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Part 1: Concepts and Terminology

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

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IEC SC 65E : DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS	
SECRETARIAT: United States of America	SECRETARY: Mr David Richmond
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	

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TITLE: Intelligent Device Management – Part 1: Concepts and Terminology

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTELLIGENT DEVICE MANAGEMENT Part 1: Concepts and terminology

FOREWORD

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IEC 63082-1 has been prepared by subcommittee **SC65E WG10: Intelligent Device Management**, of IEC technical committee **TC65: Industrial-process measurement, control and automation**. It is an International Standard.

This first edition of IEC 63082-1 constitutes a technical revision to the previous issued technical report IEC TR 63082-1/2020.

This edition includes the following significant technical changes with respect to the previous edition:

- a) ...;
- b)

The text of this **International Standard** is based on the following documents:

Draft	Report on voting
SC65E/888/NP	SC65E/932/RVN

313

314 Full information on the voting for its approval can be found in the report on voting indicated in
315 the above table.

316 The language used for the development of this **International Standard** is **English**.

317 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
318 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
319 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
320 described in greater detail at www.iec.ch/publications.

321 The committee has decided that the contents of this document will remain unchanged until the
322 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
323 specific document. At this date, the document will be

- 324 • reconfirmed,
- 325 • withdrawn,
- 326 • replaced by a revised edition, or
- 327 • amended.

328

329

INTRODUCTION

330 The purpose of the IEC 63082 series is to define an environment that enables the effective use
331 of intelligent devices. The IEC 63082 series defines common concepts, terminology, and
332 management activities.

333 Intelligent device management (IDM) represents activities for managing intelligent devices
334 through the facility life cycle and does not imply a particular asset management tool or set of
335 those tools. Hardware and software tools are necessary to support work processes and
336 procedures, but specification of the tools is not a part of the IEC 63082 series. IDM is one of
337 many enterprise programs. IDM activities optimize the value from intelligent devices and
338 supports integration of data from the production level with business systems. IDM is consistent
339 with smart manufacturing initiatives.

340 Several stakeholders are responsible for delivering successful intelligent device management,
341 including EPC business providers, system integrators, suppliers, service providers and
342 consultants.

343 The IEC 63082 series is not intended to replace or contradict other standards, for example IEC
344 61511 (all parts) for safety instrumented systems and IEC 62443 (all parts) for cybersecurity.

345 While the work processes and implementation practices specified in the IEC 63082 series might
346 be used for non-automation equipment with some diagnostic capability, the IEC 63082 series
347 does not cover these equipment types.

348 The IEC 63082 series consists of the following parts:

- 349 • IEC 63082-1: Concepts and Terminology
- 350 • IEC 63082-2: Normative Requirements and Recommendations

351 IEC 63082-1 describes intelligent device management concepts and terminology necessary for
352 in-depth understanding and effective communication. It gives the basic concepts of how
353 intelligent devices can be managed and an overview of how this device management works
354 throughout the facility life cycle. IEC 63082-1 provides basic knowledge to understand the
355 concepts of intelligent device management necessary to implement an IDM program.

356 IEC 63082-2 provides normative provisions (requirements and recommendations) in the body
357 of the document. Additional information on why a requirement is given are provided in
358 informative Annex A. The information provided in IEC 63082-1 is intended to be useful as
359 background material for better understanding of provisions in IEC63082-2.

INTELLIGENT DEVICE MANAGEMENT

Part 1: Concepts and terminology

1 Scope

This part of IEC 63082 defines the concepts and terminology necessary to understand and communicate effectively about intelligent device management (IDM). This document explains the relationship between IDM and other existing asset management standards.

Additionally, this document describes principles and defines organizational and functional structures associated with IDM. This document also introduces the concept of IDM program for coordination of multiple stakeholders.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 63082-2 Ed 1 (CD)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Terms and definitions

3.1.1 activity

set of actions that consume time and resources and whose performance is necessary to achieve, or contribute to, the realization of one or more objectives

Note 1 to entry: Includes work processes, procedures, and tasks.

[SOURCE: ISO/IEC TR 24766:2009, 3.1, modified – “outcomes” was replaced with “objectives”.]

3.1.2 alarm

notification to the operator of an equipment malfunction, process deviation, or abnormal condition requiring a unique, timely, and documented (predetermined) response from the operator

[SOURCE: IEC 62682: 2022, 3.1.7, modified – “audible and/or visible means of indicating” was replaced with “notification”, “unique,” was added, “and documented (predetermined)” was added, and “from the operator” was added.]

3.1.3

alarm management

collection of processes and practices for determining, documenting, designing, operating, monitoring, and maintaining alarm systems

[SOURCE: IEC 62682: 2022, 3.1.17]

3.1.4

alert

notification to responsible person of an abnormal condition that can require action with a time tolerance much longer than for alarms

Note 1 to entry: “responsible person” can include operators, maintenance personnel, and engineering personnel.

3.1.5

apparatus

device or assembly of devices which can be used as an independent unit for specific functions

EXAMPLE Apparatus includes intelligent measuring and control devices, inspection and testing devices, and host systems.

[SOURCE: IEC 60050-151-11-22: 2001, modified – Note was deleted, and EXAMPLE was added.]

3.1.6

asset management

coordinated activities of an organization to ensure the intended capability of assets is available

Note 1 to entry: The capability of an asset is dynamic and asset management will respond to satisfy changing objectives.

