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EXPRO National Manual of Assets and Facilities Management

Volume 4, Chapter 2

Obsolescence Management

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1.0 PURPOSE

The purpose of this document is to inform and guide Entities on the principles of Obsolescence Management (OM), which should be applied through all stages of an asset's lifecycle to ensure that the supply of spare parts can be maintained after asset's warranty, until the asset or system is removed from service. The concept of obsolescence and managing it, is closely related to the whole life planning and ultimately to the Life Cycle Cost (LCC) of assets. Having a thorough understanding of obsolescence will assist in the management of assets in an efficient, and sustainable manner.

By managing obsolescence throughout an asset's lifecycle, Entities can maximize operational availability of assets while minimizing costs. Furthermore, it will assist the development of measures required throughout the lifetime of the asset, ensuring that the obsolescence is captured within the initial CapEx (Capital Expenditure) budget.

2.0 SCOPE

Within Volume 4: Financial Planning of the National Manual of Assets and Facilities Management (NMA&FM) is addressed as one of the most important aspects of planning in the life of an asset. It applies to all Entities throughout the Kingdom of Saudi Arabia (KSA), which are responsible for the management, operations and maintenance of public infrastructure and buildings assets.

This includes buildings, infrastructures, plants, and any other constructed assets that fall within the portfolio of the Entities. It does not apply to other asset classes, such as financial, intellectual property, and/or other intangible assets.

There will be different levels of sophistication required for the financial planning, depending on the organization's size and function. Nonetheless, every organization should have some kind of financial planning in place, to structure and implement the raising, spending, and generation of funds.

2.1 OM Concept

The international standard EN 62402 Obsolescence Management - Application Guide, defines obsolescence as being the "transition from availability of products by the original manufacturer or supplier to unavailability".

OM applies to *"any organization that is dependent on another organization to obtain value from the usefulness of the items that it provides"* as per the International Electrotechnical Commission (IEC) 62402:2019 With a much interconnected economy, this applies to most organizations and is certainly applicable to Government Entities within the KSA.

3.0 DEFINITIONS

Term	Definition
Asset	An item, thing, or entity that has potential or actual value to an organization. The value will vary between different organizations and their stakeholders, and can be tangible or intangible, financial or non-financial.
Asset Category	A sub-group of assets within a class hierarchy, for financial reporting and management purposes.
Asset Class	A group of assets having a similar nature or function in the operations of an Entity, and which, for purposes of disclosure, are shown as a single item without supplementary disclosure.
Asset Database	A list of assets with associated information about that asset – usually stored in an Asset Register.
Asset Lifecycle	The cycle of activities that an asset (or Facility) goes through while it retains an identity as a particular asset, i.e., from planning and design, to decommissioning or disposal.

Term	Definition
Asset Management	The coordinated activity of an organization to realize value from assets.
Asset Register	A list of the assets owned by an Entity. It contains relevant details about each asset. The register can identify the location, description, value, and age of the asset.
CADMID	Concept, Assessment, Development, Manufacture, In-use, Disposal - phases in the life of an asset.
Capital Expenditure (Capex)	Financial resources used to procure new assets.
Corrective Action	Action to eliminate the cause of a nonconformity and to prevent recurrence.
Due Diligence	Compilation, comprehensive appraisal, and validation of information of an organization, required for assessing accuracy, commercial integrity, financial stability, and functional competence integrity, at the appropriate stage of the agreement sourcing process.
Entity (or Entities)	A KSA Government organization which is responsible for the delivery of government funded Operations and Maintenance (O&M) projects.
Facilities Management	Organizational function which integrates people, place, and process within the built environment, with the purpose of improving the quality of life of the people and the productivity of the core business
Facility	An environment built, installed, or established to serve an organization in the delivery of its operational objective. This is also a generic term to describe a specific building, a group of buildings on the same site, and/or a site itself, which is used to provide an overall function. For example, a school, a research establishment, a hospital complex, a training complex, a university campus
Industry Best Practice	In relation to any undertaking and any circumstances, the exercise of that degree of skill, diligence, prudence, and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator, engaged in the same type of undertaking, under the same or similar circumstances.
National Manual of Assets and Facilities Management (NMA&FM)	Defines the minimum requirements to be followed in the planning, execution, and delivery of O&M by KSA Entities.
Operating Expenditure (OPEX)	Financial Resources used to maintain & operate Assets.
Quality Management	The act of overseeing all activities and tasks needed to maintain a desired level of excellence.
Strategic Plan	A plan containing the long-term goals and strategies of an organization. Strategic plans have a strong external focus, cover major portions of the organization, and identify major targets, actions, and resource allocations relating to the long-term survival, value, and growth of the organization
Acronyms	
BER	Beyond Economical Repair
BIS	Business, Innovation, and Skills
BOM	Bill of Materials
BS	British Standard
BSRIA	Building Services Research and Information Association (United Kingdom (UK))
CA	Condition Assessment
CADMID	Concept, Assessment, Development, Manufacture, In-service, Disposal
Capex	Capital Expenditure
CMMS	Computerized Maintenance Management System
COTS	Commercial Off The Shelf
CPU	Central Processing Unit

Term	Definition
EOL	End of Life
IC	Integrated Circuit
ICAEW	Institute of Chartered Accountants in England and Wales
ICMS	International Construction Measurement Standards
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JSP	Joint Service Publication
KPI	Key Performance Indicator
KSA	Kingdom of Saudi Arabia
LCC	Life Cycle Cost
MCL	Monitored Components List
NAR	National Asset Register
NMA&FM	National Manual of Assets and Facilities Management
NRM	New Rules of Measurement
O&M	Operations and Maintenance
OCM	Original Component Manufacturer
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OM	Obsolescence Management
OMP	Obsolescence Management Plan
OPEX	Operating Expenditure
OS	Operating System
PC	Personal Computer
PDCA	Plan-Do-Check-Act
PIC	Probability, Impact, and Cost
PPE	Personal Protective Equipment
PROM	Programmable Read-Only Memory
RAM	Reliability, Availability, and Maintainability
RICS	Royal Institute of Chartered Surveyors (UK)
SC	Supply Chain
SME	Subject Matter Expert
TOR	Terms of Reference
UK	United Kingdom
US	United States

Table 1: Terms & Definitions

4.0 REFERENCES

- BIS – Department for Business, Innovation and Skills
- British Standard (BS)/ISO 15686-5: 2008 Buildings and Constructed Assets – Service life planning – Part 5: Life Cycle Costing
- Building Services Research and Information Association (BSRIA) BG 67/2016 Life Cycle Costing
- Cost Analysis and Benchmarking (1st edition), RICS Guidance Note 86/2011, RICS, 2011
- Department for Business, Innovation and Skills: Construction input cost indices: Methodology (November 2014) AECOM
- EN 62402 OM - Application Guide
- EUROSTAT Statistical Office of the European Communities
- ICAEW – Institute of Chartered Accountants in England and Wales
- IEC 60300-3-3 (2004-07) Dependability Management, Part 3 – Application Guide Section 3: Life Cycle Costing
- IEC 62402 and Joint Service Publication (JSP) 886 (The Defense Logistics Support Chain Manual V7)
- IEC 62402:2019
- IEC 62402:2007 Obsolescence Management, 2007, International Electro-technical Commission (IEC)
- International Construction Measurement Standards (ICMS): Global Consistency in Presenting Construction and Other Life Cycle Costs
- International Organization for Standardization (ISO) 15686-1 General principles and framework
- ISO 15686-10 When to assess functional performance
- ISO 15686-5 Life Cycle Costing
- ISO 15686-8:2008 Buildings and constructed Assets – Service-life planning – Part 8: Reference service life and service-life estimation
- ISO 15686-9 Guidance on assessment of service-life data
- ISO 9001 – Quality Management
- Joint Service Publication (JSP) 886 Volume 7 Part 4
- NACE Statistical Classification of Economic Activities in the European Community
- National Manual of Assets and Facilities Management – Volume 12: Risk Management
- National Manual of Assets and Facilities Management – Volume 2: Asset Management
- National Manual of Assets and Facilities Management – Volume 3: Condition Assessments
- National Manual of Assets and Facilities Management – Volume 4: Financial Planning
- National Manual of Assets and Facilities Management – Volume 4 Chapter 2: Design Reviews – EOM-ZL0-PR-000002
- OECD – Cost Indices: Organization for Economic Co-operation and Development
- OM Application Guide 62402:2007
- RICS – New Rules of Measurement (NRM) Order of cost estimating and cost planning for building maintenance works
- RICS – Elemental Form of Property Cost Analysis (4th edition), NRM
- RICS Professional Guidance, Life Cycle Costing: 1st edition, April 2016

5.0 RESPONSIBILITIES

Role	Description
Asset Management Team	• Team responsible for maintaining records of the asset's condition and systems being maintained.
Operations Team	• Team responsible for taking on operational ownership of the repaired, replaced, altered, or extended assets or systems.
Entity	• Prepare plans for Condition Assessment (CA) including frequency • Ensure that CA is aligned with Government Regulations, and the details as laid out in the NMA&FM. • Identify or source the appropriate resources to carry out the exercise. • Train or brief (whichever is more appropriate, depending on the resources selected) the selected resources, to ensure uniformity across all asset categories and conformity to the NMA&FM. • Liaise with the selected resource to ensure effective and efficient programming, including required shutdowns and possible access requirements. • Manage and oversee the delivery of the CA activity, according to the agreed strategy and plans. • Assist in the compilation of the CA report, particularly in the prioritization of assets and possible future requirements for the use of assets. • Plan and implement recommendations established by the CA report.
Service Delivery Team	• Understand, develop, and prepare requirements to undertake the CA exercise. • Provide competent personnel to conduct the CA. • Follow agreed procedures in delivering survey, especially concerning access requirements and shutdown requirements. • Carry out the assessments in a healthy and safe manner, using appropriate tools, equipment, standards of dress, and Personal Protective Equipment (PPE). • Provide detailed reports and advice based on analysis of CA data, and in conjunction with the Entity.

Table 2: Responsibilities

6.0 PROCESS

6.1 Introducing Obsolescence

Obsolescence is defined as the "transition from being obtainable from the original manufacturer to becoming unobtainable".

Organizations rely on many systems and diverse equipment provided by other specialist organizations, in their field or domain. Examples include parts or equipment components of assets, including air conditioning units in virtually any enclosed space, power plants that are operated by utility service providers, navigation equipment for airports, and so forth. The absence of replacement parts for some of these assets may not have a severe impact, but it may be detrimental for critical assets.

6.1.1 Principles of Obsolescence Management

Just like assets' ageing, obsolescence cannot be avoided. What can be done is to assess the possible impacts and severity of its occurrence, and use that to mitigate and plan ways to protect the asset function, and the organization.

