BRITISH STANDARD

BS 7000-5:2001

Design management systems —

Part 5: Guide to managing obsolescence

ICS 03.100.01

Committees responsible for this British Standard

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Association of Innovation Management
Association of MBAs
Association of Project Managers
BEAMA Ltd.
British Standards Society
BSI Consumer Policy Committee
Chartered Society of Designers
Defence Manufacturers Association
Design Council
Department of Trade and Industry (Design Policy and Services)
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Contents

Foreword

This part of BS 7000-5 has been prepared by Panel MS/4/-/9.

This standard was developed from the UK Ministry of Defence Standard Def Stan 00-71/Issue 2 which is a revision of Interim Def Stan 00-71/Issue 1.

BS 7000, *Design management systems* currently comprises the following parts:

— *Part 1: Guide to managing innovation*;

— *Part 2: Guide to managing the design of manufactured products*;

— *Part 3: Guide to managing service design*;

— *Part 4: Guide to managing design in construction*;

— *Part 5: Guide to managing obsolescence* (this part);

— *Part 10: Glossary of terms used in design management*.

Other parts might be added.

Because of the novel nature of this subject matter Technical Committee MS/4 invites users to submit technical comments, observations and suggestions to the Committee Secretary at BSI (see address on back cover). This will assist the Committee when it reviews the standard in due course and when it considers the preparation of further parts of BS 7000.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 and a back cover.

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Introduction

Obsolescence affects all products and it impacts upon all stages of the life of products. Obsolescence is inevitable and it cannot be ignored but forethought and careful planning can minimize its impact and its potentially high costs. The objective of obsolescence management is to ensure that obsolescence is managed as an integral part of design, development, production and in-service support in order to minimize cost and detrimental impact throughout the product life cycle.

Commercial off-the-shelf (COTS) products and project-specific parts, e.g. new design tools and production processes, tend to have a much shorter life than those traditionally used. With the increased use of commercial parts in systems it has become essential to include obsolescence management within programme plans from the earliest stages. Furthermore environmental legislation has the potential to affect the use of some materials and should be considered at the outset of projects.

Obsolescence management is essential to achieve optimum cost-effectiveness throughout the life cycle of a product. The purpose of this standard is to provide guidance on planning a cost-effective obsolescence management process that takes into account essential factors to ensure product life cycle costs are considered and applied. Clauses **4** and **5** give guidance on how to choose an appropriate obsolescence management plan. Clauses **6**, **7** and **8** give guidance, detailed as follows, on how to carry out an effective management plan.

— Clause **6** gives guidance on a reactive strategy.

— Clause **7** gives guidance on a proactive strategy.

— Clause **8** gives guidance on strategies for dealing with the obsolescence of software.

1 Scope

This British Standard gives guidance for establishing a framework for obsolescence management and for planning a cost-effective obsolescence management process that is applicable through all phases of the product life cycle. This standard is applicable to all products that include electronic, electrical and electro-mechanical components, although its use can be extended to include other products and processes.

Obsolescence management covers the following areas:

a) new products;

b) technology insertion;

c) legacy equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS EN ISO 9000:2000*, Quality management systems — Fundamentals and vocabulary.*

BS 6079-2:2000*, Project management — Vocabulary.*

3 Terms and definitions

For the purposes of this standard the terms and definitions given in BS EN ISO 9000:2000, BS 6079-2:2000 and the following apply.

3.1
application-specific integrated circuit (ASIC)
integrated circuit whose physical design is customized by or on behalf of the customer

NOTE The contrasting term “standard product” refers to devices whose physical design is fixed by the supplier.

3.2
bespoke
written or adapted to meet the specific need of the customer

NOTE If an item is bespoke it may not have universal application.