[SOURCE: ISO 55000:2014, 3.3.1, modified – “to realize value from assets” was replaced with “to ensure the intended capability of assets is available”, Notes to entry were deleted, a new Note 1 to entry was added.]

3.1.7

calibration

procedure of checking and when necessary adjusting (by comparison with a reference standard) the accuracy of a measuring instrument

[SOURCE: ISO 15378: 2017, 3.3.2, modified – “process” was replaced with “procedure” and “or” was replaced with “and when necessary”.]

3.1.8

certification

procedure by which a third party gives documented assurance that a product, process, or service conforms to specified requirements

[SOURCE: IEC 61400-22:2010, 3.4, modified – “written” was replaced with “documented” and “also known as conformity assessment” was deleted.]

3.1.9

commissioning

procedure prior, or related, to the handing over of a product ready for putting into service, including final acceptance testing, the handing over of all documentation relevant to the use of the product and, if necessary, instructing personnel

[SOURCE: IEC 82079-1: 2012, 3.3, modified – “procedures” was replaced with “procedure”.]

3.1.10**configuration database**

structured collection of parameter settings for intelligent devices

3.1.11**corrective action**

action to eliminate the cause of a non-fulfilment of a requirement and to prevent recurrence

[SOURCE: ISO 55000: 2014, 3.4.1, modified – “nonconformity” was replaced with “non-fulfilment of a requirement”, Note 1 to entry was deleted.]

3.1.12**covert fault**

fault in relation to hardware and software, undetected by the diagnostics, proof tests, operator intervention (for example physical inspection and manual tests), or through normal operation

Note 1 to entry: These are sometimes called latent faults or unknown faults.

[SOURCE: IEC 61508-4: 2010, 3.8.9 covert, modified – “fault” and “and software” were added, “diagnostic test” was replaced with “diagnostics”, EXAMPLE was deleted, Note 1 to entry was added.]

3.1.13**criticality**

degree of risk represented by specified set of levels

3.1.14**decommissioning**

act of taking an engineered system or component out of service, render it inoperative, dismantle and decontaminate it

[SOURCE: ISO 27914:2017, 3.13, modified – “decommission” was replaced with “decommissioning”, change “take” was replaced with “act of taking”.]

3.1.15**device**

independent physical entity capable of performing one or more specified functions in a particular context and delimited by its interfaces

[SOURCE: IEC 61499-1: 2012, 3.29, modified – Note 1 to entry was deleted.]

3.1.16**device configuration**

procedure that loads parameters into an intelligent device to define its function

3.1.17**device life cycle**

period of time over which a device with a specific model code is developed, brought to market and eventually removed from the market

3.1.18**device monitoring**

monitor that tracks behaviour of a device, providing notifications of events for the device and for all calls associated with the device

[SOURCE: ISO/IEC TR 18053:2000, 3.141, modified – term “Device-Type Monitor” was replaced with “device monitoring”, “A” was removed.]

484 **3.1.19**
 485 **device template**
 486 set of predefined parameters which characterize a specific device release for a particular type
 487 of application

488 Note 1 to entry: Device templates are normally prepared by the device supplier.

489 **3.1.20**
 490 **diagnostics**
 491 automated function which detects faults, malfunctions, deviations, and/or variations of
 492 hardware or software

493 Note 1 to entry: Diagnostics can be initiated manually for off-line diagnostics.

494 Note 2 to entry: "Diagnostic" is used for an adjective and as a generic word.

495 **3.1.21**
 496 **enterprise**
 497 group of organizations sharing a set of goals and objectives to offer products or services or
 498 both

499 [SOURCE: ISO 14258: 1998, 2.1.1, modified – "a" was deleted.]

500 **3.1.22**
 501 **equipment**
 502 single apparatus or set of devices or apparatuses, or the set of main devices of an installation,
 503 or all devices necessary to perform a specific task

504 EXAMPLE Intelligent measuring and control devices, inspection and testing devices, and host systems.

505 [SOURCE: IEC 60050-151-11-25: 2001, modified – Note was deleted, and EXAMPLE was
 506 added.]

507 **3.1.23**
 508 **facility**
 509 physical entity that is built, constructed, installed or established to perform some particular
 510 function or to serve or facilitate some particular end

511 EXAMPLE A plant, factory, mill, and site.

512 [SOURCE: IEC/TR 62066:2002, 3.6, modified – parentheses are removed, EXAMPLE is
 513 added.]

514 **3.1.24**
 515 **facility implementation project**
 516 set of activities to put into practice before the facility starts or continues its intended service

517 **3.1.25**
 518 **failure**
 519 loss of the ability to perform as required

520 Note 1 to entry: A failure of an item is an event that results in a fault of that item.

521 Note 2 to entry: Qualifiers, such as catastrophic, critical, major, minor, marginal and insignificant, can be used to
 522 categorise failures according to the severity of consequences, the choice and definitions of severity criteria
 523 depending upon the field of application.

524 Note 3 to entry: Failure could lead to loss of a single function of an item (e.g. secondary function such as diagnostics)
 525 not impacting the primary function of the item.

526 Note 4 to entry: In this definition "an item" refers to "a device".

527 [SOURCE: IEC 60050-192-03-01:2015, modified – <of an item> was deleted, Note 3 to entry
528 was modified, Note 4 to entry was added.]

529 **3.1.26**

530 **fault**

531 inability to perform as required, due to an internal state

532 Note 1 to entry: A fault of an item results from a failure, either of the item itself, or from a deficiency in an earlier
533 stage of the life cycle, such as specification, design, manufacture or maintenance.

