specification* stainless steel piping system within an industrial process. Whilst the initial cost is higher, the maintenance costs may be lower and the expected life 3 times longer, the risk of disruptive failure may be lower and therefore the risk to the organisation from a performance, health & safety and environmental perspective consequently much lower. The total life cycle costs, therefore, may be lower and the total risk to the organisation through purchasing the more expensive piping system therefore represents a good asset management decision.

Eg.2. A poor asset management decision might be to reduce the frequency of maintenance activity on an asset without appreciating the full impact of doing so.

Whilst there may be a short term financial benefit, the long term cost to the organisation, if the asset prematurely fails, might substantially outweigh this benefit. Of course, maintenance is recognised as a means of introducing failures, so proper investigation may prove that reducing maintenance frequency is a net benefit to the organisation!

2. Asset Management:

- **Is not** just about maintenance. Maintenance is part of the stewardship of assets, but so is design, procurement, installation, commissioning, operation, etc. See a description of the Asset Life Cycle later
- **Is not** a substitute for quality management. Asset Management, like other management processes, should be subject to scrutiny through a quality process to ensure rigour
- **Is not** a project management system
- **Is not** just for engineers. Everyone working in a company that owns or operates assets should be interested. This includes those working in procurement, finance, personnel, service, planning, design, operations, administration, leadership, marketing and sales
- **Is not** just an accounting exercise. Whilst it may help you understand the deterioration and hence depreciation of an asset, it is of interest to every part of the organisation
- **Is not** a purely academic discipline. Whilst it is a worthy subject for academic review and advancement, it is primarily a pragmatic, hands-on subject



Why Asset Management is important

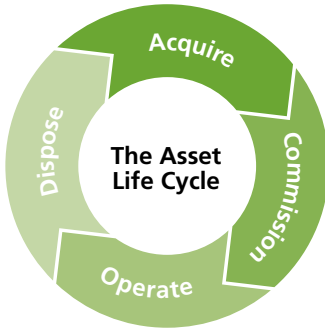
Asset Management is important because it can help organisations to:

1. **Reduce** the total **costs of operating** their assets
2. **Reduce** the **capital costs** of investing in the asset base
3. **Improve** the **operating performance** of their assets (reduce failure rates, increase availability, etc)
4. **Reduce** the potential **health impacts** of operating the assets
5. **Reduce** the **safety risks** of operating the assets
6. **Minimise** the **environmental impact** of operating the assets
7. Maintain and **improve** the **reputation** of the organisation
8. **Improve** the **regulatory performance** of the organisation
9. **Reduce legal risks** associated with operating assets

The key to good Asset Management is that it **OPTIMISES** these benefits. That means that asset management takes all of the above into account and determines the best blend of activity to achieve the best balance for all of the above for the benefit of the organisation.

Asset Management is **explicitly focussed** on **helping organisations to achieve their defined objectives and to determine the optimal blend of activities based on these objectives.**

Asset life cycle



Understanding that assets have a life cycle is a key concept within Asset Management and is therefore worthy of scrutiny.

There are dozens of different ways of representing the life cycle, but the diagram above captures a simple representation of it. The arrows don't represent the length of time spent in each phase!

1. Acquire

This covers everything that goes into planning, designing and procuring an asset. Some life cycle diagrams capture Planning as a separate function. Proper application of these activities ensures that the asset is fit for purpose.

2. Commission

This covers the activities of installing / creating or building the asset and ensuring that it is fully functional. It is a recognised fact that there is a higher incidence of failure after first installation / building of an asset (Infant Mortality, see glossary). This is reflected in the need for the commissioning stage in the life cycle to oversee the initial operation of the assets.

3. Operate

This is normally the bulk of the life cycle for an asset during which it provides the function for which it was designed. During this period the asset should be subject to appropriate monitoring, maintenance, refurbishment and potential upgrade to meet any change in condition or operational requirement.

For many assets, this phase is decades long. It may even be centuries. It is the phase that many engineers are most familiar with.

4. Dispose

This is often the most overlooked phase. Assets can last beyond a human lifetime and it can be difficult to consider asset disposal when it is so far into the future. Asset Management teaches us that we ignore any stage of the asset life cycle at our peril.

This is a key period within an asset's life. With some assets, e.g. in the nuclear industry, this can be an extended and highly critical period. Key activities during this period include the effective removal of the asset from operation; the disposal or recycling of the asset or its components; and the feed in to the planning for the replacement asset (if a replacement is required) to determine the operational requirements based on the effectiveness of operation and the failure modes encountered.