3.3
cannibalization
practice of using components, parts or assemblies, taken from within an inventory or product, in order to support other systems, plant or equipment

3.4
commercial-off-the-shelf (COTS)
conforming to the manufacturer's data sheet and available to any purchaser

3.5
hardware
physical components of a system including its associated data and documentation

3.6
integrated logistic support (ILS)
disciplined management approach, aimed at optimizing product whole-life costs (WLCs)

NOTE Integrated logistic support includes elements for influencing product design and determining support requirements to achieve supportable and supported products. (For further information see Defence Standard 00-60, Integrated logistic support.[1)])

3.7
lifetime buy
purchase of a supply of components sufficient to support the product throughout its life cycle or until the next planned technology update

3.8
logistic support analysis record (LSAR)
data table recording the results of the analysis of the provision of supplies and services necessary for maintaining materiel readiness

3.9
materiel
systems, equipment, stores, supplies, spares and related documentation, manuals, computer software and firmware

3.10
obsolescence management plan
description of the strategies for the identification and mitigation of the effects of obsolescence through all stages of the life of a product

3.11
obsolescent
‹hardware› subject to an announced future end of production date by the manufacturer

3.12
obsolescent
‹software› subject to an announced future end of support date

3.13
obsolete
‹hardware› no longer in production by the manufacturer

3.14
obsolete
‹software› no longer supported

3.15
post-design services
service for further development work undertaken after acceptance into service to ensure that the item of materiel continues to meet its approved specification or staff requirement

1) Defence Standards are available from www.dstan.mod.uk and the DStan Helpdesk, UK Defence Standardization, Room 1138, Kentigern House, 65 Brown Street, Glasgow, G2 8EX. Tel: +44 (0) 141 224 2531. Fax: +44 (0) 141 224 2503.

3.16
product
result of a process

NOTE There are three generic product categories, as follows:

— hardware (e.g. engine mechanical part);

— software (e.g. computer program);

— service (e.g. transport).

3.17
software
programs, procedures, rules, data and documentation associated with programmable aspects of systems hardware and infrastructure

3.18
support
total resources required to operate and maintain systems or equipment throughout their service life, including all aspects of software, hardware and complete design knowledge

3.19
technology insertion
updates to legacy equipment (utilizing developing technologies)

3.20
whole-life costs (WLC)
total resource required to assemble, equip, sustain, operate and dispose of a specified asset as detailed in the plan at defined levels of readiness, reliability, performance and safety.

NOTE WLC also includes the costs to recruit, train and retain personnel as well as the costs of higher organizations.

4 Obsolescence management initial planning

An increased incidence in obsolescence is likely to be a significant factor in cost, supportability and product life cycle. It is essential therefore that customers and suppliers are pro-active in managing obsolescence from the outset.

For a new project the project manager should analyse the anticipated project implementation(s), technology(ies) and support strategy(ies) taking into account their potential obsolescence. Where a product or programme already exists the project manager should analyse the product and support arrangements that have already been decided upon.

Based on this analysis the project manager should consider the following risks over the life of the product.

a) What would be the impact of product being unavailable due to lack of spares?

b) What would be the impact of performance degradation due to substituted parts?

c) What would be the likely cost of premature replacement?

d) What would be the likely cost of other measures to circumvent obsolescence?

e) What is the probability of obsolescence occurring due to advances in technology?

f) What is the probability of obsolescence occurring due to the introduction of new legislation?

Having carried out an analysis there are two options available. These are based on the perceived risk of impact, cost and probability.

The two main strategy options that should be considered are:

a) Strategy 1 — Reactive (see clause **6**):
React to problems of obsolescence as and when they occur;

b) Strategy 2 — Proactive (see clause **7**):
Develop and implement an obsolescence management programme.

5 The obsolescence management plan

5.1 General

The project manager should produce an outline obsolescence management plan at the earliest stages of a project. However, everyone involved in the project should recognize that the finally agreed strategy will be influenced by proposals offered by contractors during the bidding phase. A costed obsolescence management plan for a specified project life should be a feature of an invitation to tender (ITT). The plan should be subject to planned review and maintenance.

NOTE Obsolescence management does not operate in a vacuum. It is best integrated with other existing management plans.