534 Note 2 to entry: Qualifiers, such as specification, design, manufacture, maintenance, or misuse, can be used to
535 indicate the cause of the fault.

536 Note 3 to entry: In this definition “an item” refers to “a device”.

537 [SOURCE: IEC 60050-192-04-01:2015, modified – “of an item” was deleted, Note 2 to entry
538 was modified, Note 3 to entry was modified, Note 4 to entry was deleted.]

539 **3.1.27**

540 **foundational requirement**

541 requirement that serves as a basis for derivation of detailed requirements

542 EXAMPLE Management of risk, management of functionality and performance, management of change

543 Note 1 to entry: Foundational requirements might not be directly actionable, but their derived requirements can be
544 a basis for action.

545 **3.1.28**

546 **host system**

547 functions or tools that digitally communicate with intelligent devices

548 Note 1 to entry: It includes automated fault handling, management of notifications, and configuration management
549 of intelligent devices.

550 Note 2 to entry: Functions and tools can be provided on one or more platforms.

551 **3.1.29**

552 **incipient fault**

553 imperfection in the state or condition of a device so that a degraded performance or critical
554 failure might eventually be the expected result if corrective action(s) is (are) not taken

555 [SOURCE: ISO 14224: 2016, 3.40, modified – term “incipient failure” was replaced with
556 “incipient fault”, “an item” was replaced with “a device”, “or critical failure might (or might not)”
557 was replaced with “performance or critical failure might”, and “actions are” was replaced with
558 “action(s) is (are)”.]

559 **3.1.30**

560 **industrial automation control system**

561 IACS

562 collection of personnel, hardware, software, procedures and policies involved in the operation
563 of the industrial process and that can affect or influence its safe, secure and reliable operation

564 Note 1 to entry: These systems include but are not limited to: a) industrial control systems, including distributed
565 control systems (DCSs), programmable logic controllers (PLCs), remote terminal units (RTUs), intelligent electronic
566 devices, supervisory control and data acquisition (SCADA), networked electronic sensing and control, and
567 monitoring and diagnostic systems. (In this context, process control systems include basic process control system
568 and safety-instrumented system (SIS) functions, whether they are physically separate or integrated.); b) associated
569 information systems such as advanced or multivariable control, online optimizers, dedicated equipment monitors,
570 graphical interfaces, process historians, manufacturing execution systems, and plant information management
571 systems; c) associated internal, human, network, or machine interfaces used to provide control, safety, and
572 manufacturing operations functionality to continuous, batch, discrete, and other processes.

573 Note 2 to entry: The IACS may include components that are not installed at the asset owner's site.

Note 3 to entry: The definition of IACS was taken from ISA-62443-3-3 and is illustrated in Figure 2. Examples of IACSs include Distributed Control Systems (DCS) and Supervisory Control and Data Acquisition (SCADA) systems. ISA-62443-2-4 also defines the proper noun "Solution" to mean the specific instance of the control system product and possibly additional components that are designed into the IACS. The Automation Solution, therefore, differs from the control system since it represents a specific implementation (design and configuration) of the control system hardware and software components for a specific asset owner.

[SOURCE: ISA-62443-3-3]

3.1.31

Intelligent Device Management System

IDMS

type of host system that facilitates a seamless exchange and retrieval of information about intelligent devices between multiple functional departments and across an organization's facilities, while also allowing live access to device information and configuration

Note 1 to entry: An IDMS is not based on a specific technology nor a predetermined/rigid architecture.

3.1.32

infrastructure

basic physical and organizational structures needed for the operation of an enterprise

3.1.33

inspection

action comprising careful scrutiny of a device and its immediate environment in order to arrive at a reliable conclusion as to the condition of a device

[SOURCE: IEC 60050-426:2008, modified – "an item" was replaced with "a device" and "carried out either without dismantling, or with the addition of partial dismantling as required, supplemented by means such as measurement," was replaced with "and its immediate environment".]

3.1.34

installation

one apparatus or a set of devices and/or apparatuses associated in a given location to fulfil specified purposes, including all means for their satisfactory operation

[SOURCE: IEC 60050-151-11-26: 2001]

3.1.35

intelligent device

configurable device having digital communication with supplemental functions such as diagnostics in addition to its basic purpose

EXAMPLE 1 Process connected devices, which are in level 1 of the IEC62264 functional hierarchy, such as smart instruments, valves and actuators, analysers, custody transfer meters, electrical breakers, and transformers.

EXAMPLE 2 Control devices, which are in level 2 of the IEC62264 functional hierarchy, such as PLCs, data acquisition subsystems, and dedicated HMI devices.

EXAMPLE 3 Other devices such as RTUs, managed industrial network routers, converters and gateways.

3.1.36

intelligent device management

IDM

formal coordinated business objectives, organizations, work processes, and resources to realize value from intelligent devices

Note 1 to entry: IDM program is used to achieve setup (provisioning, engineering, configuration and calibration), optimization, diagnostics, maintenance and disposal of intelligent devices over the facility life cycle based on asset management.

621 Note 2 to entry: IDM can be applied to multiple facilities of an enterprise or a facility of an enterprise.

622 [SOURCE: definition of “asset management” by ISO 55000:2014, 3.3.1, modified – “assets”
623 was replaced with “intelligent devices” and Notes to entry were added.]

