A Guide to...

Effective Asset Management for Buildings & Equipment

Contents

Author: Service Works Global Ltd.
Reviewer: Martin G Bell, Director; Strategic FM Consulting, Bell Associates Ltd.

Introduction

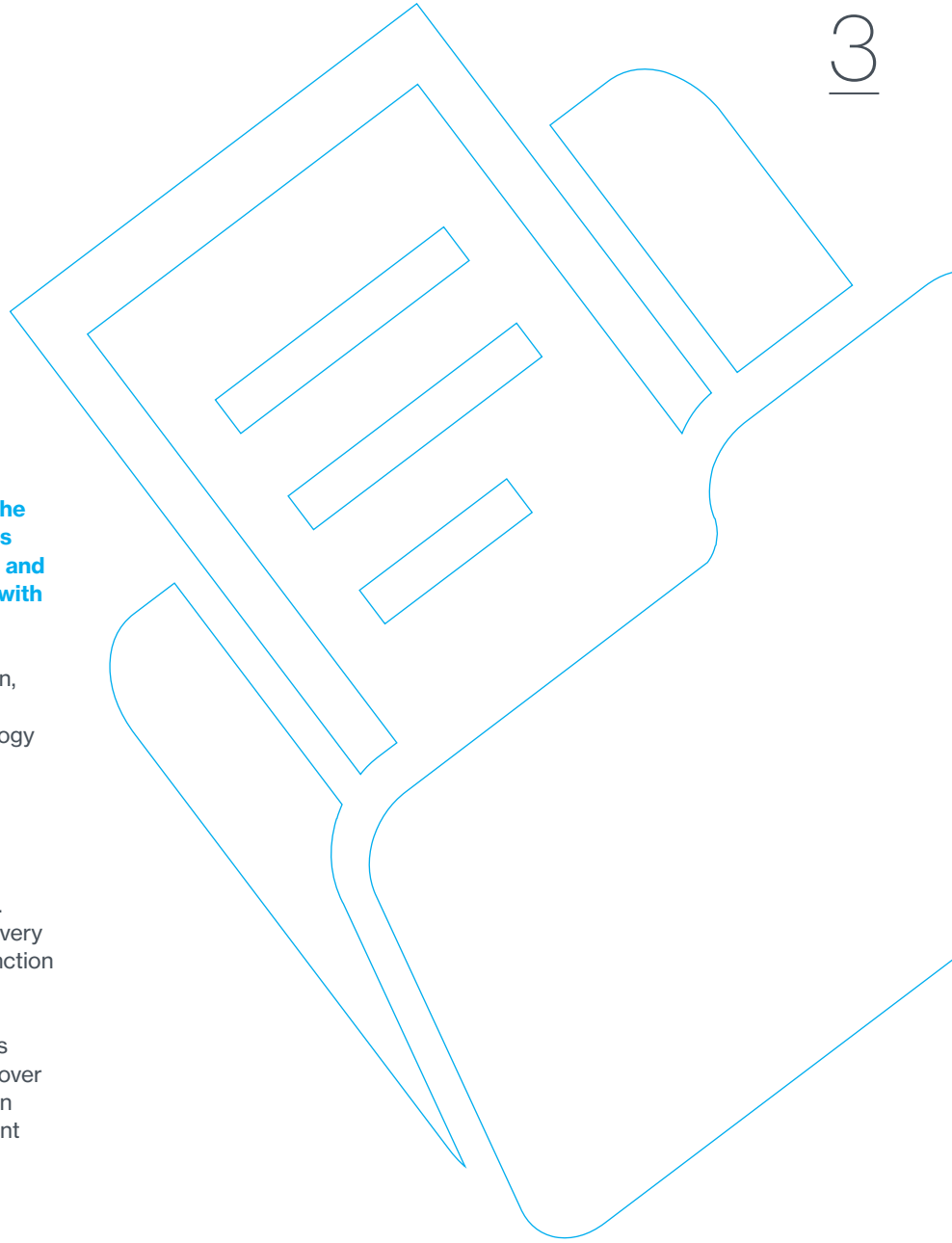
1

This guide aims to provide an overview of asset management within the facilities management context. It is targeted at the practising facilities professional with little knowledge of professional asset management and explores some of the key definitions of asset management, together with the terminology used.

It looks at the four phases of an asset's life, from planning and acquisition, to operation, maintenance and then disposal and the role good asset management plays in each. The guide then examines the role of technology to track and manage assets. A useful glossary at the end explains some of the commonly-used abbreviations and acronyms in the field of asset management together with some areas for further reading on the topic.

Actively managing assets is essential for the efficient and sustainable operation of an organisation and, at an aggregate level, for the economy. Whether it's an item of building services plant, a school or a rail bridge, every asset needs to be managed and maintained to ensure it continues to function within design parameters.

Many economies have deteriorating public infrastructure because assets have not been properly maintained. Backlog maintenance, accumulated over several years, puts a strain on public finances. For example, the American Society of Civil Engineers (ASCE) gave US infrastructure a D+ grade point average score in its 2017 report card (D = poor) and estimates that $4.6 trillion (A$6 trillion) needs to be spent by 2025.



What is asset management?

2

In the context of facilities management, asset management is the management of physical assets, from their initial acquisition to their operation, maintenance, inspection, renewal or disposal. A good asset management strategy can optimise operational performance, minimise whole life cost and support the organisation's corporate goals and objectives. It can also manage risk and drive business continuity strategies. Asset management is not something an organisation can buy, but rather a discipline it must follow to efficiently and effectively maintain its asset base.

An asset could be an item of building plant such as a boiler or chiller costing several thousand pounds; commercial kitchen equipment or a smaller item such as an office chair or flat screen display.

The fundamental principle of asset management is to intervene at strategic points in an asset's normal life with optimised repair and maintenance activities, in order to maintain the performance of an asset and extend its life.

An asset management strategy must be:

- Integrated: cross-disciplinary and joined-up across the organisation
- Sustainable: optimising life-cycles and supporting environmental objectives with long-term goals
- Methodical: defined and structured

A good asset management strategy can deliver significant financial and performance / service improvements to an organisation. It can also make an FM's life easier at an operational level. According to the UK Government's Department for Communities and Local Government's report 'Building on Strong Foundations: A Framework for Local Authority Asset Management', good asset management (within the wider property sense) can:

- Ensure that, once built, property assets are correctly maintained
- Generate efficiency gains, capital receipts or an income stream; and
- Improve the quality of the public realm
- Introduce new working practices and trigger cultural organisational changes
- Reduce carbon emissions and improve environmental sustainability
- Deliver exceptional services for citizens, aligned with locally agreed priorities, while focusing investment clearly on need
- Increase co-location, partnership working and sharing of knowledge
- Empower communities and stimulate debate
- Improve the economic wellbeing of an area

In an FM context, proactive asset management provides a holistic view of what the organisation owns (or leases), where it is, what state it is in and when it will next be maintained and / or replaced. This benefits FM because it simplifies the budget planning process and enables effective PPM, reducing backlog liabilities.

Many organisations are legally required to have asset registers (lists of assets, their location and condition) for auditing purposes, and insurance requirements: if a building burns down, for example, organisations need an accurate record of its contents in order to submit a successful insurance claim. In the event of a fire, the condition of the organisation's assets, for example fire extinguishers, fire doors, sprinkler systems and fire alarm systems, would also have to be demonstrated to prove that regular maintenance had taken place and the assets were fit for purpose.

Organisations which fail to keep these types of records are at risk of having a claim turned down in the event of an incident. It is also essential to have an accurate assessment of the value of your assets to ensure that insurance cover is adequate but not excessive.

The lack of proactive asset management can also damage an organisation's core business and make that business unsustainable. In its review of strategic asset management in local government, 'Room for Improvement', the Audit Commission in the UK found that although councils realised an annual average of £4 billion (A$6.75 billion) from property sales across a seven year period, they spent £1.2 billion (A$2 billion) more on buying or refurbishing their offices than they have brought in from sales; few councils managed strategically their £250 billion (A$422 billion) of assets, with only one in 14 (7 per cent) of councils being an exemplary manager of its assets; while a third do not yet share assets with other public services.

These findings are relevant to the private sector, where property and other assets are not always managed in a strategic way.

ISO 55000 standards enable an organisation to achieve its intended outcome through the effective management of assets

To support professional asset management, the ISO 55000 suite of standards enable an organisation to achieve its intended outcome through the effective and efficient management of its assets.