5.2 Obsolescence management plan objective

The objective of the obsolescence management plan should be to describe strategies for identification and mitigation of the effects of obsolescence through all stages of the product life cycle.

The aims of the plan should be to:

a) achieve the optimum compromise between whole-life costs for the system, equipment performance and equipment availability and maintainability;

b) include all materiel regardless of whether it has been developed specifically for a customer;

c) be compatible with the customer's current support arrangements;

d) provide a clear basis upon which obsolescence management requirements can be negotiated with suppliers and partners in collaborative projects;

e) be robust within an environment of change;

f) show consideration of the need for component or equipment requalification following component or module substitution.

5.3 Obsolescence management plan contents

Details of plans, decisions and analyses should be recorded for later reference. The obsolescence management plan should initially record the choice of strategy. The level of detail in the plan should increase as the project proceeds. Subsidiary documentation should contain a full record of the factors in the analysis and trade-off arguments. The process for recording decisions is shown in Figure 1.

As well as the record of decisions the obsolescence management plan should also identify the following aspects:

a) the periodicity of review;

b) the obsolescence management roles and responsibilities of the customer and supplier;

c) the current authority responsible for review and maintenance of the plan and the milestones for future transfer of ownership of the plan if applicable.

Guidance on the content of an obsolescence management plan for the management strategies described for hardware (including integral software) can be found in clause **6** for Strategy 1 and in clause **7** for Strategy 2.

Guidance on the content of an obsolescence management plan for the management strategies described for software that is separable from its hardware can be found in clause **8**.

5.4 Budgetary provision

Budgetary provision should take account of all aspects of the chosen strategy and contain sufficient funding for its implementation.

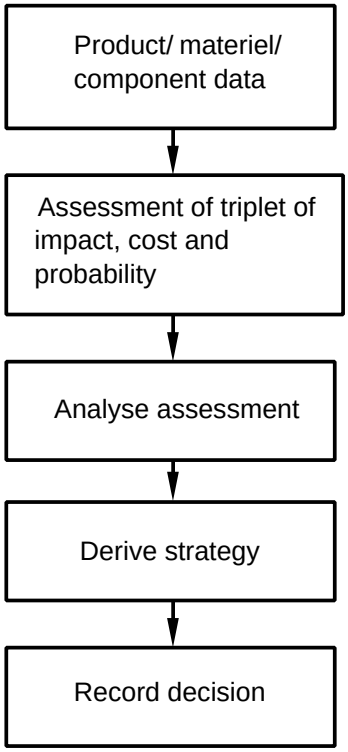

Figure 1 — Process for recording obsolescence management plan decisions

6 Obsolescence management plan for Strategy 1

6.1 Budgetary situation

While Strategy 1 implies no specific provision for obsolescence there may be costs associated with following this option. For example increased costs may be incurred for post-design services or for the purchase of replacement parts. An estimate of costs involved should be included within the plan to feed into the through life management plan.

6.2 Reviewing the strategy

The obsolescence strategy should be reviewed to take account of any changes in circumstances. Details of the strategy review mechanism should be stated.

NOTE Selecting Strategy 1 in the initial stages may limit the ability to apply Strategy 2 in the future. The Strategy 1 option may result in some items required to support Strategy 2 being unavailable at a later date. Items may be unavailable because of a lack of documentation or access to intellectual property rights (IPR).

6.3 Procurement methods when parts have become obsolete

6.3.1 *Parts search*

A parts search may be carried out either by the customer/supplier or by a specialist contractor. Methods include use of proprietary databases some of which are available over the internet.

It may be necessary to consult the design authority to determine compatibility or to do some assessment work to maintain the qualification status of the equipment.

6.3.2 *Cannibalization*

This is the process of using parts and assemblies taken from products within the inventory to support other products.

NOTE Certain regulatory agencies do not allow this to happen.