Understanding risk

1. Dictionary definition of risk is:

“(Exposure to) the possibility of loss, injury, or other adverse or unwelcome circumstance; a chance or situation involving such a possibility.”

2. The management of risk within asset management is critical. Why? Because asset managers are responsible for OPTIMISING outcomes for the good of their organisation, and therefore need to make judgements about which actions best achieve the right blend of outcomes based on organisational objectives.

To make these judgements, they need to predict how their actions will impact on the future performance of the assets. They need to quantify both the probability of their actions (or inactions) causing a change in performance and then they need to determine the impact or consequences of that change in performance.

$$\text{Risk} = \text{Probability (of failure)} \times \text{Consequence (of failure)}$$

3. For example an asset manager is responsible for maintaining the building which houses some critical electrical equipment. Water ingress into the building would result in certain failure of the equipment and the consequence would be that several thousand people would be without power for a period of 24 hours. How does the asset manager quantify the **risk** associated with water ingress? How does he/she determine the best way to minimise the cost to the organisation while maintaining performance?

continued...

Two forms of potential water ingress exist:

- Leakage of rain water through the roof
- Flooding from a nearby river

Roofs of the type on the building have a design life of 25 years and its current condition suggests that it is likely to leak in the next 5 years

The **consequence** in each failure mode is the same. The **probability** of the roof leaking is 25 times higher than the probability of the river flooding. The **risk** associated with the roof leakage is therefore 25 times higher. So the optimal mitigation to reduce the risk of failure of the electrical plant as a result of water ingress is to repair the roof! Easy!

In the real world, we tend to focus on one solution to manage risk: either manage the probability or manage the consequences. These solutions often rest with different departments, different budgets or even different organisations. The **optimum** reduction in risk comes when we identify where the risk is coming from and invest in and manage both the probability and the consequences accordingly. Correctly addressing this challenge is at the heart of asset management discipline.



So what does an asset manager do?

Drawing on the Institute of Asset Management's Competences Framework, 2008 as a reference point, there are seven key activities that asset managers get involved in. It is important to understand that all of these activities overlap:

1. **Developing Policy**

The Asset Management Policy is the link between the Organisational Plan (that is the top level 'business plan' in a company) and the Asset Management Strategy. It is typically a set of principles or guidelines to steer Asset Management activity to achieve the organisation's objectives. It specifically covers the 'what' and the 'why'.

2. **Developing Strategy**

The Asset Management Strategy directs the organisation's Asset Management activity; it will determine the high level Asset Management objectives that are needed from the activity to deliver the organisation's objectives; it will define the approach to planning that will be taken.

3. **Asset Management Planning**

Asset Management Planning looks at considering all the options for activities and investments going forward and then putting together a set of plans which describe what will be done when and by whom. The asset manager ensures that the plan delivers what is required of it by the strategy.

4. **Delivering the Plans**

This is the bit where work is actually done on the assets, whether assessing or monitoring them, maintaining or repairing them, refurbishing or

replacing them. This activity clearly needs to include the appropriate controls to ensure the work is done efficiently and that information gathered is fed back into the strategy and planning activities.

5. **Developing People**

This activity is specifically about developing the skills and competences of people to better deliver Asset Management activities. It spans from the board room to the tool box and also through the supply chain. As well as individual skills, it looks at the culture within an organisation and how change can be managed to achieve optimal results for that organisation.

6. **Managing Risk**

Understanding risk is a critical concept in Asset Management and is a key function and area of competence. Its focus is on being able to assess the risk of action or inaction on the performance of assets in the context of the organisation's corporate objectives.

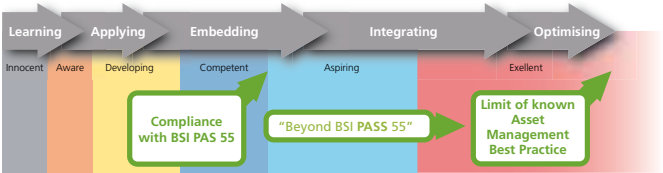
7. **Managing Asset Information**

Collecting and collating the right information to inform Asset Management decisions is crucial to achieving Asset Management success. Too much data confuses the picture and costs money to collect. Too little data results in decisions made in the dark (or at best the twilight!).

Ensuring that the right people have the right information to make the best decisions is key.

How good do you need to be?