Published in January 2014, ISO 55000 is the first set of International Standards for Asset Management, and comprises three standards:

- ISO 55000 provides an overview of the subject of asset management and the standard terms and definitions to be used
- ISO 55001 outlines the requirements specifications for an integrated, effective management system for assets
- ISO 55002 provides the guidance for the implementation of such a system

Unlike other ISO management system standards, the ISO 55000 series provides organisations with three means of certification:

a.) Self-review and declaration of compliance

b.) Third party verification of conformance by parties that have interest in the organisation (for example, customers)

c.) Obtaining certification/registration of its asset management system by an external body

ISO55000 has been developed by a Project Committee representing over 30 countries around the world, to develop global standards for best practice in asset management around the world.

IPWEA (Institute of Public Works Engineering Australasia) has been particularly proactive in developing the necessary tools and training to assist asset managers in delivering good asset management practice, including the International Infrastructure Management Manual and NAMS.PLUS, an on-line guided pathway for writing asset management plans and long term financial management plans.

NAMS.AU has also produced the Australian Infrastructure Financial Management Guidelines, which provide consistent key performance indicators for annual reporting on a range of critical asset management performance measures.

In addition to the standards outlined above there are also a number of different approaches to asset management that it is useful for the facilities professional to understand:

1 **Total Asset Management** (TAM) was developed by Honeywell in the early 1990s. It is comprehensive maintenance for a whole facility on a performance basis, including capital replacement, for a fixed price over an agreed period. It enables the client to transfer risk to the contractor and allows for easier budgeting with no surprises. TAM is ideally suited for performance-based Public Private Partnerships (PPP) contracts and commercial buildings which require facilities maintenance management services for periods up to 30 years.

2 **Life Cycle Asset Management** (LCAM) is focused on the individual asset (rather than the enterprise-wide focus of EAM – see below) and aims to extract maximum productivity from the asset and minimise the total costs involved in its acquisition, operations and maintenance. The goal is to strike a balance between maximising Overall Asset Productivity (OAP) while minimising Total Cost of Ownership (TCO). LCAM also offers guidance on whether it is more cost-effective to maintain, overhaul or replace a failing asset.

3 **Enterprise Asset Management** (EAM) is the whole life optimal management of the physical assets across departments, locations, facilities and business units. By taking an holistic approach to managing assets across an organisation, businesses can improve use and performance, reduce capital costs, reduce asset-related operating costs, extend asset life and improve their return on investment (ROI) in an asset.

EAM gives the organisation visibility of the need for resource (both capital and human) allocation decisions across equipment purchases/rationalisation, replacement, over-hauling, redundancy setup and maintenance budgets in order to meet business needs. It takes the collective LCAM data and makes decisions based on long and short-term economic considerations at the enterprise level.

When tough times hit, most organisations look to cut costs and start by looking at their assets

EAM would cover not just physical asset management (the realm of the FM) but also infrastructure asset management expanding to include utilities, property and transport systems in the public sector; fixed assets management; IT asset management: and digital asset management. This can also be called Public Asset Management (PAM) when it is done on a large scale within the public sector.

All organisations manage their assets to some degree. For example, if the boiler breaks down it will be mended. But questions about the condition of the asset, its fitness for purpose and long-term sustainability tend to, at best only be considered informally and worst, not at all.

The move from reactive asset management to whole life planning, life cycle costing, planned and proactive maintenance and other industry best practices usually comes about as a result of a specific event such as:

Merger, acquisition, disposal or business administration
During the due diligence process before an acquisition or merger, an organisation's assets will be part of the valuation and due diligence process. If proactive asset management isn't already in place through a comprehensive asset register (see chapter 3) then this will usually be a subject of investigation before any deal is signed.

A relocation
When organisations move premises, not only is an asset register required for the removal firm to cost up the work, but the organisation itself will need to know what it has and where it's located, to know what will need to be disposed of / purchased in advance of the move to the new building.

A fire or burglary resulting in an insurance claim
As previously stated, most insurance companies will require proof of an organisation's losses, such as an up-to-date asset register, in the event of an incident such as a burglary or fire. The asset register will also demonstrate that appropriate fire and security-related assets were not just in place but fit for purpose and well-maintained at the time of the incident.

The decision to outsource
When an organisation decides to outsource part or all of its facilities or maintenance management, it will need an in-depth knowledge of what it owns and the state of its assets before it goes to market. This will allow potential suppliers to pitch accurately for the work and avoids problems once the contracts get underway.

The decision to change outsourced provider
Any change in outsourced provider will require a thorough assessment of current assets (if that isn't current practice) to ensure that accurate information is given to potential partners.

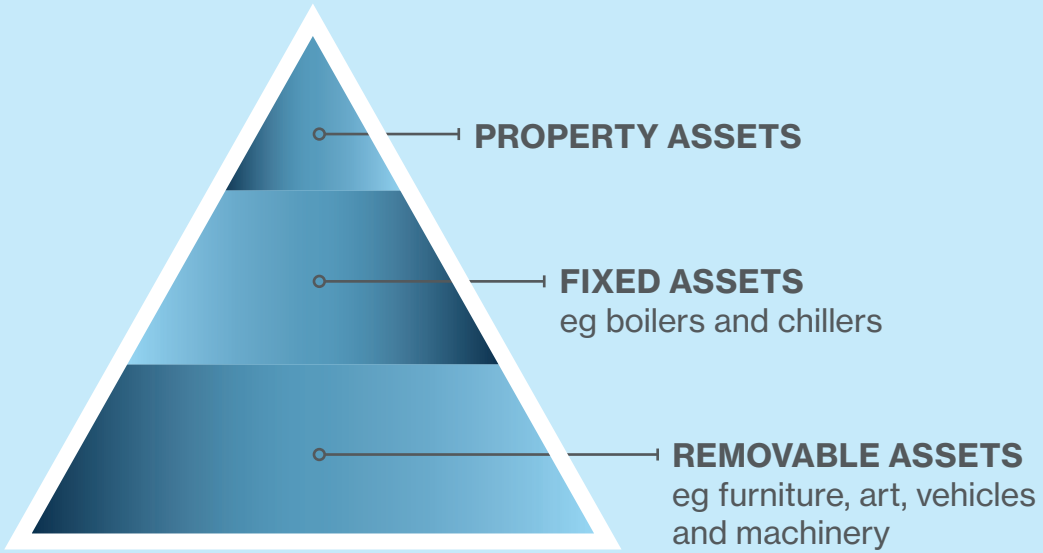
A cost-cutting drive
When tough times hit, most organisations look to cut costs and start by assessing their assets, often beginning with property assets (especially if redundancies have been made and less space is required). An accurate picture of FM assets through an asset register, combined with other information around leases etc., will help senior management to decide which buildings are the most effective and efficient to run.

Change in working practices
Many organisations have introduced new ways of working, such as hot-desking and flexible working by time or location, which changes how a building is used and the assets it needs. A well-maintained asset register will help an organisation to decide whether the M&E assets, such as boilers and chillers, can maintain environmental conditions with increased working hours and less downtime, for example.

A change in the senior or facilities management team
Fresh blood joining an organisation often results in a change of strategy including a focus on proactive asset management.

A large purchase
When an organisation is looking to make a sizeable capital purchase, whether it is a new boiler or new whiteboards for its meeting rooms across its portfolio, questions are often asked about current assets. For example, if the portfolio is large and widespread, data might be available on the costs in use of other boilers or which types of whiteboards are popular and easy to maintain elsewhere. If an asset register and asset management strategy is not already in place, this often prompts its creation.

The three types of asset



Organisation growth or strategy development
As an organisation grows in size it may become subject to certain financial reporting requirements which require in-depth knowledge of the organisation's assets.

Adopting new strategies, such as a commitment to reduce carbon emissions, will require detailed information on assets and their performance.

Understanding what an asset is and how it supports the organisation is key to creating an asset management strategy. The facilities professional will typically deal with three types of asset (see image).

In the FM context an asset could be a property or building asset in its entirety or part of a building such as a meeting room; a fixed asset such as a piece of M&E (mechanical and electrical) plant; or a removable asset / FF&E assets (furniture, fixtures and equipment) such as furniture or 'white goods'. An asset is an item which has a clear value to the organisation. This is discussed further in chapter 3.

There are four phases to an asset's life:
- Acquisition: the decision to purchase the asset
- Operation: the management and use of an asset to deliver services
- Maintenance: maintaining the asset during its life
- Disposal: the end of the asset's life

Proactive asset management has a key role to play at every stage of an asset's existence and the following chapters look in further detail at each phase.