6.3.3 *Design revision*

6.3.3.1 Design revision includes the following.

a) *Parametric change*

Search databases may identify parts that provide a limited parametric match, but which, after consultation with the person or organization responsible for the design, may be deemed suitable for use within the applicable operational circumstance.

b) *Emulation*

In addition to after-market suppliers who purchase production rights (and IPR) to obsolete components, specialist contractors also exist who will design and manufacture new parts to order to replace obsolete items. The redesign may be carried out using the original specification or from characteristics gained from an in-depth examination of a working example of the part to be replaced. This process involves significant cost and time and can involve complex IPR issues.

c) *Partial equipment redesign*

When it is impractical or impossible to reprocure a part which has become obsolete it may be appropriate to invest in a redesign to procure a new design entity which gives a direct form, fit and function replacement at one or more levels higher in the product-design hierarchy.

d) *Equipment replacement*

When both re-procurement and redesign prove uneconomic, replacing whole products may be considered.

6.3.3.2 Any design revisions should include an assessment of the need for requalification.

7 Obsolescence management plan for Strategy 2

7.1 Defining the plan

Only limited information may be available in the early stages of a project, so the plan should be progressively developed and reviewed as the project matures. The plan should take into account the technology, complexity, cost and operational considerations of the product. The plan should be used throughout the life of the product to define obsolescence management activities and responsibilities.

The plan should record the chosen options (see **7.2**) for the project, with reasons for the choice. It may be appropriate to apply different management options to different parts of the same project and the choices should be regularly reviewed to ensure that they are still appropriate.

The plan should be based on the best understanding of the project and its implementation at the time. If it is clear that early reconsideration is appropriate this fact should be recorded with a recommendation of the longest time that should be allowed to elapse before review.

The plan should never appear to be absolute or beyond question unless the product itself is approaching the end of its life. The essential factor in choosing between options is optimum value for money over the life of the project taking account of cash flow constraints. Regardless of the option chosen the associated costs should be included in the cost of ownership and recorded in the through life management plan.

7.2 Options summary

The five options for obsolescence management are given as follows.

a) Do nothing until the need arises (see **7.3.1**).

b) Define all interfaces so that the consequences of obsolescence in any one module are bounded. This is called technology transparency (see **7.3.2**).

c) Monitor the parts, materials and processes used in the product for approaching obsolescence (see **7.3.3**).

d) Plan to upgrade the equipment at defined intervals, dealing with obsolescence of components and materials at the same time (see **7.3.4**).

e) Lifetime buy of important items (see **7.3.5**).

The use of one or more of these options should be carefully considered and an application should be planned.

NOTE The information in **6.3** could be of assistance in making appropriate choices. An overview of each option follows in **7.3**.

7.3 The options

7.3.1 *Do nothing until the need arises*

When the triplet of impact, cost and probability indicates some risk and a positive decision is taken not to manage obsolescence, the option to do nothing until the need arises will be relevant. This option may be selected if one or more of the following situations arise:

a) the cost of planning is not easily affordable;

b) the product has been procured to satisfy an operational need, has a finite duration and no further purchases are planned;

c) the probability of obsolescence is very low, e.g. low technology products;

d) the product has a high reliability and can be supported throughout its service life from available spares;

e) system/equipment is composed of COTS computing equipment;

f) there are reliable supplier guarantees.

7.3.2 *Technology transparency*

7.3.2.1 *General*

This is a design methodology that depends on the specification of interfaces. The intended consequence is that any technology can be used in manufacture and support provided that the form, fit and function (FFF) of complete assemblies are maintained. The concept may be extended by the use of open system architectures and standards.

Technology transparency relies for effectiveness on the assumption that a component or module can be substituted provided that its interfaces are completely specified. This should be independent of the technology used within the module. Care should be taken because it is usually only when a substitution fails that the adequacy or otherwise of the interface definition is demonstrated.

7.3.2.2 *Considerations for use*

Technology transparency is a concept that should be applied from the outset of a project. It is particularly appropriate for new projects and can be applied to legacy systems when they are updated or when modules are redesigned.