624 **3.1.37**

625 **intelligent device management program**

626 **IDM program**

627 set of coordinated policies, strategies, activities, resources, and organization to achieve IDM
628 objectives

629 Note 1 to entry: IDM program is a type of enterprise program.

630 **3.1.38**

631 **life cycle**

632 finite set of generic phases and steps which a system will go through over its entire life history

633 EXAMPLE A typical system lifecycle consists of: concept and definition; design and development; construction,
634 installation and commissioning; operation and maintenance; mid-life upgrading, or life extension; and
635 decommissioning and disposal

636 [SOURCE: IEC 60050 192-01-09, modified – “may” was replaced with “will” and EXAMPLE
637 added.]

638 **3.1.39**

639 **loop**

640 all the hardware and software necessary to work together for the measurement, communication, and/or control of
641 a process variable

642 Note1 to entry: The loop consists of all associated components and functions including sensor, logic, control,
643 actuator, and HMI.

644 Note 2 to entry: Loop checking is described in IEC 62382.

645 **3.1.40**

646 **maintenance**

647 activity including supervisory actions, intended to retain an item in, or restore it to, a state in
648 which it can perform a required function[SOURCE: IEC 60050 192-06-01, modified –
649 “combination of all technical and management actions” was replaced with “activity including
650 supervisory actions,” “as required” with “a required function”, and Note 1 was removed.]

651 **3.1.41**

652 **management of change**

653 process of controlling and documenting any change in a system to maintain the proper
654 operation of the equipment under control

655 [SOURCE: IEC 62443-2-1:2010, 3.1.8, modified – “change management” was replaced with
656 “management of change”.]

657 **3.1.42**

658 **management program**

659 activity that manages a group of related projects and/or work processes in a way that provides
660 benefits and control not available by managing each activity individually and independently

661 **3.1.43**

662 **normal operation**

663 operation of apparatus conforming electrically and mechanically within design specification and
664 used within the limits specified by the apparatus manufacturer

665 [SOURCE: IEC 60050-426-04-10: 2020, modified – <explosive atmospheres> was deleted,
666 “equipment” was replaced with “apparatus”, “with its” was replaced with “within”, and Notes
667 were removed.]

668 **3.1.44**

669 **notification**

670 means of communicating a value, state, condition, or symptom to an intended recipient

671 **3.1.45**

672 **off-line diagnostics**

673 diagnostics which is performed while device is out-of-service

674 **3.1.46**

675 **operator**

676 person who monitors and makes changes to the production process of the facility

677 [SOURCE: IEC 62682: 2022, 3.1.64, modified – “the process” was replaced with “the process
678 of the facility”.]

679 **3.1.47**

680 **organisation**

681 body that is based on the membership of other bodies or individuals and has an established
682 constitution and its own administration

683 [SOURCE: ISO/IEC Guide 2:2004, 4.2]

684 **3.1.48**

685 **overt fault**

686 fault in relation to hardware and software, detected by the diagnostics, proof tests, operator
687 intervention (for example physical inspection and manual tests), or through normal operation

688 [SOURCE: IEC 61508-4: 2010, 3.8.8 overt, modified – “fault” and “and software” were added,
689 “diagnostic test” was replaced with “diagnostics”, EXAMPLE and NOTE were removed.]

690 **3.1.49**

691 **owner operator**

692 enterprise or agency responsible for the day-to-day operation of a facility

693 Note 1 to entry: Owner operator can contractually delegate some or all these responsibilities.

694 **3.1.50**

695 **preventive maintenance**

696 maintenance carried out at predetermined intervals or according to prescribed criteria and
697 intended to reduce the probability of failure or the degradation of the functioning of an item

698 [SOURCE: IEC60050-192-06-05, modified – “to mitigate degradation and” was replaced with
699 “at predetermined intervals or according to prescribed criteria and intended to”, “or the
700 degradation of the functioning of an item” was removed, and Note 1 was removed.]

701 **3.1.51**

702 **proactive maintenance**

703 preventive maintenance (3.1.50) which is carried out based on alerts from the devices

704 **3.1.52**

705 **procedure**

706 sequence of tasks with a defined beginning and end that is intended to accomplish a specific
707 objective

3.1.53**prompt**

notification that requires the responsible person to take an action that is part of normal operation

3.1.54**provisioning**

process of pre-configuring some static information that includes network identifier, security level, join key, and shared key for the intelligent devices

[SOURCE: IEC 62948:2017, modified – “WIA-FA” was removed.]

3.1.55**quality management system**

organisation framework whose structure provides the policies, processes, procedures, and resources required to implement the quality management plan

Note 1 to entry: The typical project quality management plan ought to be compatible to the organisation's quality management system.

[SOURCE: ISO/IEC 30105-4: 2016, 3.41, modified – “the” was deleted and “should” was changed to “ought to” in Note 1.]

3.1.56**requirement**

expression, in the content of a document, that conveys objectively verifiable criteria to be fulfilled and from which no deviation is permitted if conformance with the document is to be claimed

Note 1 to entry: Requirements can describe an essential service, capability, feature or activity.

[SOURCE: ISO/IEC Directives Part 2, Edition 9, 3.3.3]

3.1.57**resources**

people, procedures, software, information, equipment, consumables, infrastructure, capital and operating funds, and time

[SOURCE: ISO/IEC 38500:2015, 2.21]

3.1.58**risk**

combination of the probability of occurrence of harm and the severity of that harm

[SOURCE: ISO/IEC Guide 51: 2014, 3.9, modified – “Note 1 to entry” was removed.]