A high-level asset management strategy, particularly in larger organisations, will inform lower level policy which can define the detailed elements of the four asset life phases.

An important concept here is 'line of sight' - the golden thread of rationale which ultimately justifies every asset management activity. The project manager or technician at the 'sharp end' of an organisation should be able to trace the rationale for what he or she is doing upwards through a clear set of plans, objectives and strategic statements to something in the organisational strategic plan.

Phase 1 of an Asset's Life – Planning & Acquisition

3

The initial cost (the capital outlay) of purchasing an asset only represents a small proportion of its total cost of ownership (TCO). The operating and maintenance costs typically outweigh the initial investment many times over. In its procurement guidance to whole-life costing, the UK's HM Treasury describes the acquisition cost as the tip of the iceberg, with the majority of the cost involved in the asset's operational phase including staff costs, training, maintenance, operation, withdrawal from service, depreciation, disposal, renewal and rehabilitation.

This is backed up by a study from the Royal Academy of Engineering (the UK's national academy for engineering), 'The Long Term Costs of Owning and Using Buildings', which found that for a typical office building, over a 30-year period, the ratio between capital cost and operational expenditure is 1:5. Other sources suggest the ratio could be even lower, with as little as 2% of lifecycle expenditure accounted for by capital costs. Therefore making the right decision at the planning and acquisition stage is crucial.

Of course, acquisition of some assets (such as CCTV) may reduce related expenditure (manned guarding).

Good asset management can help in a number of ways. At the most basic, it can help an organisation to decide whether it actually needs to purchase an item at all (i.e. how to invest; whether to purchase it outright, lease or hire the item). Is the planned purchase already owned by the organisation but in another department, building or campus, for example? It's not unknown for an organisation to close a building and put the contents into storage. Later a new building is leased or purchased but the equipment and furniture in storage is forgotten about and new materials purchased. An asset register would contain this information and prevent duplicate purchases and wasted money.

It can also help the organisation to make the right kind of purchase. For example, an asset register combined with an asset management system (information about the asset's past and future maintenance schedule) could give historical data about the cost of running certain assets around the estate. Although cost data may be limited in the early stages of the asset's life, particularly during the design/acquisition phase, life cycle costing can be refined as experience of the asset in use is gained. For example, a $75 chair might seem like a great purchase but if it falls apart within a year, and a $250 chair lasts ten years, then it has been a poor purchase decision.

An up-to-date asset management plan allows the FM to look at the performance of models over a period of time – which may not be so crucial in the chair example but more so, if you were fitting out 20 new kitchenettes with a range of white goods. Life cost analysis involves the continuous monitoring of the actual performance of an asset during its operation and maintenance to identify areas in which cost savings may be made and to provide feedback for future life cost planning activities. If that information is not available in-house, then industry-wide benchmarking tools and product reviews can be useful in determining performance of a wide range of FM assets and improve capital asset planning. For example, it may be better to replace an expensive building component with a more efficient solution prior to the end of its useful life than to continue with a poor initial decision.

It is therefore essential that the facilities professional defines the service requirements of the asset. What is the asset required to do, what minimum condition is acceptable, and how can its service levels be measured? The service levels should take into account the potential consequences of failure, and the minimum condition grade of an asset, which will feed into the asset's criticality ranking which will be explored further in chapter 5.

Good asset management starts with an asset register, which is essentially a list of an organisation's assets and their condition and is used to manage the organisation's assets to deliver an agreed standard of service. This helps an organisation to ascertain what it owns or leases and the stock of that item; and find out where that asset resides and who is responsible for it.

The asset register will feed into the asset management system which contains information about the asset's maintenance schedule. The organisation can plan for replacements more concisely and, as stated in chapter 1, it is a record for insurance claims and auditors.

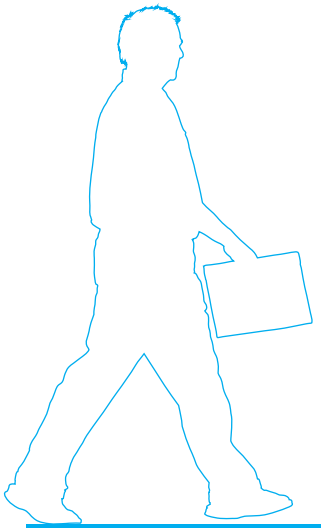
As previously stated, FM-related assets typically fall into three classes: property; fixed assets and removable assets. The asset register should typically only include details of the last two categories as property assets are likely to be kept in a separate register. What the register should contain varies from organisation to organisation, but a typical register would include:

- All items with an original cost in excess of $2,000 (or as little as $500 depending on the organisation)
- Personal computers, IT and audio visual equipment with an original cost of more than $1000
- Other equipment, whatever its original value, that may be considered attractive to potential thieves. For example, while a Dictaphone, keyboard or task light may cost less than $200 they might be an attractive item to steal and would be included on the asset register in some organisations
- Other equipment, whatever its original value, where there may be a health and safety issue, either in its use or in its disposal
- Other items that the FM team might want to keep track of, for example for portable appliance testing
- Other maintenance-related items that the FM may want to keep track of for maintenance purposes, such as light fittings

Many organisations may choose to group assets together, for example by describing a meeting room as an asset which includes items such as tables, chairs, artwork etc.

The register should include the following information, although again it will need to be adapted depending on the type of organisation, as displayed in the sample asset register to the right.

	ASSET REGISTER ENTRY	DETAILS	EXAMPLE
1	ID number	Unique number given to each individual asset to identify it	1001
2	Item description	Short description of item which is standardised within the register so, for example, a search could reveal all the fridges owned by the organisation	Fridge
3	Supplier	It might be useful to include the supplier's details for future reference or comparison. For leased items, this should be the lessor	Myer
4	Item make	Manufacturer of item	Samsung
5	Item model	Item's model number, found on the invoice or catalogue	RSH7UNRS
6	Item serial number	Unique serial number of item, usually found stamped on the item itself	33777184JN
7	Item location	Where in the facility / estate the item currently resides. Use set room / floor / building numbers. If the item is mobile, then it must be owned by a department and that department's location should be used	INB 2.34
8	Purchase / lease / loan	Description of whether the item was purchased outright, leased by the organisation or loaned to the organisation from another source	Purchased
9	Purchase / lease / loan date	When the item was purchased or the lease/loan commenced	25/11/2014
10	Purchase / lease amount	This should include delivery, installation, non-recoverable VAT and import duties	$1,199
11	Purchase order number	For internal use only	MAG123456
12	Lease / loan end date	Details of when the item needs to be returned to its legal owner	N/A
13	Is the item in service?	Yes / No answer	Yes
14	Is it under warranty?	Yes – one year	Expires 01/07/2016
15	Organisation owner	Name of the department or business unit which currently owns the item – again use standardised names so a search can be made of a department's assets	INB/ RE
16	Disposal date	When the item needs to be disposed by (perhaps for legal reasons) or its estimated end-of-life	25/11/2022
17	Disposal method	How the item will be disposed of, for example recycled, scrapped etc.	WEEE Directive