Asset Management Maturity



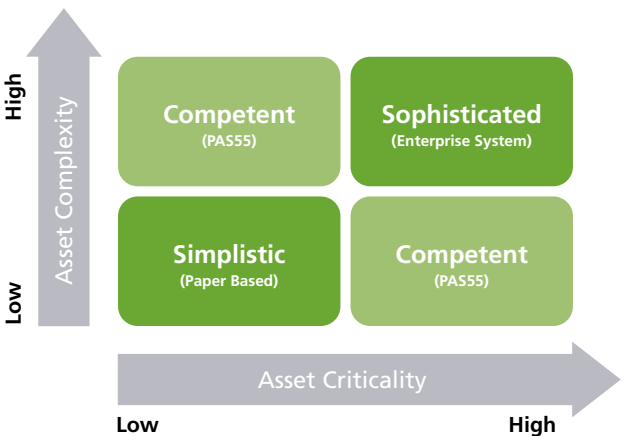
The Institute of Asset Management describes a range of 'maturities' of asset managers. It captures their skills, experience and level of development and their level of maturity compared to the BSI PAS 55 standard, as shown in the diagram above.





8. Good Asset Management practice advises that you should only be as sophisticated as you need to be. In other words, high levels of maturity in Asset Management practices for an asset base which is of low complexity and low criticality will attract unnecessary cost. Conversely, immature Asset Management practices on complex or critical asset bases introduces huge risk to an organisation.

This concept is captured in the diagram below:



More details... the subject areas

The Institute of Asset Management has identified a range of subject areas that justify further development and focus.

Not every organisation will require excellence in every one of these areas. Nevertheless, this is a very useful checklist and asset management organisations should, at the very least, consider what level of competence is appropriate. Where necessary, skills and expertise can be developed in the areas deemed critical for a successful outcome.

Asset Management Strategy and Planning

- Asset Management Policy
- Asset Management Strategy
- Demand Analysis
- Strategic Planning
- Asset Management Plans

Asset Management Decision-Making

- Capital Investment Decision-Making
- Operations & Maintenance Decision-Making
- Life Cycle Cost and Value Optimisation
- Resourcing Strategy and Optimisation
- Shutdowns & Outage Strategy and Optimisation
- Ageing Assets Strategy



Lifecycle Delivery Activities

- Technical Standards & Legislation
- Asset Creation & Acquisition
- Systems Engineering
- Maintenance Delivery
- Reliability Engineering and Root Cause Analysis
- Asset Operations
- Resource Management
- Shutdown/Outage Management
- Incident Response
- Asset Rationalisation & Disposal

Asset Knowledge Enablers

- Asset Information Strategy
- Asset Knowledge Standards
- Asset Information Systems
- Asset Data & Knowledge

Organisation and People Enablers

- Contract & Supplier Management
- Asset Management Leadership
- Organisational Structure, Culture, Roles & Responsibilities
- Competence & Behaviour

Risk & Review

- Criticality, Risk Assessment & Management
- Contingency Planning & Resilience Analysis
- Sustainable Development
- Weather & Climate Change
- Asset & Systems Performance & Health Monitoring
- Asset & System Change Management
- Management Review, Audit and Assurance
- Accounting Practices
- Stakeholder Relations

Glossary of Asset Management terminology

Acquire

Buy an asset based on proper understanding of its life cycle

Ageing

Getting old, specifically beyond the design life of the asset

Asset Register

A central database of information about your assets

Asset Repository

Same as Asset Register

Asset Information Systems

Can be paper based, but normally a software system for ensuring the right asset information gets to the right people

Asset Management Plan

A coordinated approach within an organisation to define and deliver a set of actions towards achieving the objectives set out in the Asset Management Strategy

Asset Management Strategy

This defines the objectives of the Asset Management Plan in the context of the Organisational Plan, the Asset Management Policy and the approach that will be adopted within the Asset Management Plan to achieve these objectives

Asset Management Policy

A set of guiding principles which steer the Asset Management activity at a high level. It describes the general approach to Asset Management, illustrating what is important to an organisation

Bath Tub Curve

Assets fail early in 'life' or later in 'life', and not so often in the middle

Balanced Score Card

A standardised approach to assessing the value to an organisation of different activities, e.g. maintenance

Benchmarking

Comparing performance, often between companies in similar sectors

BSI PAS55

This is a publicly available specification seeking to define a standard approach to the Asset Management discipline. Available from British Standards Institute or the IAM

Capital Expenditure

Monies spent on equipment or plant which normally feature on a balance sheet as capital