3.1.59**risk analysis**

systematic use of available information to identify hazards and to estimate the risk

[SOURCE: ISO/IEC Guide 51: 2014, 3.10]

3.1.60**risk assessment**

overall process comprising a risk analysis and a risk evaluation

[SOURCE: ISO/IEC Guide 51: 2014, 3.11]

749 **3.1.61**
750 **risk evaluation**
751 procedure based on the risk analysis to determine whether tolerable risk has been exceeded

752 [SOURCE: ISO/IEC Guide 51: 2014, 3.12]

753 **3.1.62**
754 **risk management**
755 process of identifying and applying countermeasures commensurate with the value of the
756 assets protected, based on a risk analysis

757 [SOURCE: IEC 62443-1-1: 2009, 3.3.89, modified – “assessment” was replaced with
758 “analysis”.]

759 **3.1.63**
760 **status**
761 state
762 distinct condition of an object

763 Note 1 to entry: The object can be a system, a process unit, a machine, etc. Conditions can be operation modes
764 — either normal (e.g. “on”, “closed”, “standby”) or abnormal (e.g. “disturbed”). They can be determined by checking
765 values of variables against limits (e.g. “too high” or “high alarm”).

766 [SOURCE: ISO 11064-5:2008 3.26, modified – “may” was replaced with “can”.]

767 **3.1.64**
768 **status notification**
769 notification that helps provide the responsible person situational awareness, is part of normal
770 operation and does not require operator action

771 **3.1.65**
772 **supplier**
773 party that produces, provides, or furnishes an item, system, or service

774 [SOURCE: ISO 28219:2017, 3.11, modified – “system” was added.]

775 **3.1.66**
776 **task**
777 single piece of work that needs to be done and does not have interacting elements requiring
778 management

779 [SOURCE: IEC 62304: 2006, 3.31, modified – “a” was deleted, “and does not have interacting
780 elements requiring management” was added.]

781 **3.1.67**
782 **testing**
783 determination of one or more characteristics of an object of conformity assessment, according
784 to a procedure

785 Note 1 to entry: “Testing” typically applies to materials, products or processes.

786 [SOURCE: IEC 60050-902-03-02: 2013]

787 **3.1.68**
788 **tool**
789 software or hardware element intended for a defined task which has been specifically designed
790 or adapted, tested and maintained for aiding offline or live working

791 Note 1 to entry: "Tools" is also used as a general term to indicate any tool, device or equipment for offline or live
792 working. Live working can be on process or in a workshop.

793 Note 2 to entry: tools can be an executable software program which interacts with the user to perform some function
794 (e.g., Link scheduling software (LSS).)

795 [SOURCE: IEC 60050-651-21-14: 2014, modified – "material" was replaced with "software or
796 hardware", "aiding offline or" was added, and Note 1 to entry was modified to include "offline"
797 as well as that "Live working can be on process or in workshop". Note 2 entry was added.
798 EXAMPLE was removed.]

799 **3.1.69**

800 **toolkit**

801 set of documents and tools that defines and supports work processes, project management,
802 and typical configuration

803 Note 1 to entry: Tools can be hardware and/or software.

804 [SOURCE: IEC 60050 651-21-14]

805 **3.1.70**

806 **typical configuration data set**

807 device template for a particular facility prepared by the personnel performing the host system
808 configuration

809 **3.1.71**

810 **turnaround**

811 scheduled activity wherein a facility is taken off-line for maintenance

812 EXAMPLE Planned shutdown.

813 **3.1.72**

814 **user**

815 hardware, software or human entity that is the initiator and/or target of content consumption

816 [SOURCE: ISO/IEC 14496-13:2004, 3.18, modified – "A" is removed.]

817 **3.1.73**

818 **work process**

819 set of interrelated or interacting procedure(s) which transforms inputs into outputs

820 [SOURCE: ISO 9000, ISO 55000, modified – "activities" was replaced with "procedures".]

821 **3.2 Abbreviations**

822	A/D	Analogue to Digital
823	CMMS	Computerized Maintenance Management System
824	D/A	Digital to Analogue
825	EDDL	Electronic Device Description Language
826	EPC	Engineering Procurement Construction
827	FAT	Factory Acceptance Test
828	FDI	Field Device Integration
829	FDT	Field Device Tool
830	HMI	Human Machine Interface
831	IACS	Industrial Automation Control System

832	IDM	Intelligent Device Management
833	IDMS	Intelligent Device Management System
834	KPI	Key Performance Indicator
835	MOC	Management of Change
836	MTBF	Mean Time Between Failures
837	OT	Operational Technology
838	PAM	Plant Asset Management
839	PLC	Programmable Logic Controller
840	PSSR	Pre-Startup Safety Review
841	PV	Process Value
842	QMS	Quality Management System
843	R&D	Research and Development
844	RAM	Risk Assessment Matrix
845	RTU	Remote Terminal Unit
846	SAT	Site Acceptance Test
847	SIS	Safety Instrumented System
848	SIT	Site Integration Test
849	USB	Universal Serial Bus
850	UML	Unified Modelling Language
851	WDT	Watch Dog Timer

852 3.3 Conventions

853 Cross-reference hyperlinks are used within this document to support the reader's
854 understanding of the relationships between inputs (predecessor requirements) and outputs
855 (results) of the different clauses and project life cycle phases.