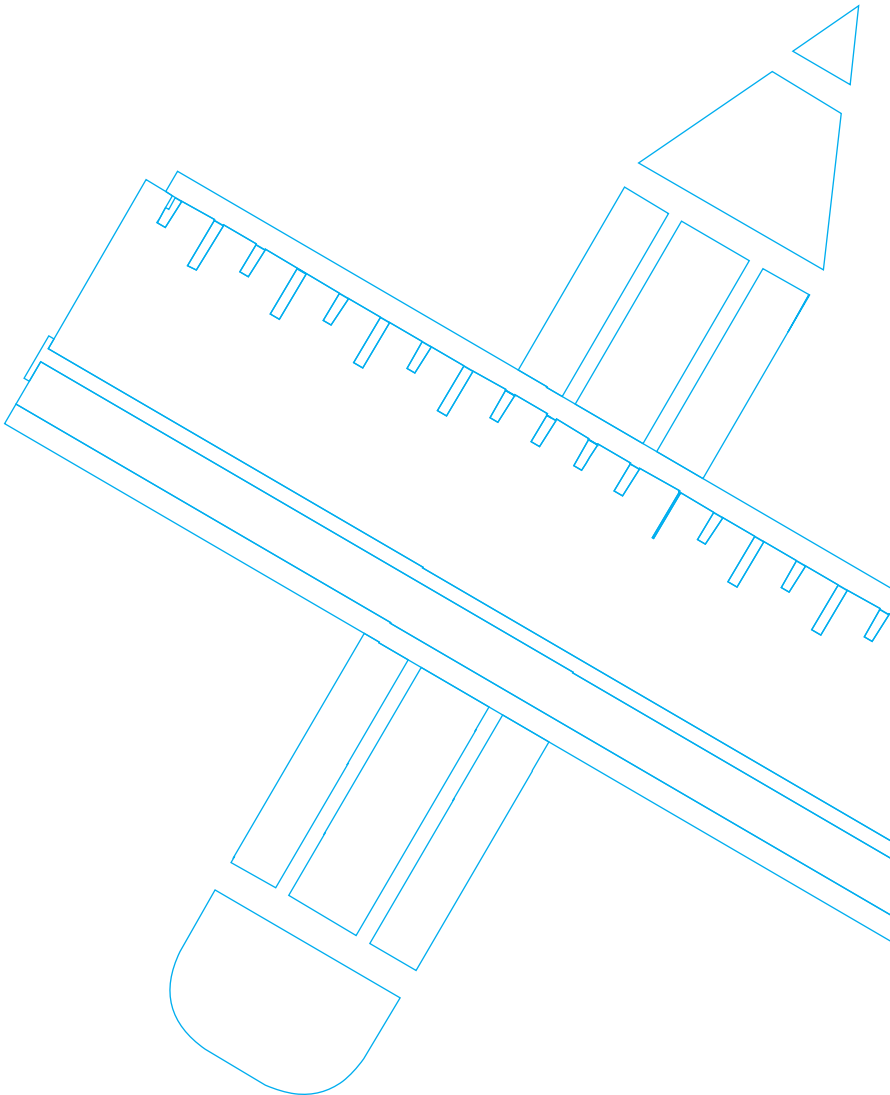
It's important to verify details by walking the building to complete an asset survey

For organisations with already-established asset registers, keeping them up to date is a matter of following set procedures – see chapter 4. But for those starting out, after one of the trigger incidents mentioned in the previous chapter, the task can seem gargantuan.

The first job is to decide what an asset is in the organisation's context. Read through the descriptions above and work out parameters for the business. For example, a charity may decide to include more lower-priced items, whereas an investment bank may raise that bar somewhat. An organisation with laboratories would have detailed information about its scientific equipment.

The asset register can be compiled from information already held but it's important to verify details by walking the building to complete an asset survey. Information can be entered directly into the register using a tablet or other device and assets could also be tagged at this point, for example using barcodes or RFID tags (see chapter 7).

At this stage, don't include details of any maintenance schedule – this can be done from the desk with access to the manufacturer's maintenance schedule and recommendations – then the FM can easily look through on a system and note that it's a certain light that takes a certain luminaire and needs to be changed every xx weeks or months. They can then start building this information into the maintenance plan.



Phase 2 of an Asset's Life – Operation

4

The operational phase of an asset's life is its longest and most useful period – it is when the asset is managed and used to deliver services to support the core business. Proactive asset management has a key role to play in this area.

With an asset register in place it's important to carry out a regular audit. The frequency of this will depend on the environment and the nature of the assets. If there are a lot of portable, high value assets that are essential to the organisation's work (as you find in a hospital, for example) the audit may be carried out as frequently as weekly or monthly.

An asset management procedure should be set up both to ensure that new items are added to the register when they are purchased or leased and that any changes to the condition of the asset is recorded in the asset management system. In terms of additions to the register, the procedures will vary depending on the size of organisation. In some cases the person responsible for the register will be the same person who orders the equipment but in larger organisations an internal system will have to be implemented so the owner of the register is kept informed of new additions.

Many organisations operate an online or hard copy form for new additions which would include sections 2-14 in the asset register example given above. Whatever approach is used, organisations must document the procedures and ensure they are circulated to the appropriate people within the organisation and it is part of the induction process for new employees at a certain level.

It is important to keep track of the maintenance to assets and to ensure that any maintenance carried out is recorded in the asset management system.

There will be further detail in chapter 7 about how technology can be used to track and manage assets but it is essential that processes and procedures are in place to ensure that this detail is recorded. However, deviation should not always be considered a bad thing.

For example, a maintenance engineer may go to a site to fix a broken light fitting. While he's there, he's also asked to fix a broken chair and does the job informally – but doesn't note it on the asset management system. The system is then essentially out of date. But the engineer saved time, money and carbon emissions by fixing both problems at the same time, so it's essential not to discourage him from doing ad-hoc work but to incentivise him to record the information appropriately. Handheld intuitive technology (i.e. tablet devices) has a key role to play here and will be discussed later.

Not all assets will perform the same across a large estate. The life and cost of operating an asset is affected by a number of issues, including the weather, local flora and fauna, location of building (i.e. height, direction it faces, proximity to water, urban/rural), hardness of the water, and type of energy supply; all of which could affect how an asset performs over its life. To take a simple example, white goods and plumbing assets such as shower heads will need more maintenance in an area of hard water than in a soft water area.

Historic performance of assets/materials: how existing assets have previously performed will have a bearing on their future performance and operating costs. A portfolio will always include a mix of new and older properties and assets and these will vary in performance and operating cost.

Methods of monitoring: different parts of the estate may monitor assets in a different way or the same monitoring techniques might not be available in some areas.

Intervention strategies: different assets and facilities may have different maintenance plans which will affect the whole-life cost and performance of an asset. Different maintenance strategies will be explored further in the next chapter.

An organisation's approach to risk assessment and business continuity planning will also have an impact.

Phase 3 of an Asset's Life – Maintenance

5

Proactive maintenance is at the very heart of asset management. A well-thought-through maintenance plan will improve the condition of, and extend the life of, the asset. Conversely, poor maintenance can reduce the useful life of an asset. Although an asset may be designed with a life of 20 years, good maintenance may mean that it could perform well beyond that period.

The detail contained in the asset management system will help the facilities manager to ascertain whether, for example, investing 10 per cent more per annum in maintenance costs would double the life of an asset. Together with an appraisal of the organisation's core strategy, it will also help to decide which maintenance strategy to follow.

There are broadly two types of maintenance:

- **Preventative maintenance**, whereby assets are maintained regularly throughout their lifecycle in order to avoid failures and breakdowns
- **Reactive (or corrective) maintenance** through which an asset is maintained after it has broken down to get it back into working order.

It is also essential to consider the role that maintenance plays in occupational health and safety (OH&S). The legislation, regulation and maintenance policies covering buildings and other assets will usually specify minimum and recommended maintenance regimes.

For example, the Queensland Government Maintenance Management Framework includes a condition assessment priority ranking scale, with highest priority works scheduled to ensure the health and safety of building occupants and to support statutory compliance obligations.

Preventative maintenance is further broken down into:

- **Planned Preventative Maintenance** (PPM): scheduled maintenance to an asset where service visits are carried out at set times by a skilled maintenance technician to ensure the asset is working correctly and performing to its required service level. The aim is to avoid unscheduled breakdown and downtime. Under proactive asset management, each asset will have its own PPM programme which is put together by combining the manufacturers' maintenance recommendation, any local conditions which may affect the asset and cause it to perform differently, relevant legislative requirements and the history of the asset and its performance. Most cars operate under a PPM programme, for example, with oil, water and parts being renewed or changed after x number of miles.

- **Predictive Maintenance** (PdM) **or Condition-based Maintenance** (CBM) is maintenance as and when required. It derives from the manufacturing sector and, in the FM context, is primarily aimed at M&E plant and equipment. The equipment is subject to condition monitoring by sophisticated instruments, together with analysis software, which determines the equipment's health, and notifies only when maintenance is necessary, minimising spare parts cost, system downtime and time spent on maintenance.

- **Reliability-centred Maintenance** (RCM), created by the US aviation industry in the 1960s, and adopted commercially in the US in the 1990s, is focused on establishing safe minimum levels of maintenance. It encourages equipment owners to monitor, assess, predict and understand the working of their physical assets, identify the operating context of the machinery, the criticality of the asset and its potential failure and determine the appropriate maintenance tasks for the identified failures. The result is a maintenance program that focuses scarce economic resources on those items that would cause the most disruption if they were to fail.