Technology transparency is especially relevant for:

a) modular systems (a module is a discrete element of the system that performs a specific function. In particular circumstances a module may be any level of assembly from a component upwards);

b) COTS items;

c) systems with a high probability of recurrent obsolescence;

d) components for specific applications.

NOTE The design of a component for a specific application such as a circuit board or an ASIC, may be considered for archiving as a high-level design description (e.g. use an HDL), to enable the component to be re-implemented at a later date in a contemporary technology.

The necessary access to IPR should be acquired.

7.3.3 *Obsolescence monitoring*

7.3.3.1 Obsolescence monitoring involves tracking the processes, materials and components used in design. It then involves taking action to provide alternatives when any of them approaches or reaches obsolescence, especially if that would prejudice support of the product. The appropriate action will often be some redesign and may involve planned system upgrades or lifetime buys as described in **7.3.4** or **7.3.5** for all, or parts, of the product concerned.

7.3.3.2 There are commercial organizations that collect information from manufacturers enabling the life cycle of certain electronic parts to be predicted. Software tools exist which enable designers and production engineers to avoid the use of electronic parts that are obsolescent. These tools can provide data to assist in spares scheduling and the planning of updates. They can provide an analysis for legacy equipment to indicate the location and severity of likely obsolescence problems. However, there is no known organized commercial tracking of the technologies used in the production of mechanical and consumable materials. Obsolescence management in these areas may be achieved by identifying critical parts and consumables for independent investigation.

7.3.3.3 Obsolescence monitoring should be considered for use:

a) for systems where the costs of obsolescence are high relative to the support budget;

b) where there is a single source;

c) when the use of scarce skills is involved;

d) where the component performs a safety critical function;

e) when there are large numbers of a particular system to be maintained in service, reducing the cost of obsolescence monitoring relative to the support budget.

The parts list supplied with a new project should make it possible to contract for continuous detailed monitoring of obsolescence. In the case of a legacy system without an LSAR it may be appropriate to carry out an obsolescence survey to scope the extent of likely problems such as unavailability of COTS and standard parts. Where problems are identified IPR issues may need to be addressed.

7.3.4 *Planned system upgrades*

This option involves predetermining points during the product's life at which the design of all, or parts, of the system will be brought up to date and obsolete items replaced. These upgrades may or may not be synchronized with "mid-life updates" which may enhance the requirement that the product is designed to satisfy. The system upgrade programme should take into account the need to minimize whole-life costs. Between the planned upgrades at least one of the other options for dealing with obsolescence will be needed. A lifetime buy will often be appropriate. A planned system upgrade is unlikely to be appropriate where it carries a high risk.

Planned system upgrades should be considered for use:

a) for all new electronic systems;

b) when the time-scale for obsolescence can be accurately predicted;

c) under circumstances of rapid technological development;

d) when a lifetime buy is inappropriate (e.g. due to a short shelf-life).

NOTE Continuous renewal by evolutionary development and insertion of technology (CREDIT) is a particular form of planned system upgrading in which the phases of research, development and use take place in parallel.

7.3.5 *Lifetime buy*

A lifetime buy involves purchasing the quantity of relevant parts predicted to be required for a defined period. It may cover the complete requirement for a production run and associated spares or it may cover only the items known to be at risk during support activities. A decision to undertake a lifetime buy should take account of possible upgrade slots. It will often become appropriate when a supplier makes known an intention to cease manufacture of a particular part if there is no known suitable substitute.

A lifetime buy will not be appropriate when the shelf-life under normal storage conditions is unsatisfactory. A lifetime buy may be considered by an individual contractor, on his or her own, or in cooperation with other contractors on the same project. Use of a lifetime buy avoids issues of IPR especially in complex components, modules or subassemblies.

A lifetime buy should be considered for use:

a) when there is a known or predicted obsolescence date;

b) when the life expectancy of a system is short;

c) when equipment is procured to satisfy an urgent operational requirement (UOR).