OM is a method to address the issue of obsolescence by identifying it, planning for it, and taking appropriate action to mitigate its adverse effects. Like many other management approaches, OM spans many stages and phases of an asset's life. There are three broad phases that describe the life of an asset:

- Creation/Acquisition Phase
- Usage/Operation Phase
- End of Life (EOL)/Disposal Phase

The main objective of OM is to ensure that the supply of spare parts can continue to be maintained after warranty, until the asset or system is removed from service. If a robust obsolescence strategy is not in place, this can result in significant impact on the Entity's operation, in terms of reliability, availability, maintainability, and safety, which may result in major legal and / or financial implications.

6.1.2 Approach to Obsolescence Management

The outcome of the risk assessment should dictate the most appropriate OM approach to adopt. This could mean the use of more than one approach for a product or project.

IEC 62402:2019 indicates that there are two approaches to select from; proactive or reactive. There are a number of suppliers who suggest that there are additional approaches available; proactive, reactive (as a result of a proactive assessment) or do nothing. These additional approaches are, however, merely different levels of pro-activity.

Proactive management can entail varying levels of effort and activity. Those items that are assessed as "Medium" risk, will not warrant the same level of effort and activity as those assessed as "High" risk will. There is, therefore, a wide scale of proactive OM activities which can be tailored to the particular needs of the project.

The Obsolescence Management Plan (OMP) should, however, include as a minimum:

- Details of strategy (or strategies) selected (if necessary, detailed by system, sub-system, assembly, or sub-assembly)
- Reason for the selection of the strategy (or strategies)

To minimize the impact of obsolescence, the Entity shall incorporate a proactive approach to OM throughout all stages of the asset lifecycle, and apply it to the asset's lifecycle appropriately.

6.1.3 Management of Life Cycles

OM is a through-life strategy, and should be integrated as such within the Concept, Assessment, Development, Manufacture, In-service, and Disposal (CADMID) phases, of an asset's lifecycle. Figure 1 (below), presents the relationship between the CADMID path, and the OM main elements. In general, a product's availability grows, matures, and declines in parallel with its production lifecycle. The lifecycles vary with different technologies, commercial aspects, and Original Component/Equipment Manufacturers (OCM/OEM).

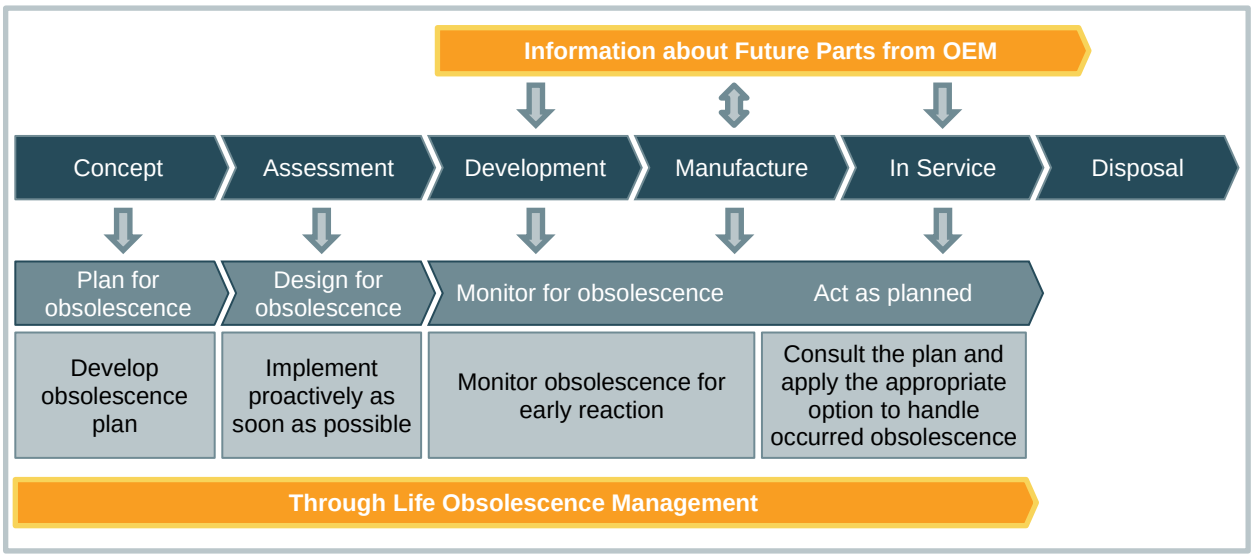

Figure 1: Relationship between the CADMID Path & OM Main Elements

The Entities are required to establish an OM approach across their asset portfolios. This should be done as early as possible in an asset's lifecycle, as the beneficial impacts of OM can be better realized if the approach is implemented in the concept and design phases. This can be done by considering the notion of obsolescence when conducting operational design reviews, which are normally undertaken during the design stage. For more on this subject, refer to Volume 4 Chapter 2: Design Reviews – EOM-ZL0-PR-000002.

A product is considered to be obsolete once it is no longer obtainable from its original manufacturer, even though some stock may still be in the Supply Chain (SC), e.g., held in storage by a distributor. The "original manufacturer" is important, because the original manufacturer is the likely owner of any associated intellectual property and manufacturing rights. See Figure 2 below.

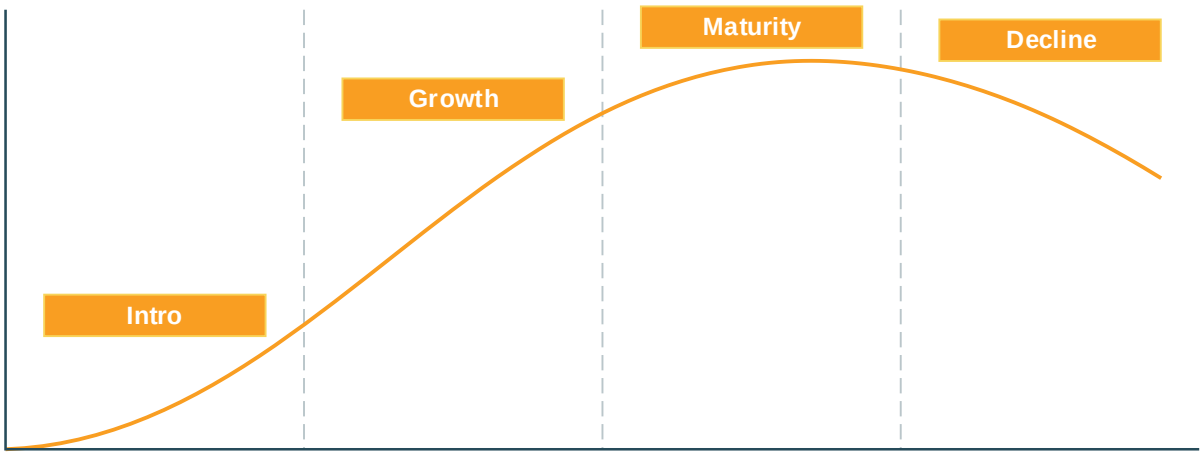

Figure 2: Standard Trend of a Product Lifecycle

6.1.4 Likely Causes of Obsolescence

Traditionally, obsolescence was prevalent in "physical" assets (or components, systems, or parts of an asset), but with the advent of electronics in virtually all aspects of assets, non-physical objects like software are also prone to obsolescence. In many cases, the impact is even more severe with software obsolescence, due to the criticality of the process or services that are controlled by it. Likely causes of obsolescence include:

- Higher technology products becoming obsolete; examples include as active microelectronic components, computers, precision-engineering components, robotics, surface-mounted printed-circuit boards, and telecommunications equipment (Note, this list is not exhaustive).
- Most non-specialist low-technology products and components are easily replicated, and are likely to be available from a variety of sources. Obsolescence is still likely, but easier to manage.
- They are deliberately designed to wear out within a specified time.
- When a product is no longer desirable because it has gone out of fashion, its style becomes obsolete.
- There are low-technology exceptions; examples include items which involve any brand, patent, or copyright restrictions; bespoke items and specialized items.
- For services and software, obsolescence is likely if specialist skills or knowledge, is required; or if there is limited access to information (legacy software, or loss of skilled employee[s]).
- Items become functionally obsolete when they can no longer adequately perform the function for which they were created.

The Entity shall identify those services, spares, and commodities that may be necessary to sustain the efficient and safe operation of any equipment that will be procured and installed, and which are likely to be affected by obsolescence during the equipment's agreed nominal life. It shall also assess any and all services, spares, and commodities, that may be necessary for the maintenance or repair of both hardware and software.

6.2 Management of Obsolescence

The foremost principle in developing an OMP is that it must fit within the framework of Asset Lifecycle Management that applies throughout all phases of an asset's lifecycle.

The first step in planning an OMP is similar to the overall concept of Asset Management; It requires knowing which assets the Entity has in its portfolio, and an Asset Register is an ideal staring point. For assets that are still in the design phase, the Bill of Quantities would be a good starting point.

There is specific information that needs to be collected about an asset, for an OMP. The most important is the criticality rating of an asset, which is measured against the importance of the asset, relative to the operations and the services that it provides to the Entity. Typical sections of an OMP include the following:

- Objectives
- Scope of the Plan (which assets are covered)
- Organization's Roles and Responsibilities
- Obsolescence Strategies
- Risk Assessment
- Obsolescence Monitoring
- Critical Components
- Supplier Arrangements
- Performance Management

The objective of OM is to ensure that obsolescence is managed as an integral part of the CADMID lifecycle, in order to minimize costs and detrimental impact to the asset. This section provides guidance on the aspects of OM, and the areas that should be considered.

Obsolescence is effectively managed by:

- Including its management as an integral part of the design, development, and in-service support of assets.
- Collecting and analyzing purchasing and supply data to identify its likelihood.
- Proactively planning to avoid or mitigate its future incidence.
- Avoiding multiple independent efforts to resolve similar issues.

Effective OM will:

- Support asset Reliability, Availability, and Maintainability (RAM)

- Reduce Whole Life Asset Costs
- Dictate the most appropriate OM approach to adopt (this can mean the use of more than one approach for an Entity)

6.2.1 Types of Obsolescence

There are different ways to classify obsolescence. One method is to view obsolescence in terms of things that can be corrected or restored, and the ones that are non-correctable (curable, incurable).

However, there are two main types of obsolescence, broken down into subcategories, see Figure 3.