Each asset is given a criticality ranking linked with business continuity planning

- **Total Productive Maintenance** (TPM) originated in Japan in the early 1970s and is an extension of Total Quality Management (TQM). It aims to improve equipment productivity (mainly in the manufacturing environment) by maintaining the plant or equipment in good condition without interfering with day-to-day work. It does this by involving the equipment operator in the maintenance process. They are trained to perform many of the day-to-day tasks of simple maintenance and fault-finding.

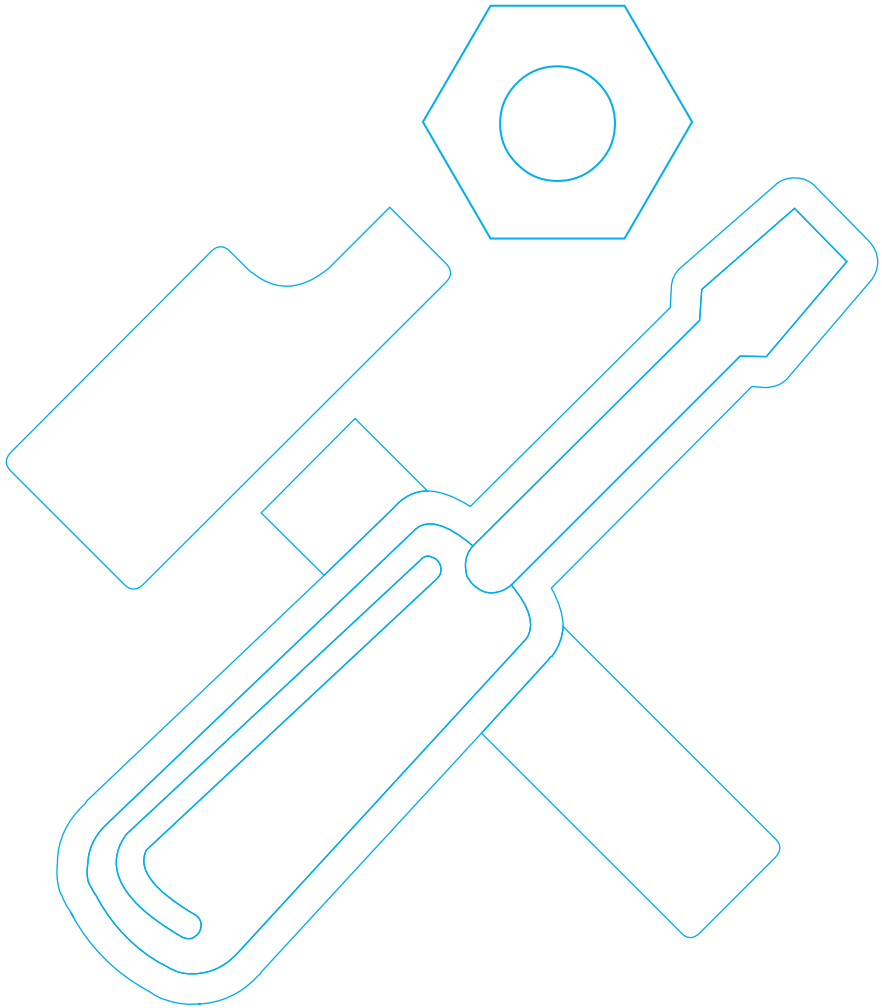
- **Run to fail** can also be seen as a maintenance strategy that might be used where a reliable solution or maintenance plan is not cost effective. Assets that, should they fail, do not pose a threat to safety, pollution or production are more suited for a "run to failure" approach. For example, if the boiler were to fail on a cold winter day, the building would likely be evacuated and work would stop, but a meeting room light failing might put that room out of action for a short period of time but would not stop the business overall. It is essential that, as part of the asset management system, each asset is given a criticality ranking and that this is linked with business continuity planning.

The first step is to define the characteristics of each asset including:

- Use within facility – mission and regularity of use
- Consequences of failure on facility and its stakeholders
- Maintenance history, including both preventative and reactive
- Asset reliability, known as mean time between failures, together with how quickly the asset might fail (for example a carpet wears out over a long period of time whereas an asset which fails quickly such as a boiler would have a higher criticality ranking)
- Lead time for spares
- Replacement value of asset

Each characteristic is given a figure from 0-10 to signify its importance to the business (10 being critical). At the end of the process, it should be clear that an asset of between 40 and 60 is critical to the business while an asset scoring less than 15 is dispensable. As well as a simple criticality number, it is essential that the facilities manager understands which characteristics make the asset critical. This will help to understand how that criticality can be better managed – for example by increasing the spares inventory, installing a back-up asset or changing the type of maintenance programme. There should also be an understanding of the events that cause each asset failure.

The message is that just because an asset is in bad condition does not necessarily justify prioritising its maintenance in the works schedule – the more critical assets must take priority to best support the business.



Phase 4 of an Asset's Life – Disposal

6

However good the asset management and maintenance planning in an organisation, the time comes when an asset reaches the end of its useful life and it needs to either be recycled, sent to landfill, sold on or donated (to an employee or third party) or dismantled and the parts reused, scrapped or sold.

Often the disposal cost will be negative because the asset has a resale value, such as a company car. But for many assets, such as white goods, there will be costs associated with disposal. There are a number of different policies, based on territory throughout Australia, highlighting best practice for asset disposal.

The Western Australian 'Disposal of Goods Policy' states that an authority must dispose of goods in a manner that is ethical, equitable and efficient, and where practicable, maximises the financial return to government, which might include:

- Transferring to another government entity
- Trade-in
- Inviting competitive offers through written quotations or open tenders
- Public auction
- Recycling
- Donating to charitable institutions where the goods have little or no economic value or the cost of disposal through other methods is not efficient or economical
- Destruction or dumping in accordance with relevant regulations
- Community re-use or environment recycling for information and communications technology (ICT) equipment
- Selling to public sector employees through a competitive process

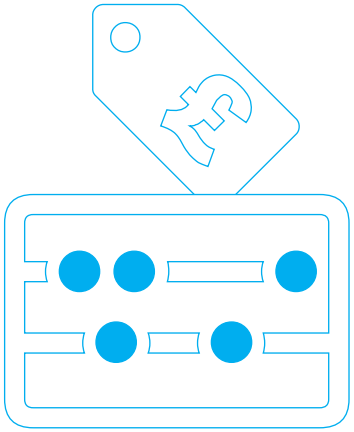
In 2011, the Product Stewardship Act was introduced to help reduce waste and prevent harmful materials by increasing recycling and the recovery of valuable materials from products.

It provides a framework in effectively managing the environmental, health and safety impacts of products, and in particular those associated with how the products are disposed.

Before disposal, facilities professionals should give due consideration to dangerous or environmenally-unfriendly goods and dispose of the; taking into account relevant government or state restrictions or legislation in respect of dangerous goods. This could include investigating the costs involved and selecting the appropiate method of disposal.

On a practical level, all assets disposed of must be recorded on the asset register and system, to ensure they are not still counted as being part of the organisation's portfolio. An electronic or hard copy equipment disposal form will allow the asset 'owner' to explain how the asset was disposed of, any residual value (for example a company car retains some residual value whereas a fridge may not) and whether it was subject to any legislation.

A key part of proactive asset management is calculating asset depreciation, a method of allocating the cost of a tangible asset over its useful life. Although this will be done in the acquisition phase, its benefits will be realised in the disposal phase. Organisations depreciate long-term assets for both tax and accounting purposes. For accounting purposes, depreciation shows how much of an asset's value has been used up (fair value depreciation) which demonstrates how much an organisation is worth; while for tax purposes, businesses can deduct the cost of the tangible assets they purchase as business expenses (depreciation with the matching principle) which affects net income.



Organisations depreciate long-term assets for both tax and accounting purposes

- **Straight-line depreciation** is the most straightforward and common technique. The organisation guesstimates the residual value of the asset at the end of its useful life and expenses a portion of original cost in equal increments over its life.

- The **accelerated depreciation method** of depreciation calculates a higher depreciation charge in the first year of an asset's life followed by gradually decreasing charges in subsequent years. This is a more realistic view of the asset's worth as newer assets are likely to be more useful to an organisation. One prevalent accelerated method is the declining-balance method (also known as the reducing balance method) whereby the book value is multiplied by a fixed rate.

- The **sum-of-years' digits** depreciation method also assumes that an asset loses a majority of its value in the first few years of use. Under this method annual depreciation is determined by multiplying the depreciable cost by a schedule of fractions. The expected life of an asset (in years) is calculated and then counted back to one and all the figures added together. For example, if a fridge has 10 years' useful life, the depreciation would be calculated = 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 Sum of the years = 55. In the first year, the asset would be depreciated 10/55 in value, 9/55 in the second year etc.