856 These cross-references are in addition to the links to Tables and Figures.

857 4 Foundational requirements for IDM

858 4.1 Objective

859 Foundational requirements apply to all life cycles to advance and sustain IDM.

860 The foundation requirements described in Clause 4 apply to all activities, technologies,
861 products, and services related to IDM, including but not limited to intelligent devices, IACS
862 hardware and software, and its management by providing the basis for detailed or derived
863 requirements on which IDM is based.

864 4.2 General

865 Clause 4 introduces concepts that include:

- 866 • basic management functions necessary for any technology that form a vital part of IDM;
- 867 • organization of activities into formally and informally managed parts;
- 868 • MOC; and
- 869 • risk management.

These four foundational concepts form the basis for IDM.

4.3 Management functions

IDM (like any other program) cannot exist without active support from and accountability of enterprise management. IDM requires support from management and must in turn provide support to management for effective implementation. The types of support include but are not limited to:

- budget and personnel resources;
- coordination with other programs and with all stakeholders;
- adapting to organizational changes and technology changes;
- setting expectations for risk management;
- accountability through tracking and reporting of program performance;
- support for continuous improvement.

All parts of IDM include technical and management functions. The overall set of technical and management functions comprise a program. The IDM program's main job or goal is to make the technical and management functions work together. This is a complex endeavour with many overlapping activities and roles. A common understanding of the functions and roles is necessary to make IDM a success.

4.4 Formal and informal work processes and procedures

One of the primary responsibilities of IDM is support for management of work processes and procedures. This management includes a decision process for deciding which processes and procedures need to be formally managed and which can be informal. (Annex E applies for an explanation of the relationships between programs, work processes, procedures and tasks). Programs, work processes, and many procedures are complex enough to justify formal documentation and training. Some tasks can be supported with informal training without extensive documentation and formal processes.

Example criteria for creating a formal work process or procedure include:

- high complexity;
- number of people or organisations involved;
- transitions in ownership or multiple owners during the life cycle;
- high risk levels;
- frequency of use; and
- need for stability, reproducibility, and accuracy over long time periods.

Example contents of formal work processes and procedures include:

- defined starting conditions or inputs;
- defined internal processes including defined roles and responsibilities;
- defined criteria for changing the approved instrumentation list;
- defined toolkits and infrastructure;
- defined staff resources (numbers, identity, and competency);
- defined external interfaces;
- defined completion and output;
- defined financial support, measures of success, and management accountability; and

- formal documentation and training.

Work processes also typically include swim lane diagrams in addition to the above items.

Formal organization to activities helps to minimize two types of error:

- errors of omission where needed actions are not performed in a timely manner;
- errors of commission where actions are performed incorrectly.

Formal organization of activities can result in a significant reduction in risk. This organization is often the most cost-effective option for complex activities.

4.5 Management of change

4.5.1 General

Management of change (MOC) is a necessary function of operating a facility. Change is imposed on users by internal and external factors including the need to modernize or optimize facility operations, and changes in the supply of products used by the facility.

MOC is necessary to assure safety and operability of facilities. It is also a legal requirement in many jurisdictions (such as USA). Both civil and criminal liabilities have been enforced for lack of MOC.

4.5.2 Impact assessment

Some changes are trivial, and some are quite complex and can have significant impact. When any change is made, the impact is to be assessed before the change is made so that proper change management can be performed. MOC can include anything from a change in facility scope and risk management measures to a simple pre-approved modification. 8.3 applies for more on this topic.

4.5.3 Planning

MOC often occurs at times when there is some urgency for completion of a change (example: to complete a repair). The urgency can be accompanied by a lack of engineering resources to cover the impact assessment.

The most impactful type of planning is the preplanned and preapproved change. IDM can support this through backward compatibility of device revisions. Backward compatibility occurs when the:

- new revision is guaranteed to perform the functionality of the older revision with the same performance;
- new revision can use the same configuration used by the older revision.

Suppliers can provide this capability for users. It is a valuable service.

When this service is provided by the suppliers, it is worthwhile to have a process in place to test the compatibility between the different revisions and document the impact.

Planning is more extensive when the change causes a change in functionality, engineering records, or in procedures.

Planning is to be complete before changes are implemented.

4.5.4 Training

Training is necessary so that facility personnel can recognize when MOC has been preplanned and preapproved, and what is the proper course of action if the change is not preapproved. Training is also necessary to make personnel aware that changes cannot be made without impact assessment and planning. Training is necessary to inform people of documentation requirements for changes. Training also might be required when the change causes a need for new procedures.

4.5.5 Documentation

Documentation consists of records of impact assessment, planning, and training.

4.5.6 Retention of data and documents

Documents are retained to capture conditions before the change, the contents of the change, and conditions after the change.

4.6 Risk management

Risk management is a foundational requirement for IDM. IDM provides and optimized methodology for managing risk by managing complexity to provide efficient work processes that lower risk while managing costs,

Risk management includes activities that assure the technology employed in IDM is appropriate for the functional, performance, and risk requirements of a facility.

Risk management is a complex activity affecting all parts of an enterprise. Informal processes are not adequate for the scope and complexity of risk management.

5 Risk management

5.1 Objective

Clause 5 identifies complementary work processes an enterprise requires to eliminate, minimize, or control any potential risks associated with IDM. Clause 5 also describes the need for a comprehensive risk management plan in IDM.

5.2 General

The IDM risk management process includes the identification of any potential threats that can occur during implementation of any IDM phase.