Condition Monitoring

Assessing an asset to understand how it is likely to perform in the future

Consequence

This is the outcome or impact of an Asset Management decision

Defect

A fault in specification or performance of an asset

Depreciation

A reduction in value of an asset based on its age or condition

Dispose

Remove asset from service and ensure it is appropriately recycled, buried, etc

Fault Tree Analysis

A graphical means of finding all of the potential causes of a fault

Failure

The point at which an asset stops performing the function for which it was designed

Failure Mode

A way in which an asset stops functioning

FMEA (Failure Mode Effects Analysis)

A means of assessing how assets can fail and the impact failure can have on the operation of the plant

Health Index

A single number which describes the overall condition of an asset

Infant Mortality

The occurrence of failure early in an asset's life

Intervention

Maintenance, refurbishment, repair or disposal of an asset

Key Performance Indicators

Those performance criteria against which the success of an activity is measured

Life Cycle

The stages of an asset's involvement with a company, from acquisition through commissioning and operation to disposal

Maintenance

An intervention on an asset to improve its operation or ensure its continued good operation

Operational Expenditure

Monies spent on activity which cannot be capitalised normally associated with the servicing, condition monitoring and maintenance of an asset or service

Physical Asset

A tangible, man made object that has a specific function, normally within a broader system

Plan Do Check Act

A systematic process which seeks to ensure quality as well as continued improvement

Preventative Maintenance

An intervention on an asset taken in advance of a failure to reduce the chances of failure

RCM

Reliability Centred Maintenance is an approach which targets intervention on assets based on the known historic performance of that or similar assets

Repair

An intervention on an asset taken after it has failed

Repair, renovate, refurbish

An intervention which improves the performance and condition of an asset to upgrade or retain desired performance

Replace

See Dispose above

Risk

The potential for an adverse circumstance to arise

Risk Factors

The categories or types of risk that may occur, e.g. relating to performance, health and safety, environmental, etc

Root Cause Analysis

A thorough assessment of all of the factors influencing the occurrence of a fault or failure

Shutdown / Outage

A period, either planned or otherwise, during which asset interventions occur

Time Based Maintenance

Intervention on an asset based on a prescribed time period during which the work is to take place

Whole Life Costing

An understanding of the full economic impact of owning an asset, covering all stages of its life cycle

Where next.....?

1. The web site of the Institute of Asset Management is a great place to start: www.theIAM.org
2. BSI PAS55:2008. This is a publicly available specification which defines a standard approach to the Asset Management discipline. Available from British Standards Institute or the IAM
3. Asset Management Competences Framework. Available to members via the IAM website
4. Asset Information Guidelines. Available to members via the IAM website
5. BSI PAS55:2008 Assessment Methodology. Available to members via the IAM website
6. Books:
 - Asset Management: Whole-life Management of Physical Assets, Chris Lloyd, et al
 - Strategic Asset Management, the Quest for Utility Excellence, Clive Deadman
7. Asset Management Council, Australia. Excellent glossary of asset management terms and evolving body of knowledge on their website





the professional body for whole life management of physical assets

About the IAM

The Institute of Asset Management (IAM) is the independent, not-for-profit, membership organisation for

- those involved in acquisition, operation and care of physical assets, particularly critical infrastructure; and
- professionals dedicated to furthering knowledge and understanding of Asset Management.

Membership benefits

- Conferences, seminars and social events – with discounts to partner events
- 'Assets' magazine – FREE to Members
- Personal learning and Continuing Professional Development (CPD)
- Projects to develop standards and guidance on best practice and assessment
- Endorsement of Training Providers and PAS55 Compliance Assessors
- Advancement and promotion of knowledge and understanding of Asset Management everywhere
- Promoting the development of external qualifications
- Directories and advertising on our website and Member-Only access to downloads and Knowledge Centre
- Professional recognition (MIAM, FIAM accreditation for Members and Fellows respectively)

Our Objectives

- Advance the science and practice of Asset Management for the public benefit
- Promote and recognise high standards of practice and professional competence
- Generate widespread awareness and understanding of the discipline.

Who should join?

Professionals in any discipline who are involved in promoting and delivering more effective Asset Management – whether in the public, private or academic sectors.

Successful Asset Management requires a combination of skills, techniques and knowledge, particularly finance and we welcome engagement and collaboration with other expert bodies and interested individuals.

Join Us

You can join as an Individual Member, and your company or organisation can join as a Corporate Member. Membership options, criteria and application details can be found on the IAM website:

Please visit us at www.theIAM.org



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