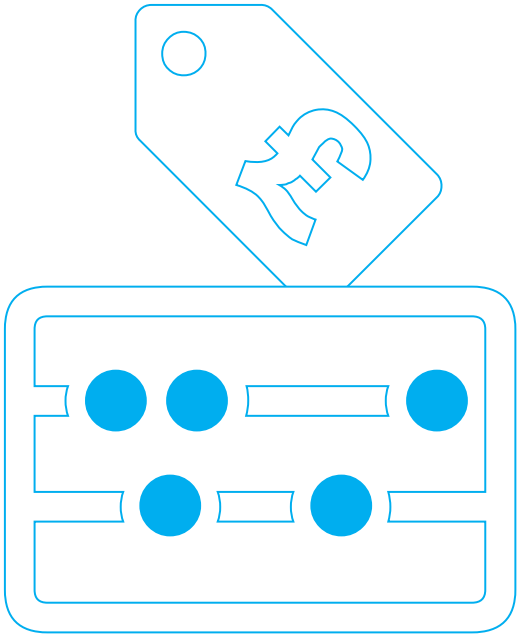
- Alternatively the asset could be depreciated based on its **level of activity**, such as miles driven or numbers of machine cycle counts, which is called activity depreciation. On acquisition its life is estimated in terms of this level of activity, for example how many miles a car will drive, or how many cycle counts a piece of equipment will perform.

Chapter 3 looked at the whole life cost of the asset and the importance of recognising, at the planning and acquisition stage, that the purchase of the asset only represents a small percentage of the total cost of ownership. Once the disposal phase of the asset's life has been completed, it is then possible to have an accurate picture of the financial cost of an asset to the organisation. This information should be fed back into the asset management system to aid option evaluation when procuring new assets in the future.

More complex plant, which cannot simply be sold or disposed of, may require a more systematic approach to decommissioning. This could include a feasibility study to establish the true liability (or possibly opportunity) of a decommissioning project.

Dismantling and reuse, demolition and mothballing or some combination of these three may all be options. Where possible, the involvement of engineers that have operated and maintained assets throughout their working life is advisable. Replacing building services plant located in basement plant rooms or on roofs may require special access arrangements such as scaffolding and cranes that will add significantly to the cost.

If demolition is the chosen option, it must be done in accordance with the relevant state regulations.



Using Technology to Improve Asset Management

7

Before implementing any particular technology solution it is essential to develop a maintenance software strategy. The first step is to understand exactly how software can benefit the maintenance operation (see below). This can help quantify the value its use can bring and therefore help both system selection and prioritisation of functionality.

A strategy will also look at implementation, training and future integration of additional modules or functionality, as well as the fit with the organisation's overall IT strategy.

The previous four chapters have explored the key stages of an asset's life from acquisition and operation to maintenance and disposal. Technology has a key role to play in each of these phases from tracking an asset's location to managing the maintenance cycle.

Asset management system
Each individual asset has complex data associated with it. This can be managed in a spreadsheet format, but the interoperability between assets and their environment is too complex for a spreadsheet format and requires a computer-based asset management system. This is usually pre-loaded with typical asset data and can be used to:

- Capture information including cost codes and management structures associated with the equipment
- Manage asset information based on groups and model types
- Identify and analyse the elements that affect reliability, servicing and repair
- Automatically create work requests when building automation systems/ building management systems alarms are triggered
- Highlight the most cost-effective method of maintaining an asset (planned preventative maintenance, reactive maintenance or complete replacement)
- Link assets with components for maintenance and refurbishment purposes. If components for an asset are recorded and linked to the asset, then if the components have different life spans and one of the components is replaced, then it is easier to make a decision about the management or replacement of the other components
- Evaluate the true cost of an asset over a period of time and calculate life-cycle costs and asset depreciation

Technology to identify, track and secure assets
When an asset register is being created (see chapter 3) each asset will be given a unique identification number or serial number which is usually displayed on the asset to aid identification and track movements. This can be done with a fabric or sticky label but more organisations now use QR Codes, barcodes or RFID tags to increase efficiency and reduce errors.

Advances in software development have allowed for more in-depth understanding of assets across their whole lifecycle. Both one-off costs associated with an asset (such as acquisition, installation, disposal and replacement) are captured as well as expenditure for routine maintenance activities (for example, the estimated cost of labour, parts and travel). By analysing every PPM task over a set period of time, many FM software applications can automatically calculate predicted maintenance costs over an asset's lifetime, over as many years as required.

With this comprehensive insight, Facilities Managers are able to plan the most effective maintenance regime for a piece of equipment, make informed decisions about servicing and replacement, and ensure that their organisation secures the best performance from its assets, both in terms of availability and maintenance costs.

QR Codes: QR codes are a new matrix barcode technology widely used in the consumer market; ideal for the FM sector, because they are low cost, offer fast readability and better storage capacity. QR codes can be implemented to attach to, track and manage asset data, providing an in-depth insight into an asset's performance and history. The reader will dissect the code and scan databases for that particular asset and its pertinent information. This could relate to the asset model, supplier, service history, maintenance call-outs or warranty information.

Handheld technology has revolutionised the work of the maintenance engineer

QR codes can also be used for labelling rooms. This enables mobile operatives to scan their location and receive context sensitive options, such as jobs or asset inventory for the location that they're in and details of previous operatives' visits. With the asset data readily available onscreen, the operative can then identify the relevant information to efficiently respond to the job, thereby reducing job rectification times and improving asset performance.

Barcodes: A barcode is an optical machine-readable code which includes information about the object to which it is attached. Barcodes are read by optical scanners or Smartphones and send the data back to the asset management system and/or register to inform it where the asset is currently located. Although accurate, they are time-consuming if there are numerous assets as they all have to be scanned individually.

Radio-frequency identification (RFID) tags use radio waves to identify or track an object. Many RFID tags do not have to be 'shown' to a reader but can be read from several metres away and several hundred can be read at one time – for example hotels insert the tags, which are only slightly larger than a grain of rice, into laundry to track items when they go to be cleaned. These are passive RFID tags, which don't have a battery. Active tags, with batteries, can be used to track containers or monitor environmental conditions such as temperature and humidity.

Many organisations also choose to use technology to security mark their assets to deter thieves. Tamper-resistant labels can be similar to the barcode described above but with details such as 'Property of" and contact details. There are more sophisticated options including permanent marking systems made with unique stencils (containing, for example, company name and postcode, the system supplier's phone number and unique reference number); and unique chemical solutions which are pasted on the asset; this is difficult to remove and even a tiny molecule of the solution can be used to determine who the item belongs to in the event of theft. These types of systems are used both as a deterrent (they typically come with warning stickers for office windows and on the asset itself) and also to allow the police to track the original owner should the item be stolen and then recovered. Details of these systems should be kept on the asset register or in the asset management plan.

Handheld technology

Handheld technology has revolutionised the work of the maintenance engineer. Instead of a bulging folder full of paper work orders, instructions and safety manuals together with client history files and other documents, many maintenance workers now carry one small handheld device around. This typically gives them work orders, listed by locations, asset, priority, status or date and avoids them having to scribble notes on paper print outs of work orders and then manually add the data directly into the asset management system, CAFM (Computer Aided Facilities Management) or CMMS (Computerised Maintenance Management System) when they're back in the office. This saves time and improves efficiency and access to information – many clients have access to CAFM or CMMS systems and can see their jobs updated in real-time by the engineer on site.

The handheld devices will also typically record signatures, images and labour used against work orders as well as remotely accessing maintenance history, costs, stock levels, meter readings and asset details. Access to instruction manuals and safety manuals, together with the service level agreements, can also be arranged to ensure the work is done to the required standard. The technology allows engineers to receive emergency job information on the spot without the need to return to base, order parts and directly influence the CAFM, CMMS or asset management system so it remains up to date. This should help to avoid the problem, outlined in chapter 4, of the engineer who fixes an ad-hoc problem but fails to record it in the asset management plan.