5.3 IDM program requirements

IDM programs provide the organisational and management support required to make IDM risk management successful. The IDM program provides continuous support for risk management activities within an enterprise.

5.4 Program coordination

IDM risk management cannot be isolated from other enterprise programs. Coordination is required to ensure all programs within an enterprise are synchronized and work together.

5.5 Facility life cycle

There are many activities involved in the IDM life cycle. Effective life cycle risk management ensures the coordination of simultaneous and sequential activities from initiation to ending.

Thorough risk identification including all types of event triggers and their cascading effects ensures the effectiveness of the facility risk reduction process throughout the life cycle.

Any changes will be properly reviewed and managed. A change not properly managed will lead to financial, production, schedule delays, resource constraints and other impacts.

Auditing, continuous oversight and monitoring of the IDM risk management process will maintain the integrity of the program throughout the life cycle.

5.6 Supplier risk management

A facility needs a consistent reliable supply of products and services throughout the life cycle. It is necessary to manage all supplier changes and associated risks. Managing these risks requires coordination between suppliers, facilities and programs.

5.7 Information management risks

Information management brings order and coordination to accessing the information needed for an effective risk management program. Risk management decisions made with inadequate information can lead to improper decisions resulting in higher risk and potential for chaos.

5.8 Cybersecurity

Management of cybersecurity is an integral part of IDM. Because devices live at the lowest level in the industrial network (level 0), cybersecurity is necessary to protect the integrity of every network level and not only the device functions. Many cybersecurity measures apply to system functions and others apply to devices. Both system level and device level cybersecurity measures need to work together to protect overall functional integrity.

Cybersecurity measures include technical capabilities and procedures used to implement those technical capabilities. Guidance for technical capabilities and procedures are given in the IEC 62443 series of documents.

Cybersecurity in IDM is hypercritical because intelligent devices can have their functionality altered electronically either locally or remotely.

When local support is not available, intelligent devices through their digital connections present an opportunity for agencies external to the facility to provide remote support. Digital networks with appropriate cybersecurity measures in place make it possible to access the information needed to troubleshoot a problem remotely without the cost and time of bringing the expertise to the facility. As a result, of this level of potential connectivity, cybersecurity is an enabling technology as well as a potential cyber-security

The analysis and classification processes in IEC 62443 provide guidance on managing this cyber-risk and therefore apply to all intelligent devices.

NOTE Rules appropriate for applicable security levels are found in IEC 62443-3-3.

6 Enterprise level management for IDM

6.1 Objective

This clause introduces the organizational structures and activities necessary for IDM. This document only introduces concepts and terminology.

NOTE The details of the work processes and the roles of personnel performing these activities are not covered in this document.

The objective of enterprise level management is to provide a means for development, maintenance, and improvement of the overall systems that drive the performance of intelligent devices for the enterprise.

Enterprise level IDM includes but is not limited to:

- a) a program or policy including management activities, standards or a basis for enterprise infrastructure including host systems;
- b) resource definition and planning including competencies and budget; and
- c) planning and coordination of a comprehensive set of life cycles including work processes and coordination between facilities.

6.2 General

The objective of IDM is to achieve required functions, expected performance, and availability of intelligent devices with acceptable risk at minimum cost by utilizing features of intelligent devices. Unfortunately, most intelligent devices are only used to perform their primary function of providing the process variable. Digital communication and auxiliary functions can maximize the value of the device but can also complicate replacement in a later stage when similar devices are no longer available.

Note: A summary of IDM objectives and associated work processes are described in Annex C.

The primary challenge of IDM is its perceived complexity. To meet the challenges and capture the benefits of IDM, suppliers, engineering firms, enterprises, and service providers all need to understand their role in proper implementation and use of the tools and support systems for intelligent devices.

IDM consists of several interactive and interdependent activities. To accomplish IDM goals, the management of these activities requires formal structure, and the structure needs to be clearly documented.

The IDM structure described through this set of documents and related standards can be implemented for both existing facilities and new facilities.

The lack of standardized work processes and available skills at a site are a challenge for dealing effectively with the potential complexity of IDM.