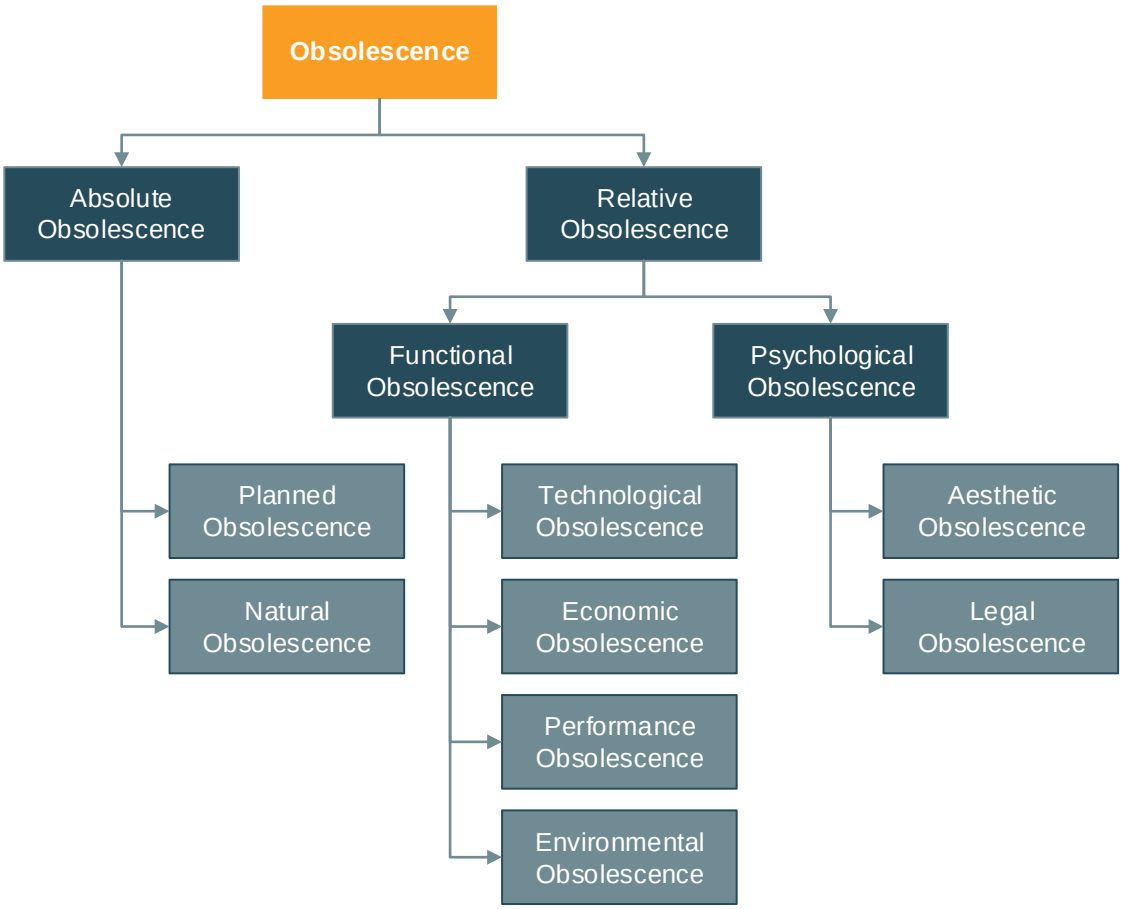

Figure 3: Obsolescence Types

6.2.2 Planned Obsolescence (Absolute)

This type of obsolescence is designed into assets purposefully, and is prevalent in consumer electronics. Manufacturers design obsolescence into their products, to ensure that after a certain period of time, the objects do not function as well as originally perceived. This puts pressure on the consumer/user to buy, or upgrade to the newer model, thus ensuring sales figures remain high or even grow. This is considered an “Absolute type of Obsolescence” as it is inevitable, being built into the asset by design.

6.2.3 Natural Obsolescence

This type of obsolesce occurs when the product is naturally left in service, until it is replaced at the end of its expected service life.

6.2.4 Functional Obsolescence (Relative)

A component or part may become obsolete, even when the current design of the product can be manufactured or supported. This may occur when particular requirements of the product have changed, which causes the current function, performance, or reliability of the product to become obsolete.

Physical/Technological Obsolescence

As the name implies, this type of obsolescence is due to the physical wearing out of the asset, its systems or components. In general, this is common and happens across all asset types, and in different industries. Nonetheless, the rate of occurrence of physical obsolescence is different for different types of assets and/or components.

Due to innovation in technology, more advanced components become available. One may have the inventory of the older part and can still use it in a system. However, the supplier of the older part no longer supports it, causing the part to become obsolete.

Performance Obsolescence

This occurs when an asset is no longer able to deliver the output or outcome that it was designed for, due to changes in technology or other external factors. This can also be caused when new standards are introduced that render an asset's capability to perform below the new standards.

Economic Obsolescence

Economic Obsolescence can be caused by other types of obsolescence, such as Physical/Technological. In many instances, the cost of operating and maintaining an asset becomes much higher than the available alternatives.

In another case, Economic Obsolescence to an infrastructure can be caused by a change in zoning or urban planning, and in this case the value of the asset might increase or decrease if the area where the asset is located, appreciates or depreciates in value.

Environmental Obsolescence

In some cases, Environmental Obsolescence can be closely related to Legal Obsolescence, where a change in legislation concerning environmental emissions, can cause an asset to become environmentally obsolete.

However, it is also the case that legislation with respect to environmental standards may not have changed, but an organization might decide to take a more proactive role in protecting the environment. While it may lead to more productive and efficient assets, new assets need new resources and hence, consume more energy and raw material, as well as have additional financial implications.

This type of obsolescence is not directly related to building design, and is difficult to forecast.

6.2.5 Psychological Obsolescence (Relative)

Psychological obsolescence refers to marketing attempts to wear out a product, in the owner's mind. This will occur when customers are no longer fascinated, or satisfied with a product. The foundations of psychological obsolescence are variations in perceived need, trends in design, desire for social status, and marketing.

Aesthetic Obsolescence

This occurs when there is a change in fashion or design thinking, and an asset's physical appearance becomes undesirable, and therefore, can be classified as obsolete. Although, this can be seen as subjective at times, it does occur, and decisions of replacements based on aesthetics are taken.

A good example is office layouts – cubicles may have been at the forefront of modern office design, but this has been changing, and while the cubicle type offices are still functional, an organization might see them as relics of the past, and therefore, classify them as obsolete.

Legal or Regulatory Obsolescence

An example of this type of obsolescence is the new safety regulations that restrict the type of material that is used in a building or Facility, the most famous example being asbestos. Health problems that were associated with asbestos were identified, and subsequently, the ban on the use of it was implemented. Any building that contained asbestos had to remove the material using controlled and approved methodology, and although the material was still functional and performing as intended, the change in regulation meant that the product had to be rendered legally obsolete.

6.2.6 Planning for Obsolescence

OM should be a strategic approach to minimizing the impact of obsolescence throughout the lifecycle, while maximizing availability through intelligent selection of designs and solutions that fit the requirements of the asset, through all stages of the lifecycle.

Planning for obsolescence early in the lifecycle begins by carrying out an assessment on the asset(s), which will identify what strategies are necessary, and allow the creation of management, mitigation, and resolution plans prior to an obsolescence issue occurring. The Entity should adopt the methodology below, as a part of the design selection to aid the implementation of a through-life strategy, and minimize whole-life costs.

There are four stages of OM planning that can be used to support the design selection, as shown in Figure 4 (below). This section describes the obsolescence planning phases, which are:

- Initiation
- Planning & Design
- Execution
- Monitoring

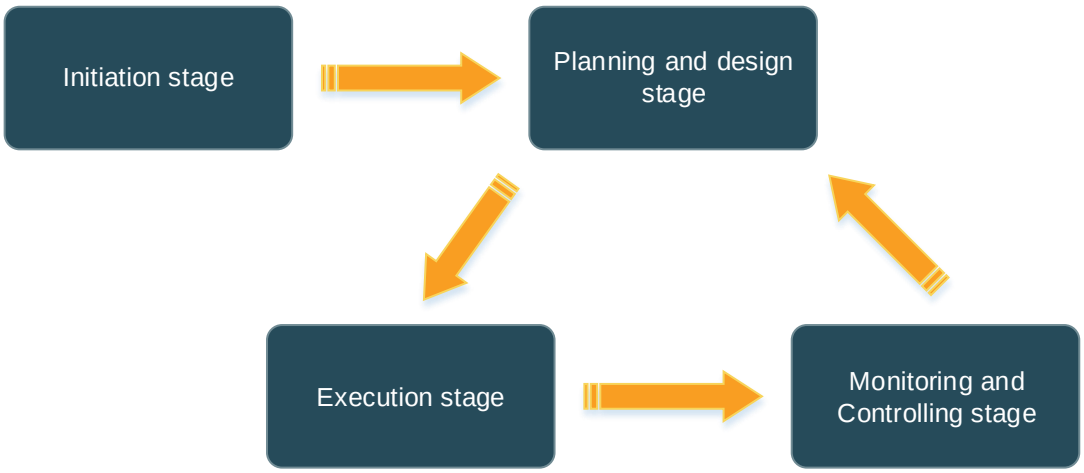

Figure 4: Phases of Obsolescence Planning

Phase 1: The initiation stage describes problem-recognition, and analysis. This stage is used to analyze the current situation, and to build a consistent knowledge base regarding obsolescence.

Phase 2: The planning and design stage describes the assessment and decision concerning the asset. This stage is used to develop initial or draft OMPs, and detect the weaknesses, risks, and causes of obsolescence.

Phase 3: The execution stage describes the management, handling, and execution of the asset. This stage is used to strategically operate, perform, and lead OM.

Phase 4: The monitoring and controlling stage is usually called the competition stage, and it describes problem-solving, and the final control of an asset. This stage is used to define, analyze, and evaluate the costs of OM.

The four stages of planning are further explained below:

- **Review of the Design:** To assess the materials, components or parts, and conduct audits and assessment of the suppliers'/contractors' ability to design for the life of the asset
- **Lifecycle Analysis:** To identify where materials, components, or parts have a short manufacturing life, and where those impacts are in the lifecycle of the asset
- **Asset Management:** To provide a forecast of the quantity of materials, components, or parts that are required to support the asset
- **Roadmap:** To plan the changes necessary to take place as a result of obsolescence, and estimate the cost to resolve and implement. In addition, by strategically planning for the impact of obsolescence, proactive plans, and mitigation actions, resolution options can be considered before the issue arises and causes a loss of service or capability. These should be reviewed and revised regularly, to ensure that they are still practical or necessary throughout the lifecycle

A typical obsolescence process that will help the Entity to manage obsolescence for the life of the asset(s) is shown in Figure 5 (below).