7.4 Additional factors affecting choice of obsolescence management programme options

7.4.1 *Legacy equipment*

Equipment that is in service or projects that are part way through the life cycle process can have significant obsolescence problems. Such equipment might not have been subject to ILS disciplines and vital data such as IPR might not be available. This data may be procured, at a cost, for the whole or part of the equipment. Judging the value of procuring such data based upon the operational role and the remaining life of the equipment is important.

7.4.2 *Support policy*

It should be ensured that there is compatibility between obsolescence management planning and support policy. Differences in approach should be resolved.

7.4.3 *Collaborative procurement*

Negotiations should always aim at the provision of the original manufacturer's part number as some equipment suppliers substitute their own identity codes. These codes tie the contractor to the supplier permanently enabling the supplier to make premium charges on all subsequent support services and supplies including obsolescence management.

7.4.4 *Contract conditions and intellectual property rights (IPR)*

IPR may restrict the legal rights of the contractor to change or reproduce product designs without reference to, and contracts with, the owner of the IPR. As far as is economically possible IPR should be obtained for all items that are at risk.

8 Software obsolescence issues and strategies

8.1 Software and hardware similarities and differences

The principles that govern the management of software and hardware obsolescence issues are basically the same. However, differences exist which should be considered and these are:

a) software does not wear out (though it may become degraded through modification);

b) the cost of generating further copies of software is negligible.

It might be deduced from the above statements that software obsolescence should not be a problem. In practice the costs associated with software obsolescence are high. The causes of software obsolescence are:

a) the rapid obsolescence of the hardware on which software runs;

b) the necessity of software modification.

8.2 Causes of software obsolescence

8.2.1 *General*

The highest rates of obsolescence for hardware tend to be associated with hardware used in conjunction with software such as microprocessors, memory and programmable devices. The reason is the competitive pressure of the commercial market which has a continuous demand for devices which are faster, smaller, use less power and offer improved user interfaces. The enormous investment involved in the manufacture of COTS components is forcing a trend towards monopolistic production. The huge number of relatively small customers encourages novelty so that upward compatibility with existing software is not a high priority. The consequence of no upward compatibility is the obsolescence of existing software.

8.2.2 *Software modifications*

Software is modified for three reasons:

a) it contains design imperfections and demands corrective modification;

b) the operating environment changes so that the software demands adaptive modification in order to retain its original functionality;

c) the functional requirements change so that the software demands enhancement modification.

8.2.3 *Imperfections*

Many software programs are so complex that no designer can understand all possible internal interactions. The state space of inputs and internal states is so large as to render exhaustive testing impractical. As a result anomalous behaviour is likely to be exhibited in use leading to a demand for modifications to be made. For large software programs the eradication of faults is unlikely ever to be complete so there is a constant demand for a support facility to provide software maintenance for operationally significant software.

8.2.4 *Adaptive and enhancement modifications*

The designer of a complex software program is unlikely to provide exactly what the prospective user specified, quite apart from what was needed. Even when fully met requirements keep changing because of changes in the usage environment. Furthermore, the climate of rapid technological advance encourages clients to seek enhancements to performance, to be carried out as a background activity by the support facility providing software maintenance. Thus software modification often becomes a continuous activity.

8.2.5 *Documentation*

The availability of complete and unambiguous documentation is a key asset in the software modification process. Failure to ensure the provision of up-to-date documentation is itself a cause of software obsolescence.

8.3 Modification of bespoke software

Modification of bespoke software may be easy to arrange but there are inherent dangers associated with the introduction of new errors and anomalies. When bespoke software fails to live up to user performance expectations after modification it is likely to become obsolete.

The demand for the modification of bespoke software has a knock-on obsolescence effect. The hardware and software tools that support the modification process suffer from obsolescence. Such tools may be computers, operating systems, compilers or software development/support environments. The availability of the necessary skills in the methods and tools used to modify software is subject to decline. In general it is found to be uneconomic to indefinitely maintain all the facilities, licences and skills to support bespoke software. This situation may prematurely shorten the in-service life of bespoke software.