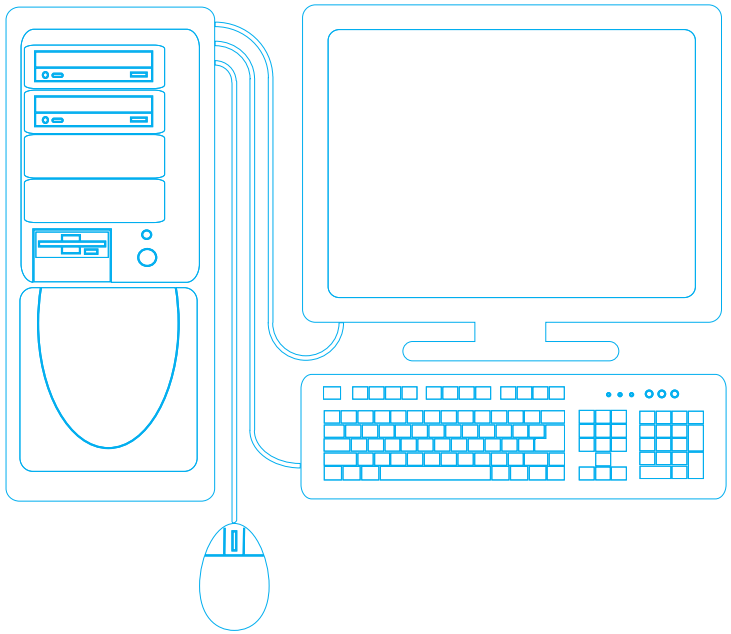
Two trends have accelerated the use of handheld technology. The first is the increasing use of tablet devices which are gaining widespread acceptance by consumers and are therefore familiar to facilities and service staff. The second is the bring your own device (BYOD) to work trend, with staff encouraged to use their own phones, laptops and tablet devices to access company applications and information stored in the Cloud.

Tablets have advantages over bespoke handheld devices because they use familiar operating systems, including Apple's iOS and Google's Android, which reduce training time. They often provide new and better functionality, including higher resolution displays, a resizable touch screen and more application options. All of this contributes to a richer and deeper user experience. They are also relatively inexpensive.

A key advantage of implementing a maintenance software system is the data it generates

Technology for condition monitoring
As mentioned in chapter 3, the condition monitoring method of maintenance requires sophisticated technology to collect the data about the asset's condition and predict failure. Instruments used for data collection are either portable handheld devices used when walking around the assets or permanent online systems that automatically collect and store data and alert the FM to any problems. They include technologies such as vibration measurement and analysis; infrared thermography; oil analysis and tribology; ultrasonics; and motor current analysis.

Sensor technology is now more accessible to FM, following a drop in costs and device size, as well as increased mobile coverage. Placed on an asset, it will join a wireless network and becomes a 'smart object' as part of the Internet of Things (IoT), transmitting live data to an IWMS or CMMS system for analysis. This integration allows potential problems to be rectified before they become a problem – for example a small change in readings can automatically create a job and have an engineer dispatched. This means the FM only has to manage one system rather than several disparate technologies.



Technology can manage the whole asset management process from the initial asset discovery and condition monitoring on handheld devices, to tracking the asset's movements, managing its condition, establishing true operating costs and enabling optimal life strategies to be implemented. Importantly it also allows for better auditability and transparency of an organisation's asset base. But it is important to recognise that technology on its own will not solve anything, it needs to be part of an organisation's asset management systems and processes.

A key advantage of implementing a maintenance software system is the data it generates. But for this data to be valuable in decision making, the organisation must have a clear and consistent approach to verification, correction and management.

Data will underpin asset management, especially where more sophisticated maintenance regimes such as CBM and RCM (see chapter 5) are adopted. Organisations that focus on management using data analysis will be able to measure and track performance in greater detail, which will allow for adjustments to achieve desired results much earlier.

Building Information Modelling (BIM)
The adoption of BIM for construction, design and through-life operation of buildings should bring a new discipline to the creation and management of asset information.

Although some years from wide-scale adoption, many companies are taking advantage of this methodology. BIM gives building operators a virtual model of the facility which links the precise location of assets with verified "as built" information from manufacturers, suppliers, installers and consultants. Data integration with FM software systems enables facilities managers to work more proactively and the benefits of adopting BIM include streamlined decision making for purchasing, maintaining and replacing assets by having a single initial source of building information.

Summary

8

Asset management is the management of physical assets, from acquisition to operation, maintenance, inspection, renewal or disposal, to optimise their operational performance, minimise their whole life cost and support the organisation's goals and objectives, risk management and business continuity strategies.

There are four phases to an asset's life:

- Acquisition: the decision to purchase the asset
- Operation: the management and use of an asset to deliver services
- Maintenance: maintaining the asset during its life
- Disposal: the end of the asset's life

The initial cost (the capital outlay) of purchasing an asset only represents a small proportion of its total cost of ownership (TCO). The operating and maintenance costs typically outweigh the initial investment many times over.

The fundamental principle of asset management is to intervene at strategic points in an asset's normal life with optimised repair and maintenance activities, in order to maintain the performance of an asset and extend its life.

A good asset management strategy can deliver significant financial and performance/service improvements to an organisation. It can also make an FM's life easier at an operational level. The strategy must be integrated, cross-disciplinary and joined-up across the organisation. It should also be methodical and sustainable.

FMs should consider standards such as the PAS 55 framework for the optimised management of physical assets or SFG20, the standard maintenance specification for building services.

There are at least three different broad approaches to asset management: Total Asset Management (TAM); Life Cycle Asset Management (LCAM) and Enterprise Asset Management (EAM).

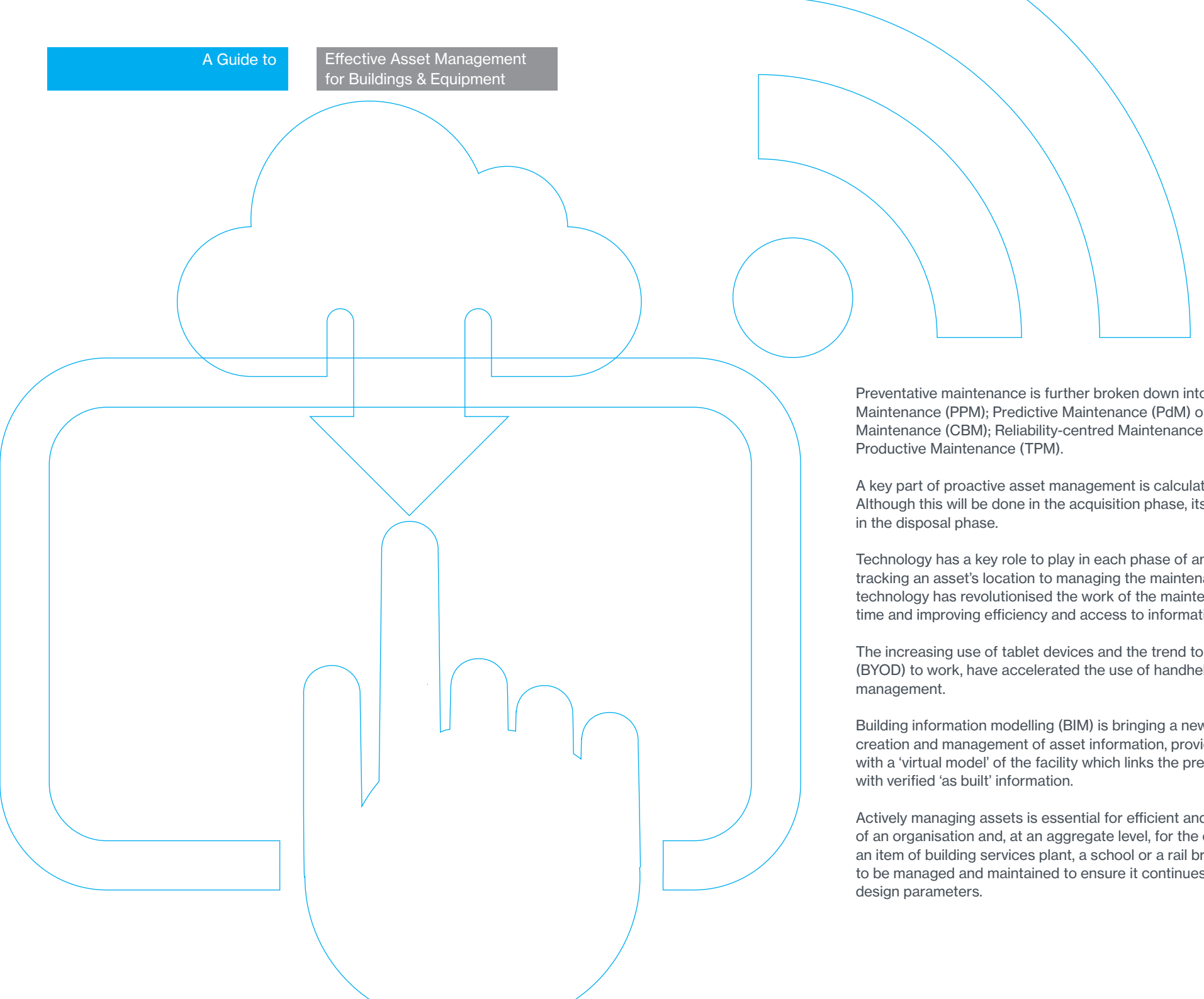
Good asset management starts with an asset register - essentially a list of an organisation's assets and their condition. This should also record any maintenance carried out on assets. It is essential that, as part of the asset management system, each asset is given a criticality ranking and that this is linked with business continuity planning.