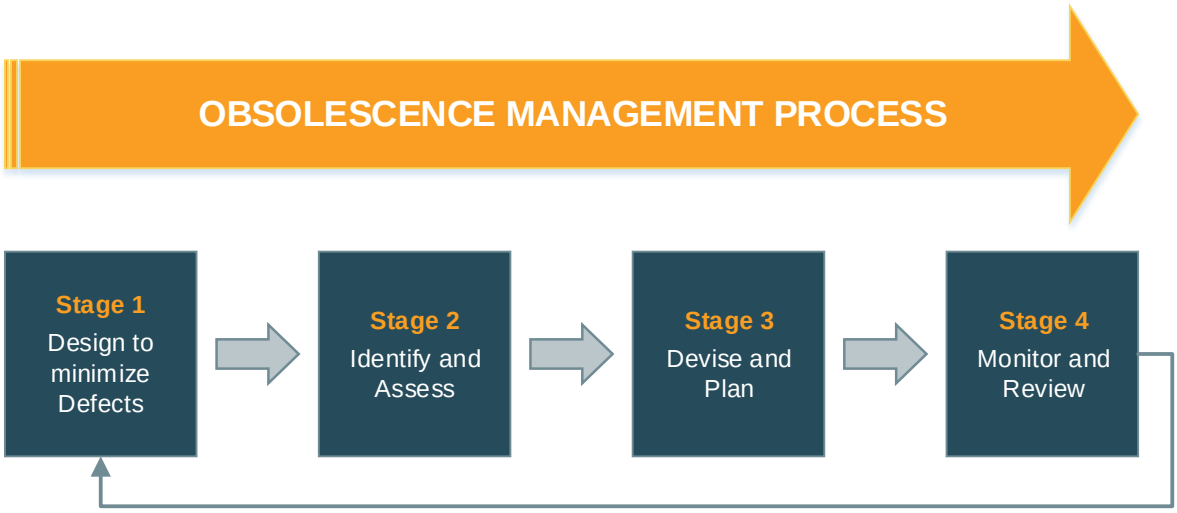

Figure 5: OM Process

Thoughtful choices of products and technologies can significantly reduce the likelihood of adverse consequences from obsolescence. For new or altered asset designs, the management of obsolescence starts at Stage 1 of the process, with choosing designs that can minimize the effects of obsolescence. Due to the high number of asset designs involved, a structured identification of all legacy obsolescence will require significant resources, and is unlikely to be cost effective.

Nevertheless, obsolescence in existing asset designs should not be ignored, and advantage can be taken of any opportunities to proactively plan for its mitigation, e.g., following the results of reviews. When such opportunities arise, OM for existing asset designs starts at Stage 2 of the process, with the identification and assessment of the effects of obsolescence.

6.2.7 Obsolescence Management Organization

In order for OM to be effective and efficient, it should be properly resourced to ensure that the activities detailed by the plan can be undertaken and managed. The plan should include details of the organization, and individuals that will be/are responsible for the conduct of activities listed by the plan. The Entity should employ competent obsolescence manager(s), to manage obsolescence.

An organization diagram should be developed which can be useful in demonstrating the relationship between the positions identified, as can the inclusion of the relevant "Terms of Reference (TOR)", if appropriate. These can include:

- Details of project's OM structure (this should include the industry partners details, if relevant)

- Details of accountabilities and responsibilities
- Means and frequency of OM communications and meetings

6.2.8 Selection of Core Strategy

There are a number of aspects to manage the obsolescence of an asset. Although an asset may be different in its technology or application, the principles are the same, and should be applied as such. A “top to bottom” or “bottom to top” approach to assess the obsolescence risk, will assist in identifying the applicable strategy to use. The reasons for this include, but are not limited to:

- The asset’s impact on use may be different to the material or component.
- The material or component resolution may impact the use of the asset.
- The cost to resolve at the asset level, may be significantly less than resolving at the lower level (material or component) or vice-versa.
- The management of an asset may be more practical and economical, to that of a material or component

In selecting an appropriate strategy, the management should at a minimum include:

- Asset Lifespan
- Material Component or Part Lifespan(s)
- Number of Suppliers or Manufacturers of the Technology Type used
- Impact on the RAM, should the item becomes obsolete
- Available Options to Resolve, should the item become obsolete
- Cost to Resolve

The management strategy should be reviewed periodically, and where an obsolescence issue arises, it should be reviewed to ensure the strategy is still practical and economical.

The management of obsolescence is typically addressed by two main strategies: Proactive and Reactive. The latter can be a legitimate part of the former strategy, where the obsolescence risk is low and the decision is made consciously. A “Do-Nothing” approach may be applicable, if the asset is late in its lifecycle.

Proactive Strategy

Proactive management of obsolescence requires that a strategy be put in place to make informed decisions, in a timely manner. When compared to a reactive OM, this results in:

- Reduced obsolescence impact from asset to material level, the impact being more often retained within the lower levels of the asset (i.e., material or component level)
- Reduced schedule impact, allowing better planning (reduced impact on build and repairs)
- Reduced resolution cost, giving more options for resolution
- No or little reduction in availability of assets due to obsolescence

Proactive management of obsolescence is provided by:

- Implementing an OMP which is to be reviewed regularly
- Active monitoring of critical assets and their components/materials
- Pre-planning of resolution or mitigation activities, to remove or reduce the impact of obsolescence
- Establishment of a management infrastructure (project and SC) to analyze, monitor, and implement resolution or mitigation schemes
- Management of the SC

Reactive Strategy

A reactive strategy is not a “Do-Nothing” strategy. The selection of a reactive strategy can be appropriate as part of the overall strategy selection for an asset, but should be a conscious decision and should be

reviewed periodically, to ensure that it is still appropriate. This strategy can be applied at any level, material, component, part, or asset.

This strategy may be appropriate where:

- Cost of planning and managing a proactive strategy is uneconomic, or unaffordable.
- The asset has a relatively short service life remaining and therefore, a low probability of obsolescence impact.
- The technology is such that the probability of obsolescence is very low.
- The equipment is known to have a high reliability and can be supported throughout its in-service life, from available spares.
- Managed supplier relationships, and enforceable sourcing-guarantees, exist.
- The asset is identified as having a low risk of obsolescence (typically consumable type items, for example; nuts, bolts, and washers).

This can lead to:

- The lack of time to solve the issue
- A decrease in the number of solutions available, and/or
- An increase in the cost to resolve due to points above points
- Being reactive to an obsolescence issue is not avoiding the problem, as the first visible symptom of the impact of obsolescence occurring may only be discovered when the SC attempts to source the original part.

Do-Nothing Strategy

The “Do-Nothing” practice is a form of reactive approach to the issue of obsolescence, that assumes that little or no planning will be undertaken to devise methods for mitigating the low risk of an obsolescence issue. It may appear to be inadequate, but it is consistent with items that are not operationally critical, or where the diminishing supply can be easily and quickly resolved. This is very common when:

- The asset is nearing the end of its service life.
- There are sufficient spares (including salvaged/reclaimed spares) to last to the end of the service life.
- A proactive approach has already been adopted at a higher level that will resolve the obsolescence (e.g., asset replacement resolves part obsolescence).

To effectively manage the obsolescence risk, each piece of the asset should have an appropriate obsolescence strategy. The process of determining the most appropriate strategy for any given asset is shown in Figure 6.

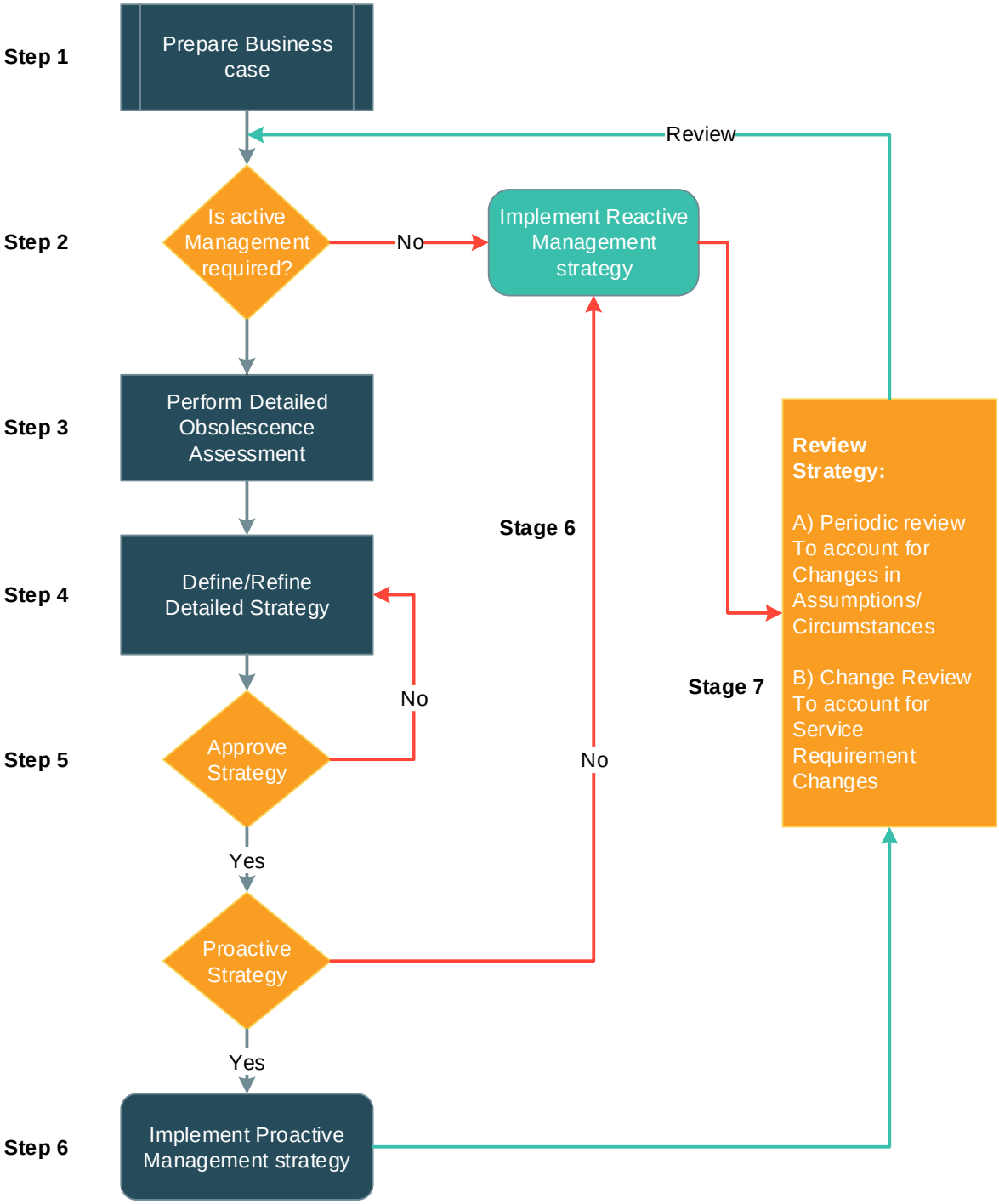

Figure 6: OM Strategy Selection Flow chart

6.3 Monitoring Obsolescence

Obsolescence monitoring involves tracking the processes, materials, components, and/or parts used in the asset design. The following should be considered for assets where the costs of obsolescence is high, relative to the support budget:

- Where the item (material, component, or part) is single source
- When the skills or tools involved in its manufacture are scarce or unique
- Where the item performs or impacts on safety-critical functions
- Where the asset has a long service life

- Where there are large numbers of particular parts or assets to be maintained in service, possible reduction in costs to resolve, versus an increase in costs to monitor

If a proactive approach is adopted, it would be expected that a Monitored Components List (MCL) or similar is created, and an activity is put in place to conduct the monitoring. For suppliers/contractors it would be expected that within the OMP, it would detail:

- What level the monitoring will be conducted at (material, component or part)
- Who will be doing the monitoring (supplier/contractor or 3rd party)
- How the monitoring will be conducted (individual investigation or use of tools)
- How the results will be communicated

The purpose of monitoring is to identify:

- Availability/Manufacturing status (from the original manufacturer)
- EOL, either predicted or known, from the original manufacturer or from tool(s)
- Planned changes to the item (e.g., material composition or functional characteristics) product roadmaps or other technology upgrades planned for the item

A strategic choice does not necessarily set the periodicity of review. This can be affected by, but is not restricted to:

- Supplier/Contractor Relationship
- Technology Lifecycle
- Monitoring Function or Toolset
- Impact on the Asset, if the component become obsolete

Typically, the monitoring period for items are at intervals of:

- 3-6 months for Commercial Off The Shelf (COTS), procurement specified items, and commercially driven technology items.
- 6-12 months for active catalogue items (such as Integrated Circuits (ICs) or Programmable Read-Only Memory (PROM) devices.
- 12-24 months for passive and/or discrete catalogue items (resistors, transistors, or diodes).

The monitoring strategy should be reviewed periodically and where an obsolescence issue arises, reviewed to ensure the strategy is still practical and economical.

If a proactive OM approach is used, it would be expected that the minimum requirement is a form of an obsolescence monitoring activity. This can range from referring to technology roadmaps, to component monitoring tools. The OMP should give:

- Details of monitoring levels at an early stage
- Details of who will be responsible for the monitoring
- Details of how the monitoring will be conducted (tools and processes)
- Details of how the results will be communicated and presented (means and frequency, charts and tables)

6.4 Approaches to Obsolescence Resolution

The risk of obsolescence cannot be eliminated entirely. Once an obsolescence issue is identified, regardless of where that is in the asset's lifecycle, it is the responsibility of the Obsolescence Manager (or the designated person), to develop a robust resolution plan which should minimize the financial and operating impact of the issue, on the asset.

Any product that has a design service life exceeding 15 years should have a methodology to determine the best dates for design reviews. The optimum actions to take at those design reviews must be outlined in an OMP.

An obsolescence issue can be identified at any point of the lifecycle. It is when the action is taken to manage the resolution that identifies whether it is proactively or reactively resolved. However, the decision as to whether to resolve it proactively, or reactively, should be made as early on as possible.

The resolution process can be viewed as the means of delivering the output from all the other activities contained in the plan. This is where the benefit of an OMP is realized and is, therefore, a key part of the OMP.

It should detail what happens when an obsolescence issue is identified, including:

- Who is responsible for identifying obsolescence issues
- How and to whom, the issue is to be communicated (means and timescale)
- Who is responsible for assessing the impact of the obsolescence issue
- How the assessment is to be conducted
- Who is responsible for identifying mitigating options
- Who has the authority for selecting the mitigation option(s) to be implemented
- Who decides when the mitigation option(s) is to be implemented (in/outside of the contract)

The OMP should have no detrimental impact on the operation of the asset. Therefore, the resolution process must be clear on where the responsibility lies for identification, analysis, and resolution. It should also consider the responsibilities and authority for rolling up solutions to meet the known upgrades or opportunities to resolve other known issues that may arise in the future (e.g., if a component on a board is being replaced to mitigate an obsolescence issue, it may be prudent to change other components that have known or suspected/predicted obsolescence issues, at the same time).

6.4.1 Resolution Options

The sooner that obsolescence issues are identified, the greater will be the degree of choice of available solutions. Consideration of the life of the asset is a contributory factor in selecting an option. The options that can be considered for resolution include, but are not limited to:

- Stock - an item that is owned within the customer stores or SC (on behalf of the customer) that is, or can be, allocated to an asset.
- Reclamation or Salvage- an item found in surplus assets or assets Beyond Economical Repair (BER)
- Alternative - an item which is different in either form, fit or function, from the original item
- Redesign - involves designing out obsolete parts via engineering changes at various asset indenture levels, with a view to enhancing the asset's performance, resolving part obsolescence, and improving reliability, availability, and maintainability.

6.4.2 Through Life Resolution

Obsolescence should be considered throughout the lifecycle of the asset; this also includes the selection of resolution solutions to support the asset, until the point that it is removed from service.

The resolution choice should take into consideration, at a minimum, include the following:

- Remaining service life of the asset
- Available spares to support the asset
- Forecasted/Predicted demand for spares and repairs
- Point of resolution implementation
- Lifecycle of the solution
- Cost of resolution

It may also be prudent to delay or bring forward the implementation of resolutions, to meet planned maintenance routines, or tech updates/upgrades. However, it should be clear about who determines the timing of the resolution implementation, and what is required to be done. The Entity should appoint an Obsolescence Manager to manage obsolescence.

6.4.3 Resolution Strategy Selection

The above sub-sections have identified a number of factors that have to be taken into consideration when choosing a resolution strategy. Further considerations are:

- Obsolescence Risk
- Technical and Logistical Analysis
- Mitigation of Concerns
- Market Study Factors

The other factor that should be considered, is the process to select a strategy and a flow chart can be useful in explaining the order of activity, and the responsibilities for each step in the process.

(Refer to Attachment 1 - Flow Process for OM Decision Making).

6.5 Obsolescence Risks

Obsolescence Risk occurs when a service or product that is either used or made by an organization, runs the risk of becoming obsolete, and will not have a competitive advantage in the market any longer. Many technology-related companies are especially prone to obsolescence risk, and their service and reputation can be significantly affected if this occurs.

6.5.1 Very High Risk

These assets or components should receive urgent attention, and mitigation strategies should be implemented to reduce probability and impact. These could be the following:

- Design Consideration
- Technology Transparency
- Agreement with Suppliers
- Monitoring
- System Upgrades

6.5.2 High Risk

A certain level of proactiveness needs to be determined by the Obsolescence Manager; the manager will have to assess how much effort and proactiveness is required, for this level of risk.

6.5.3 Medium Risk

This type of risk should be monitored, so that the issue can be managed proactively.

6.5.4 Low Risk

This risk does not require a proactive approach, is not cost effective, and should be dealt with in a reactive manner.

Figure 7, illustrates the Obsolescence Risk Assessment Best Practice.

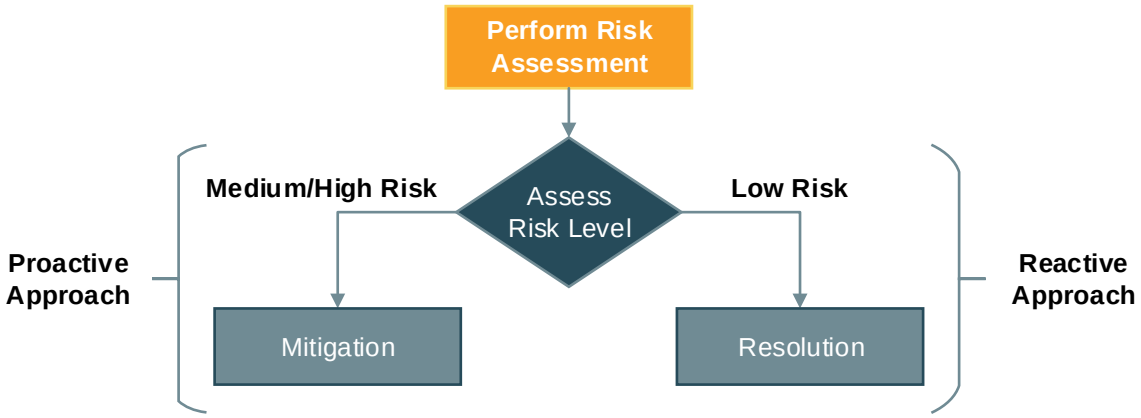

Figure 7: Obsolescence Risk Assessment Best Practice

6.6 Management of Risk

It is important to identify, assess, and manage the obsolescence risk for items, based on the size and complexity of the equipment being manufactured or supported. What is crucial to the assessment of obsolescence risk is not the time at which a component/item/part becomes obsolete, but when as a result of the obsolescence, product availability and support, is threatened.

The principles of risk management are the same for managing obsolescence risk, in that:

- The Risk is Assessed
- Controls are Planned
- Controls (or Mitigation) are Implemented
- The Risk is Monitored and Evaluated

6.6.1 Types of Risk Identification & Assessment Processes

There are two types of processes that can be used to identify, assess, and mitigate risk, by anticipating obsolescence issues. These are:

- Probability, Impact, and Cost (PIC)
- Technology, Lifecycle, and Resolution

The main objectives of these processes are to prioritize all the obsolescence issues, which enables the Entity to analyze, plan, and avoid delays in implementing a resolution.

6.6.2 Probability, Impact & Cost

The obsolescence risk for each component in a filtered Bill of Materials (BOM), should be assessed according to the following parameters:

- Probability of becoming obsolete, and turning into an obsolescence issue. This can be assessed considering the level of stock available for that project, compared with the consumption rate, and either the number of manufacturers available, or the number of years to EOL of the component.
- Impact of the obsolescence on the system's functioning and performance, resulting in a potential loss of system availability, or capability.
- Cost of mitigating or resolving the obsolescence to maintain availability and/or capability; the value can either be a defined cost range, or percentage, and is specific to each asset;
- For each component, the number of sources available and the comparison between stock available and consumption rate, will indicate the probability of having an obsolescence issue.

6.6.3 Technology, Lifecycle & Resolution

Three criteria are defined as risk-drivers – Technology, Lifecycle, and Type of Resolution. These criteria are defined and valued by assigning a risk-rating to each asset. This type of assessment evaluates if the technology is a low or high risk, if the component or part is available or not, and if there is a solution to manage the situation.

6.6.4 Risk Assessment

The risk assessment and the resolution process should form the basis of the Entity's OMP. An obsolescence risk assessment shall be conducted as part of the design acceptance of any proposed asset, and continued support of an asset.