8.4 Inconsistency of COTS software

Many COTS information technology products have a short commercial life before being superseded by a new version or dropped from the product range of the supplier. Market pressures encourage continuous change. Retaining superseded COTS products in a system risks a growing incompatibility with other parts of the system that are being upgraded. Incorporating a new, or replacement alternative, COTS product means coping with differences at the interfaces and in the performance of the system. The need to maintain consistency means that a COTS-based system may be expected to be in a state of continuous redesign throughout its lifetime.

8.5 Strategies to combat software obsolescence

Having established the obsolescence issues relating to software outlined in this clause the use of obsolescence strategies in support of software obsolescence should be clearly detailed.

All software is used in conjunction with hardware. Obsolescence management operates at system level which encompasses both hardware and software. Software may form a part of a product and its obsolescence management should be developed accordingly.

Devices where hardware and software form a single integrated unit should be managed as hardware in accordance with the strategies defined in clause **6** and clause **7**. Predominantly this covers low-level code, such as machine code and memory assignment, targeted at specific devices generically known as firmware.

Software which is separable from hardware, for instance software developed in a high-level language, is unlikely to match the impact, cost, probability triplet low, low, low when taking account of the ramifications of coding, installation, running and support. For this reason it is recommended that Strategy 2, as described below, should be applied to all software which does not form an integrated unit with its hardware.

8.6 Strategy 2 as applied to software separable from hardware

8.6.1 *Relationship between the customer and the supplier*

The invitation to tender (ITT) should define the requirements for obsolescence management and explain to prospective contractors the choices made in the initial obsolescence management plan. If the contract that is placed differs from what was envisaged in the initial obsolescence management plan, that plan should be brought into line with the agreed contractual terms.

8.6.2 *Defining the plan*

Limited information may only be available in the early stages of a project so the plan should be progressively developed and reviewed as the project matures. The plan should take into account the technology, complexity, cost and operational considerations of the product. The plan should be used throughout the life of the product to define the obsolescence management activities and responsibilities.

The plan should record the chosen options (see **8.6.3**) for the project giving reasons for the choice. It may be appropriate to apply different management options to different parts of the same project and the choices should be regularly reviewed to ensure that they are still appropriate. The plan should be based on the best understanding of the project and its implementation at the time. If it is clear that early reconsideration is appropriate this fact should be recorded with a recommendation of the longest time that should be allowed to elapse before review.

The plan should never appear to be absolute or beyond question unless the equipment itself is approaching the end of its life. The essential factor in choosing between options is optimum value for money over the life of the project taking account of cash flow constraints.

8.6.3 *Options summary*

The four options for obsolescence management of software are as follows.

a) Do nothing until the need arises (see **8.6.4.1**).

b) Document fully all interfaces so that the consequences of obsolescence in any one module are bounded, targeting technology transparency and open systems wherever practicable (see **8.6.4.2**).

c) Contract for a support agency to provide software maintenance (see **8.6.4.3**).

d) Plan to upgrade the software at defined intervals, taking account of the obsolescence of hardware and software at the same time (see **8.6.4.4**).

The use of one or more of these options should be carefully considered and its application planned. An overview of each option is given in **8.6.4**.

8.6.4 *The options*

8.6.4.1 *Do nothing until the need arises*

The reasons for selecting this option may include the following:

a) the software has been procured to satisfy an operational demand which has a finite duration and no further use is planned;

b) the probability of obsolescence is very low, e.g. low-complexity software;

c) the software is a COTS product in a stand-alone system;

d) there are reliable supplier guarantees that the software will not become obsolescent until a planned upgrade of the associated hardware is undertaken.

8.6.4.2 *Technology transparency/open systems*

This is a design methodology that depends on the specification of generic interfaces. It depends upon architectures and standards being agreed and implemented thus ensuring that internationally recognized methods and tools become supported on a wide variety of hardware platforms. Therefore technology transparency/open systems requires cooperative effort on the part of users.