Proactive maintenance is at the very heart of asset management. A well-thought-through maintenance plan will improve the condition of, and extend the life of, the asset. Conversely, poor maintenance can reduce the useful life of an asset.

There are broadly two types of maintenance:

- Preventative maintenance. Assets are maintained regularly throughout their lifecycle in order to avoid failures and breakdowns
- Reactive (or corrective) maintenance. An asset is maintained after it has broken down to get it back into working order.

The fundamental principle of asset management is to intervene at strategic points in an asset's normal life with optimised repair and maintenance activities



Preventative maintenance is further broken down into: Planned Preventative Maintenance (PPM); Predictive Maintenance (PdM) or Condition-based Maintenance (CBM); Reliability-centred Maintenance (RCM) and Total Productive Maintenance (TPM).

A key part of proactive asset management is calculating asset depreciation. Although this will be done in the acquisition phase, its benefits will be realised in the disposal phase.

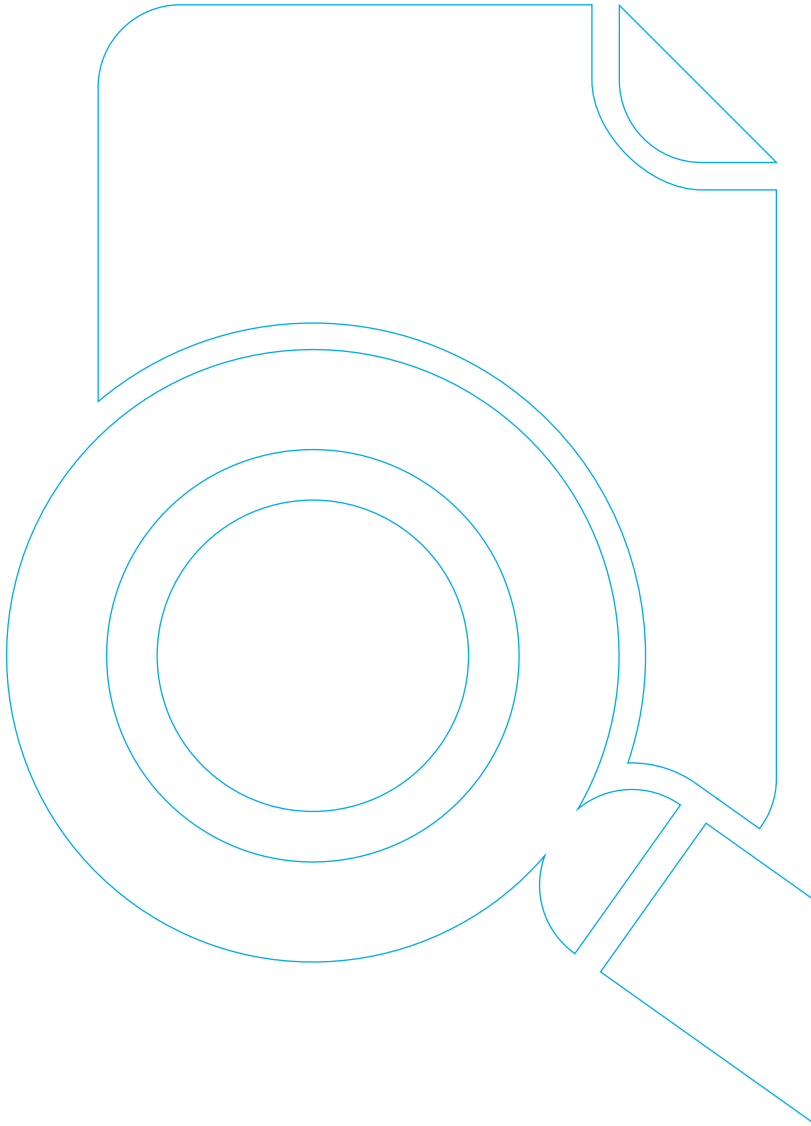
Technology has a key role to play in each phase of an asset's life, from tracking an asset's location to managing the maintenance cycle. Handheld technology has revolutionised the work of the maintenance operative, saving time and improving efficiency and access to information.

The increasing use of tablet devices and the trend to bring your own device (BYOD) to work, have accelerated the use of handheld technology for asset management.

Building information modelling (BIM) is bringing a new discipline to the creation and management of asset information, providing building operators with a 'virtual model' of the facility which links the precise location of assets with verified 'as built' information.

Actively managing assets is essential for efficient and sustainable operation of an organisation and, at an aggregate level, for the economy. Whether it's an item of building services plant, a school or a rail bridge every asset needs to be managed and maintained to ensure it continues to function within design parameters.

Appendix 1: Glossary



BIM	Building Information Modelling
BYOD	Bring Your Own Device
FM	Facilities Management
CBM	Condition-based Maintenance
CCOHS	Canadian Centre for Occupational Health & Safety
CMMS	Computerised Maintenance Management System
EAM	Enterprise Asset Management
EIHWHRMR	Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations
FF&E	Furniture, Fixtures and Equipment
ISO	International Organisation for Standardisation
IWMS	Intergrated Workplace Management System
LCAM	Life Cycle Asset Management
M&E	Mechanical and Electrical
OAP	Overall Asset Productivity
OH&S	Occupational Health & Safety
PAM	Public Asset Management
PPM	Planned Preventative Maintenance
RCM	Reliability-centred Maintenance
RFID	Radio-frequency Identification
ROI	Return on Investment
TAM	Total Asset Management
TCO	Total Cost of Ownership
TPM	Total Productive Maintenance
TQM	Total Quality Management

Useful glossary of Maintenance terms:

▶ **www.skf.com/aptitudexchange/glossary.html**

Appendix 2: Further reading & information

10

Asset management - Whole-life management of physical assets Edited by Chris Lloyd, published by Thomas Telford, London, February 2010

Communities and Local Government, Building on Strong Foundations: A Framework for Local Authority Asset Management, Department for Communities and Local Government, UK, 2008.

Communities and Local Government, Making Assets Work: The Quirk Review of Community Management and Ownership of Public Assets, Department for Communities and Local Government, UK, 2007.

ISO 55000 International Standard for Asset Management:
http://bit.ly/139VYrK

PAS 55: Institute of Asset Management:
http://bit.ly/152git5

SFG20:
www.sfg20.com

Transforming Government Procurement, HM Treasury, UK, 2007

American Society of Civil Engineers (ASCE) Infrastructure Report Card:
http://www.infrastructurereportcard.org/

LinkedIn groups on asset management (*log in to LinkedIn and search for the following names under Groups*)

- Institute of Asset Management
- ISO55000 / PAS55 Asset Management
- Asset Integrity, HSE and Risk Management
- Asset Investment Planning
- Asset Life Cycle management
- Strategic Asset Management
- IT Asset Management - Global
- Software Asset Management

CONTACTS

Asia Pacific:
Service Works Global Pty Ltd
Suite 2.12, 365 Little Collins Street
Melbourne
VIC 3000

T: +61 (0)3 8676 0380

North America & Canada:
Service Works Global Ltd
1100 Burloak Drive
Suite 300
Burlington
Ontario
L7L 6B2

T: +1 905 332 2335

Europe, Africa & Middle East:
Service Works Group Ltd
SWG House
4 Keswick Road
Putney
London
SW15 2JN

T: +44 (0)208 877 4080

www.swg.com
info@swg.com

Service Works Global is an international expert solutions provider of comprehensive, customisable Facilities, Property and Workplace Management Software. With offices across the world, Service Works Global delivers solutions to organisations across all industry sectors, to manage a broad spectrum of performance, delivery and service environments.