The purpose of this is to identify any criticality issues, and enable a plan to be implemented to mitigate and resolve, as necessary. The risk assessment along with the resolution process should form the basis of an OMP. It is the means of deriving the OM approach, and provides staff with the obsolescence health status of the Entity's assets. The recommended means of conducting the risk assessment is the use of PIC as described by IEC 62402:2007.

The Entity should prepare a plan which shall include the following:

- Details of how risk assessment is to be conducted
- Results of the risk assessment
- Periodicity of reviews

To start the process, the Entity should carry out the activities in the order as set below:

- Detailed Assessment
- Estimate the likelihood of Obsolescence
- Assign a Criticality Rating
- Approximate a Procurement Life-rating
- Evaluate an Obsolescence Impact Score
- Review and Determine OM Planning Requirements

6.6.5 Obsolescence Risk Assessment Process

The process below, illustrates a typical risk assessment process and explains each step.

- The assessment must be conducted to ensure sufficient time is available, should any mitigation or resolution actions be required to be put in place.
- The results of the assessment conducted must, at a minimum, determine whether a "Do-Nothing", Reactive, or Proactive strategy is to be applied
- The plan should be properly resourced to ensure that the activities detailed by the plan, can be undertaken and managed. The plan should include details of the organization and individuals that will be/are responsible for conducting the activities listed in the plan.

Step 1: System Support Plan

In this step, the time period for which the components in BOM needs support, is identified. This may be mid-term modernization, or upgrades.

Step 2: Resource Planning

Where resources from the Entity obsolescence team are identified and made available to manage obsolescence.

- Obsolescence Manager(s)
- Obsolescence monitoring tools
- Budget for OM

Step 3: The Extract from BOM

This should be at component level, as most of the obsolescence issues are seen on this level only. Once extracted at component level, the OEM may support those items for a fixed and known number of years.

Figure 8: Obsolescence Risk Assessment Process

Step 4: Risk Analysis

This is done by component, and should be based on:

- Obsolescence Probability
- Impact Severity

This investigates the number of manufacturers available, for how long they will be available, the probability that the obsolescence will occur, and also identifies the risk levels as either:

- Components with Very High Risk of Obsolescence
- Components with High Risk of Obsolescence

- Components with Medium Risk of Obsolescence

Step 5: Once Step 4 is completed, document and implement strategy

Step 6: Update the Risk Register

Step 7: Periodic Review

Review and update on a periodic basis. It is a good practice to review on a yearly or two yearly basis.

6.6.6 Estimate the Likelihood of Obsolescence

Identify those services, spares, and commodities that may be necessary to sustain the efficient and safe operation of any equipment that will be procured, installed, altered, or supported, as part of the project works, and which are likely to be affected by obsolescence during the equipment's agreed nominal life.

Assess any and all services, spares, and commodities that may be necessary for the maintenance or repair of both hardware, and software.

At this stage, do not decide resolutions or mitigations – the objective is merely to identify likelihood.

Guidance:

- There is a likelihood of obsolescence for higher technology products
- Examples are active microelectronic components, computers, precision-engineering components, robotics, surface-mounted printed-circuit boards, and telecommunications equipment (this list is not exhaustive)
- Most non-specialist low-technology products and components are easily replicated and are likely to be available from a variety of sources. Obsolescence is still therefore likely, but easier to manage and resolve when necessary
- Examples are enclosures, woodwork and metalwork, passive electronic, and electrical components (this list is not exhaustive)
- There are low technology exceptions, examples of which include items which involve any brand, patent, or copyright restrictions; bespoke items; specialized items; and similar ones. The transfer of rights and ownership should be clearly defined within any requirements placed upon a supplier; where this is not possible, these types of items are to be closely managed
- For services and software, obsolescence is likely if specialist skills or knowledge is required, or if there is limited access to information (legacy software or loss of skilled employee(s))
- Compile a list of the services, spares, and commodities which are likely to be affected by obsolescence

6.6.7 Criticality Rating

Assign a criticality rating for each service, spare, or commodity identified as likely to be affected by obsolescence. If the resultant effect is less than the minimum criteria given in Table 3 - Criticality, then assign a criticality rating of zero. (Table 3 – Criticality, uses Railway, as an example)

Criticality ratings are assigned according to the subsequent loss of function that will occur, should an item be unobtainable when needed. This is measured in terms of the resultant effect on cost or reputation or both, using the descriptions for cost and reputation consequences described in Table 3 – Criticality, below.

To award a criticality rating, carry out the following activities:

- Assume the service, spare, or commodity is unobtainable, i.e., assume both, that it cannot be procured and, that there is no stock-holding or internal resource.
- Assume an event which creates an indisputable need for the service, spare, or commodity (e.g., equipment failure or damage).
- Determine the subsequent loss of function that will occur, and assume the loss of function to be continuous.

- Determine the consequences in terms of performance loss, additional maintenance costs, adverse media coverage, or adverse impact on relationships with stakeholders
- Select the description from the Table 3 - Criticality, which most closely matches the likely consequences of the continued loss of equipment function, and read off the corresponding criticality rating.

It is important to note that a criticality rating can be assigned irrespective of other factors. It is based solely on the consequences of a loss of function, i.e., if the equipment concerned can no longer carry out the role for which it was intended. Refer to Table 3 – Criticality, below, for further information on criticality.

Criticality rating	The effect of continued loss of function	
	Effect on cost, measured in terms of performance loss or additional maintenance cost	**Effect on reputation, measured in terms of media coverage or impact on the relationship with stakeholders**
5	Repeated major loss of asset availability, and delays to journey times. Major adverse impact on revenue	Extensive ongoing negative media coverage and major loss of confidence/significant intrusion by regulators and stakeholders
4	Significant repeated loss of asset availability, and delay to customer journeys. Significant adverse impact on revenue	Ongoing negative media coverage up to a week, and loss of confidence/significant intrusion by regulators and stakeholders
3	Loss of asset availability and delay to customer journeys. Adverse impact on revenue	Negative media coverage, such as headline television coverage or print media for one day. Loss of confidence/increased intrusion by regulators and stakeholders
2	Minor impact on Asset availability, delays to customer journeys, and loss of revenue	Negative media coverage such as coverage in the Evening Standard, or other print media for one day. Impact on relations with regulators and stakeholders
1	Minimal impact on Asset availability, and short-term impact on customer journeys. Limited impact on revenue	Risk occurrence will not result in negative media coverage, or impact on relations with regulators and stakeholders. However, negative impact via 'word of mouth' by customers.

Table 3: Criticality

Table 3 - Criticality example calculation:

- Assume that a spare component necessary for an assembly, which is part of an escalator monitoring system, is unobtainable.
- Assume a failure of the assembly, which will require this spare component, in order to affect a repair.
- An assembly failure will result in a loss of function, which is to monitor the escalator. Assume that the loss of function is continuous, and that there is the potential for further irreparable failures elsewhere on the network.
- The subsequent effects will be extra staff to monitor the escalator, and passenger delays due to increased dwell-time, as well as the possibility of negative media coverage.
- From Table 3 - Criticality above, rating 3 is selected due to increased expense (an adverse impact on revenue), delay to customer journeys, and negative media coverage.

6.6.8 Assign Procurement Life

Procurement life is the length of time that a service, spare, or commodity is expected to remain obtainable from its original manufacturer. This refers only to the original item as specified; for example, to any alternatives or substitutes.

Assign a procurement life rating for each service, spare, or commodity which has been assigned a criticality rating of 1 or greater. See Table 4 - Procurement Life Rating, below.

To assign a procurement life rating, the following should be done:

- Measure the assumed procurement life taken from Table 4 - Procurement Life Rating from the date of installation of the first delivered equipment, i.e., deduct the time that has passed between the date of installation, and the delivery date of this OM Assessment
- Do not take account of any quantity of spares held, or predicted to be held in stock (i.e., do not extend procurement life by the time that any stockholding is expected to last)
- Use procurement life (or predicted EOL) information obtained from a supplier (take into consideration any recommendations the supplier advises)
- Assign a rating according to Table 4 - Procurement Life Rating, using the remaining procurement life

An accurate prediction of procurement life is not possible because of too many uncertainties. An assumption is sufficient, as long as it is based on an assessment of technology, and market trends. Use a two-stage process:

- Assume a length of time that the item will remain available for procurement
- Validate that assumption by consulting with the supplier or manufacturer

When necessary, use the original assumption, if information from the supplier is unavailable or cannot be provided. However, use the supplier's suggested procurement life – whether longer or shorter – if it is provided (it may be necessary to factor in a +/- or months or years where there is reassurance or doubt, with regard to the data).

Rating	Procurement life
5	≤ 2 years
4	> 2 years but ≤ 4 years
3	> 4 years but ≤ 6 years
2	> 6 years but ≤ 8 years
1	> 8 years but < 10 years
0	≥ 10 years

Table 4: Procurement Life Rating

6.6.9 Impact Score

The impact score is a score that determines the level which obsolescence may have on the operation, if not resolved. An obsolescence impact score can then be calculated as follows:

Obsolescence Impact Score = Criticality Rating x Procurement Life Rating

- 0 - 4 score – Implement a "Do-Nothing" strategy
- Between 5 and 14 – Implement a Reactive strategy. A plan as to how to resolve any obsolescence should be developed

15 or more – Implement a Proactive strategy. A plan as to how to mitigate or resolve any obsolescence when it will occur, must be detailed. Refer to Figure 9.

As mentioned earlier**,** reactive strategies involve finding a solution, once obsolescence has already occurred; whereas proactive strategy manages the problem of obsolescence, before it actually happens. A key aspect of proactive management is the forecasting of obsolescence dates, of various components in a BOM.

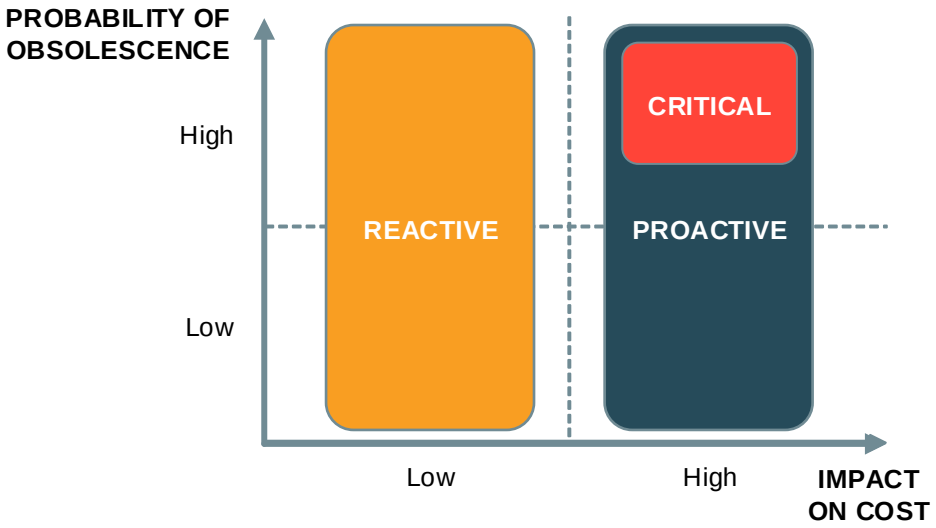

Figure 9: Obsolescence Cost Impact

Having determined the best procurement life approximation, a procurement life rating can be assigned, according to the remaining procurement life.