The concept of open systems relies for effectiveness on the assumption that a replacement module, which may be software combined with hardware, can be substituted provided that the interfaces are completely specified and rigorously implemented. This should be achieved in a way that is independent of the technology used within the module. Care should be taken because it is only when a substitution fails that the adequacy or otherwise of the interface definition is demonstrated. Use of supplier specific enhancements to a standard may prevent the expected benefits of open systems from being achieved.

Technology transparency/open systems is a concept that should be applied from the outset of a project. It is particularly appropriate for new projects and can be applied to legacy systems when they are updated or when modules are redesigned. The technology transparency/open systems concept is especially relevant for:

a) modular systems;

b) COTS software;

c) systems with a high probability of recurrent obsolescence, e.g. microprocessor based systems, because proprietary interfaces may change even before a design can be realized in production.

8.6.4.3 *Contract support*

A complex bespoke software package is unlikely to be operated intensively for long before requiring modification (see **8.3**). Modifications can be accommodated by contracting for support from the original supplier or from a third party. Unconstrained access to the code and its documentation should be made available to the organization contracted to provide software support. When contract support for software is likely to be the chosen option, at the start or later in the life cycle of a project, the software acquisition contract should make provision for sufficient documentation, support facilities and IPR to be available so that third party software maintenance is a realistic option.

Open-source software may seem attractive in terms of openness and cost but the cost of assessing the fitness for purpose should be considered. A commercially supported version of open-source software should be used in view of the unpredictability of access to the open-source version.

Contract support should be considered for use:

a) for bespoke software;

b) for open-source software;

c) when it is offered for a COTS product.

8.6.4.4 *Planned upgrades*

This option involves the predetermination of points during the product life cycle at which the design of all or parts of the system will be brought up to date and obsolete items replaced. These upgrades will often involve both the software and the underlying hardware together. Between the planned upgrades one of the other options may be necessary.

Planned upgrades should be considered for use:

a) for all new electronic systems;

b) when the time-scale for obsolescence can be accurately predicted;

c) under circumstances of rapid technological development. Microprocessor based systems come into this category, even when conforming to open systems, because of rapid advances in technology and performance.

8.6.5 *Additional factors affecting choice of obsolescence management programme options*

NOTE For general information on this topic see **7.4**.

8.6.5.1 *Legacy systems*

A legacy system incorporating complex software may exhibit a wide range of problems. The software may be inadequately documented, constructed using obsolete languages and support tools, full of embedded COTS components from defunct suppliers, generated without regard to a modular programming style and lacking any form of obsolescence management plan. Strategies 1 and 2 given in this standard remain applicable but the costs of rectifying the deficiencies in order to implement a strategy are likely to be high.

8.6.5.2 *Escrow arrangements*

Irrespective of the option chosen, it may be advantageous to safeguard access to development documentation and source code by entering into an escrow arrangement with the supplier.

Bibliography

Further reading

BS 6079-1, *Project management — Guide to project management.*

BS EN ISO 10007, *Quality management — Guidelines for configuration management.*

BS EN ISO 14001, *Environmental management systems — Specification with guidance for use.*

BS EN ISO 14040, *Environmental management — Life cycle assessment — Principles and framework.*

BS IEC 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements.*

BS IEC 61508-3, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 3: Software requirements.*

BS ISO 15686-1, *Buildings and constructed assets — Service life planning — Part 1: General principles.*

BS ISO 15686-2, *Buildings and constructed assets — Service life planning — Part 2: Service life prediction procedures.*

Def Stan 00-60[2)], *Integrated logistic support.*

PAS 2001, *Knowledge management.*

PD 6614, *Obsolescence management — Guide to the substitution of components in electronic equipment.*

PD 6667, *Obsolescence management — Code of practice for obsolescence notification and support from suppliers of electronic components.*

[2)] Defence Standards are available from www.dstan.mod.uk and the DStan Helpdesk, UK Defence Standardization, Room 1138, Kentigern House, 65 Brown Street, Glasgow, G2 8EX. Tel: +44 (0) 141 224 2531. Fax: +44 (0) 141 224 2503.

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