An obsolescence impact score can then be calculated as follows:

Obsolescence impact score = Criticality rating × Procurement life rating (Table 4)

Procurement Life	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Criticality				

Table 5: Obsolescence Impact Score

As a result of the obsolescence assessment, for all services, spares, and commodities which are awarded an obsolescence impact score of 1, but less than 15, and a procurement life rating less than 5, the Entity should agree on an OMP.

Further consideration of the details that should be contained within an OMP, is a mitigation plan for obsolescence concerns or issues. By creating and implementing an OMP, Entities can potentially reduce financial losses that can be caused due to a loss of service.

As with any common approach to risk management, efforts will be concerned with reducing the likelihood of the event occurring, or reducing the severity of the occurrence, or both. For more information about Risk Management, please refer to NMA&FM Volume 12 – Risk Management.

6.7 Further Consideration

6.7.1 Software

Software obsolescence is similar to hardware in that it is the loss of supply or support, but specifically in software, it is the inability to implement a software change. Dependent on the scale and length of the asset lifecycle, it could leave the Entity at risk of a temporary or permanent capability gap, and unacceptable asset availability. There are many factors that impact software obsolescence; inoperability and withdrawal

of supplier support needs to be considered and managed, as part of the software support plan, or as a part of the overall equipment OMP.

The OM Application Guide 62402:2007, provides guidance on how to manage software obsolescence issues and strategies, while Joint Service Publication (JSP) 886 Volume 7 Part 4, provides recommendations for ensuring that software is supportable throughout the lifecycle.

6.7.2 Managing Software Obsolescence

An OMP should detail the strategy on how to manage not just the software, but also the hardware associated with the software. Managing software obsolescence is inter-related with hardware, where hardware changes may necessitate changes to the software.

Where the Entity is reliant upon software supplied by COTS suppliers, where possible, a support requirement should be put in place. Operating Systems (OSs) (i.e. Windows Personal Computer [PC] OSs), are reliant upon that manufacturer's commercial decisions, and withdrawal of support. These considerations need to be included within any design choice with a plan to mitigate or resolve, prior to the withdrawal of support.

6.8 Aids for Monitoring Obsolescence

6.8.1 Monitoring Tools

There are two types of monitoring that can be used. These are either by:

- People and/or
- Databases

The use of internal employees (normally technicians) to monitor/identify the manufacturing status of materials, components and parts is common where the strategy for the asset is 'reactive', or the cost for using databases is prohibitively high. However, there are pros and cons to using this type of resource:

- **Advantages**: Able to target specific items for monitoring on a regular or irregular basis, direct interaction with the OEM, builds relationships, and knowledge transfer. Engineering based knowledge of the asset enables a better understanding of what, and how to monitor.
- **Disadvantages**: Can be time consuming if a large list of items require monitoring, possibility of missing an OEM change, or discontinuation notices.

Databases provide users with access to component (and sometimes material) data, for analysis. These are supported by direct links to manufacturers, or are reliant upon input from data programmers. This type of support also has resulting advantages and disadvantages, which are:

- **Advantages**: Able to monitor large lists of components (over thousand lines), datasheets are typically attached to the record, predictive EOL available (formula calculated); purchase sources identified, and changes in status electronically notified
- **Disadvantages**: Can be expensive if using for multi-site/person, with large quantity of component lists, reliant upon data input (and date of input), not all part numbers captured, and will require matching by user to part families

6.8.2 Forecasting Obsolescence

Obsolescence forecasting is the process that predicts the probability that a given part will become obsolete before its lifecycle comes to an end. There are several forecasting approaches:

- **Ordinal scale-based methods:** Using a combination of technological attributes of the lifecycle, stages of the component or part are determined.
- **Based on the product sales-curve method:** The life cycle curve of a product is obtained from the manufacture or supplier.

- **Leading indicator methods:** A leading indicator of a product or component can be further identified in each lifecycle pattern of product, and provides advanced indication of changes in demand trends.
- **Using data mining techniques:** A combination of lifecycle curve forecasting, and the determination of electronic part vendor-specific windows of obsolescence, using historical data.

Commercial web-based software tools that can be used to calculate the predicted lifecycle of components that are available. These tools focus exclusively on active digital components: microprocessors, ICs, and Central Processing Units (CPUs), and only recognize industry, standard parts.

There is not a single tool which covers all active components (a comprehensive 'worldwide' tool or database does not exist), and each tool's results will be based on information taken from its provider's partners. So, it is not unusual for different tools to give conflicting results.

In general, these tools provide a rough guide based on assumptions, and should only be used at the "assume" stage.

Suppliers often make use of these tools to assist in their long-term planning. They have better knowledge of their products, and can make informed judgments about the choice of tool, and the value of the acquired information. Information gained by a supplier should not be discounted, because one of these tools was used to aid their planning.

Obsolescence forecasting is important in both the design phase of the product, and the manufacturing lifecycle of the product. Establishing the risk level for each product in the proposed bills of materials developed in the design phase, can help designers determine designs that have lower risk of component obsolescence, and therefore reduce the lifetime cost impact.

6.9 Supply Chain

6.9.1 Introduction to Obsolescence for the Supply Chain

One of the most important areas to consider when implementing an OM strategy for a project or asset, is to ensure that the contractual conditions are well defined, and important decisions are made at the outset, or as early as possible. The correct contractual conditions should be in place to ensure that the financial and availability risk to the project or asset, as a result of obsolescence, is being managed as part of a "Through-Life" approach, and in the most cost effective method.

There are two main elements that should be addressed when contracting for OM:

- If an Entity decides to pass on the responsibility for managing obsolescence risk to a supplier (contractor), the OMP should conform to IEC 62402:2007, and clearly state the strategy which will be implemented for the equipment/asset.
- No matter how effective an OM strategy is, there will always be obsolescence issues that need to be managed and resolved. The key is to decide where the risk resides, as this will dictate who pays for the mitigation and/or resolution.

6.9.2 Entity & Supplier Relationship

Developing and maintaining a relationship with a supplier, will aid in managing expectations of both the Entity, and the supplier. By being involved more closely with a supplier, and understanding how they are intending to support the asset, will enable the Entity to:

- Actively engage the supplier about their roadmaps
- Work collaboratively on solutions, both short and long-term

If the OM activity is being cascaded through the SC, then it will be necessary to instigate arrangements with suppliers, to ensure that they are conducting the appropriate level of OM activity. It is very important to understand the relationship with suppliers and users. Figure 10 illustrates a typical relationship with supplier and users.

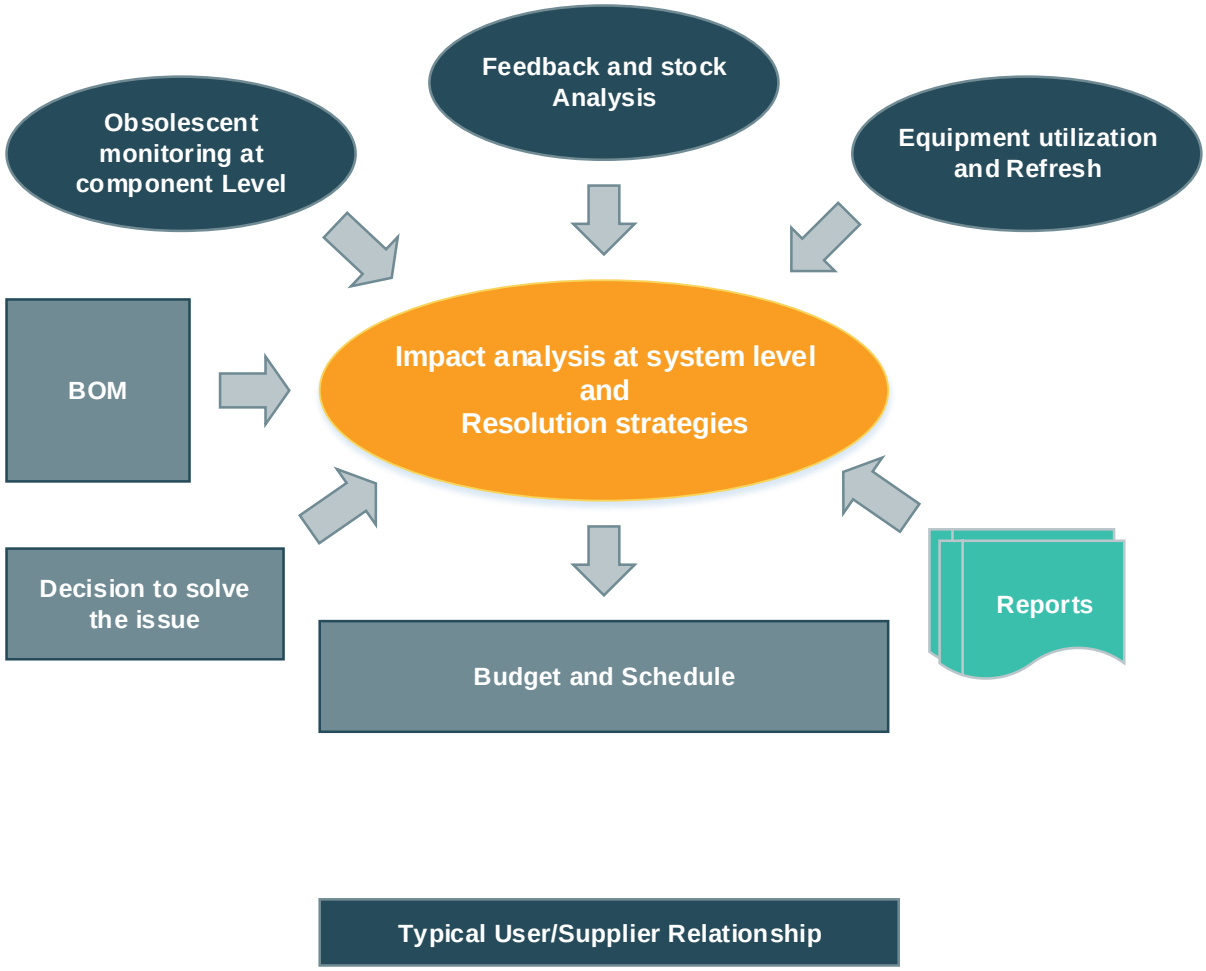

Figure 10: Typical Relationship with Supplier & Users

The OMP should incorporate the SC arrangements and list the following:

- Details of arrangements with suppliers, specifying if these are contractual requirements or requests (including means and frequency of communication)
- Any exclusions that may apply, and why it is so

If monitoring activity is being undertaken down the SC, it is important to ensure that the communications chain, in reporting a notification or any occurrence, and the subsequent decision-making process in addressing the occurrence, is effective enough to provide the appropriate time to respond (i.e., the time taken to pass information up and down the SC does not impact on the options available to address the obsolescence issue).

6.9.3 Engagement with Supplier

The most obvious and often the most reliable source of information about procurement life, is the supplier. Suppliers should be able to approximate the length of time that the items they, supply are likely to remain available for procurement and support, especially if the supplier is also the manufacturer. Non-manufacturing suppliers should obtain the necessary information from their manufacturing sources. The Entity should keep close contact with suppliers on a regular basis. to ensure that they become aware at a very early stage of any potential obsolescence issues, or changes.

6.10 Reviewing Performance

6.10.1 Measuring Obsolescence Management

In order to justify the expense of an OM program, it is necessary to measure the performance of the service provided (either by the Entity or the Supplier). There are ways that a service can be measured; auditing/assessing a supplier, which can be conducted repeatedly throughout the contract. Whichever way is adopted, it should be clearly specified how and in which way the performance shall be measured, which should include:

- Details of how the performance will be measured:
  - What is being measured
  - Deliverables (Plans, Reports)
  - Management, Monitoring
  - What is it being measured against
- Details of how the metrics will be used:
  - Part of Key Performance Indicators (KPIs)
  - Milestone payments paid, deferred, or reduced
- Details on the reporting of the performance information

6.10.2 Cost Benefit Analysis

The primary motivation for proactive OM is that “finding solutions early will save you money”. Wherever possible, it is recommended to create a record of cost metrics for a project/asset, so as to be able to quickly identify likely costs to resolve any obsolescence issues. The purpose of conducting a cost benefit analysis is to identify what the best cost is, and the optimal point of implementing the activity. Figure 11, shows the relationship between cost of service, and the time taken to resolve the issue.

- Cost of the Service
- Cost to resolve
- Time to Resolve (duration)

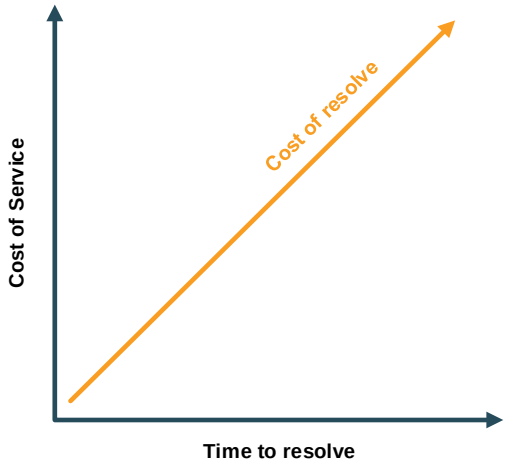

Figure 11: Relationship between Cost of service & Time to Resolve

A Cost Benefit Analysis can be conducted at any point of a system, equipment, or asset’s lifecycle, and should be recorded each time, and reviewed. This can enable the Entity to:

- Plan for future costs
- Review actual costs against planned costs
- Identify if costs savings have been accomplished
- Revise future costs against known (occurred) costs

Regardless of whether an OMP is run by the Entity, suppliers, or as a partnership between both, the cost of conducting an OMP can involve considerable expense. The Entity should be able to demonstrate that the cost of the program will be offset by the cost avoidance, of undertaking the activity.

In order to justify the expense of the OMP, it is necessary to measure the performance of the plan (and therefore the program or service). The plan should specify how the performance of the plan is to be assessed. At a minimum, the “Cost Avoidance” achieved by implementing a proactive OM strategy shall be calculated.

6.11 Customer & Stakeholder Considerations

The OMP shall be developed to ensure that challenges and opportunities that the Entities may face, as well as intelligent management of obsolescence, can provide a key contribution to the organization.

In addition, it is for internal and external stakeholders alike, as well as industry peers and suppliers, to communicate how the management of obsolescence will play a significant role in meeting the Entity’s corporate vision.

The OMP shall provide a strategic focal point to align and develop appropriate technical strategies (in order to exploit future technologies), and to enable the Entities to incorporate effective and efficient whole-life supportable assets into their infrastructures.

6.12 Continuous Improvement

To ensure a constant qualitative performance, an OMP should be improved continually. The Plan-Do-Check-Act (PDCA) cycle shown in Figure 12 (below), is an appropriate way to satisfy this goal. Developed by Dr. W. Edwards Deming, the PDCA cycle is also called the Deming Cycle.

The effect of obsolescence could be very expensive in maintaining long-life assets and systems. This makes OM a key decision for maintaining long-life systems, and therefore needs to be continuously monitored and reviewed. Figure 12 shows a typical process for improving obsolescence.

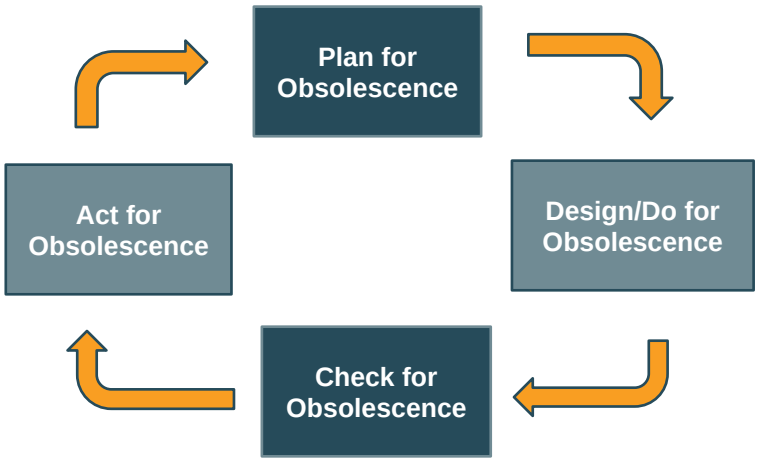

Figure 12: A Process for Continuously Improving Obsolescence

6.13 Benefits of Effective Obsolescence Management

The benefits of a well-planned and operated OM are:

- Ability to make well-informed asset management decisions
- Reduced operational expenditure
- Improved asset reliability, availability, maintainability, and safety of the infrastructure
- Sustained and improved reputation

7.0 ATTACHMENTS

1. Flow Process for OM Decision Making

Attachment 1 – Flow Process for OM Decision Making

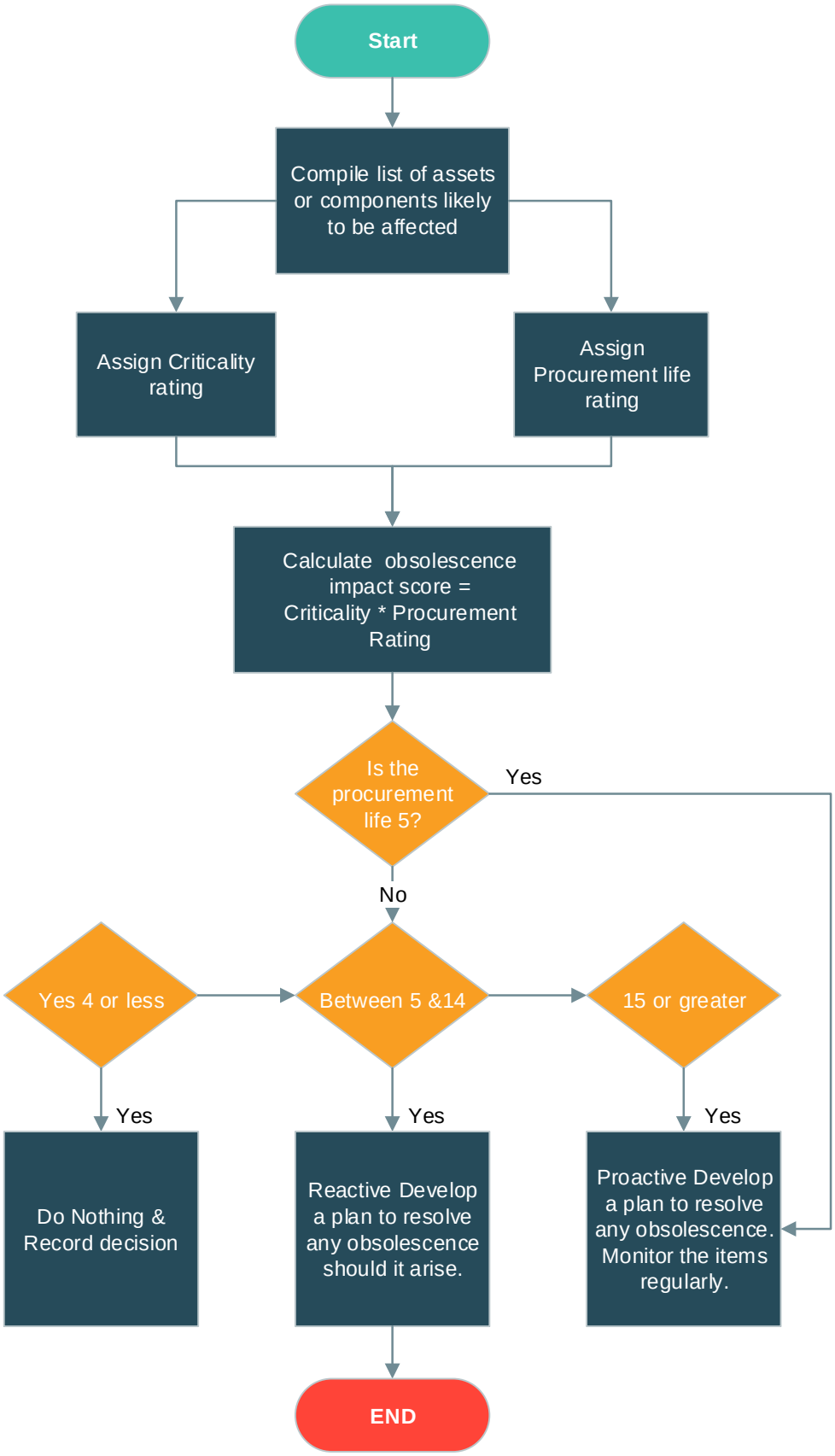

Figure 13: Flow Process for OM Decision Making