6.3 Organization and resources

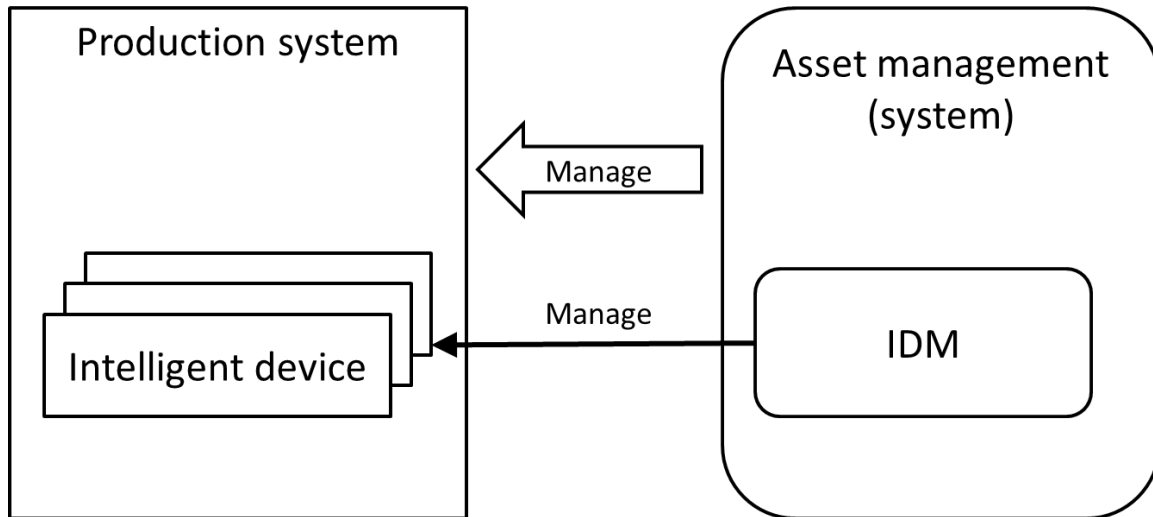
6.3.1 Relationship to asset management

IDM is based on asset management concepts that are outlined in ISO 55000 and specified by ISO 55001. Therefore, IDM aligns with the basic requirements specified by ISO 55001.

As ISO 55000 mentions, the nature and purpose of an organization and its operating environment all have a strong influence on the type of assets that the organization needs to

1061 achieve its objectives. An organization's and its stakeholders' intents are translated into design
1062 criteria for asset management.

1063 Figure 1 shows the relationship between intelligent device management and intelligent devices
1064 in the context of asset management. (An overview and conventions of UML class diagrams are
1065 described in Annex A.) Figures 1 through to figure 8, less figure 2, are duplicated as an
1066 equivalent UML class diagram in Annex B.



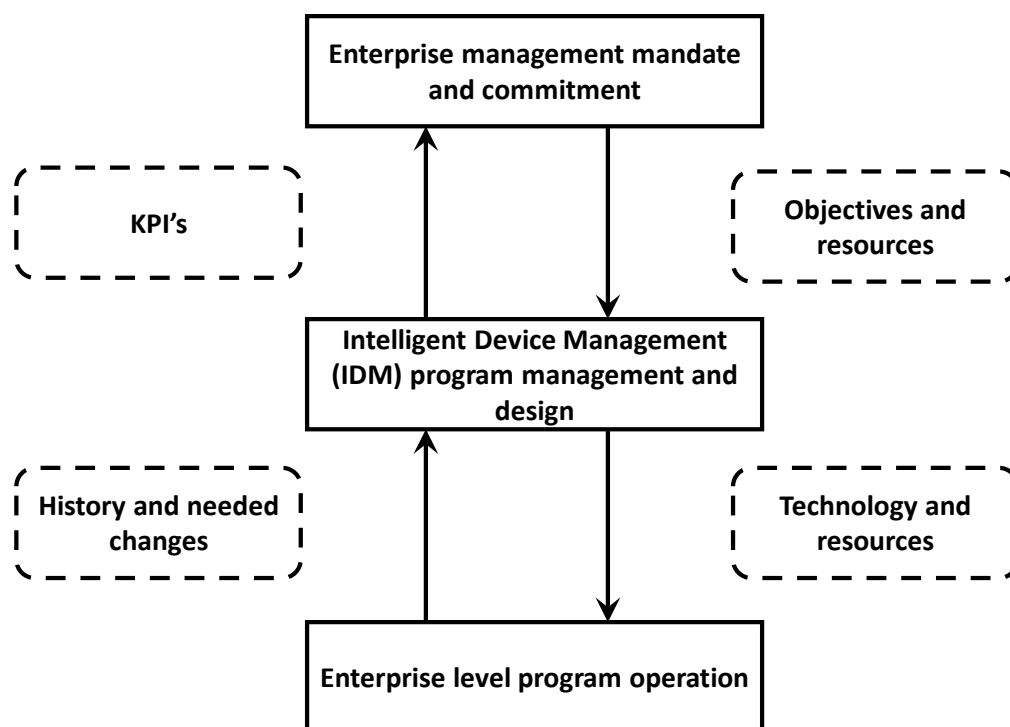
1067

1068 **Figure 1 – IDM and intelligent device in the context of asset management**

1069 Asset management of the enterprise manages its assets. An intelligent device is one form of
1070 asset that is managed by IDM following the principles of asset management, as illustrated in
1071 Figure 1.

1072 **6.3.2 Positioning of IDM programs**

1073 6.3.2 describes an organizational structure to support IDM activities.



Key:

Arrows represent information flow

Dashed and rounded boxes indicate typical information being transferred.

Note:

IDM coordinates business, engineering, operation, and maintenance

Figure 2 – Positioning of IDM program

Figure 2 shows the positioning of IDM in the context of enterprise business management and IDM work processes. An IDM program translates objectives provided by higher levels of the organization such as business management processes into requirements of technology and resources then passes them to IDM work processes. Similarly, the IDM program translates performance history recorded by work processes into KPIs and passes them to higher or other levels of the organization.

Implementation methods for enterprise business management are non-technical and a function of each enterprise's operating practices. Many enterprise business management stakeholders can have an impact on the success of IDM. Most enterprise business management processes are created for larger purposes and are not structured to directly manage IDM. A technical and business focus for IDM and a mid-level management structure that can focus on IDM can provide valuable coordination between the IDM work processes and higher-level management.

IDM programs are implemented and supported via IDM work processes. The IDM program requires a well-defined functional structure, but the structure can be tailored to the enterprise's needs.

6.3.3 Structure of IDM activities

IDM programs contain multiple work processes that contain or utilize procedures and tasks. This structure is illustrated in Figure 3 below.

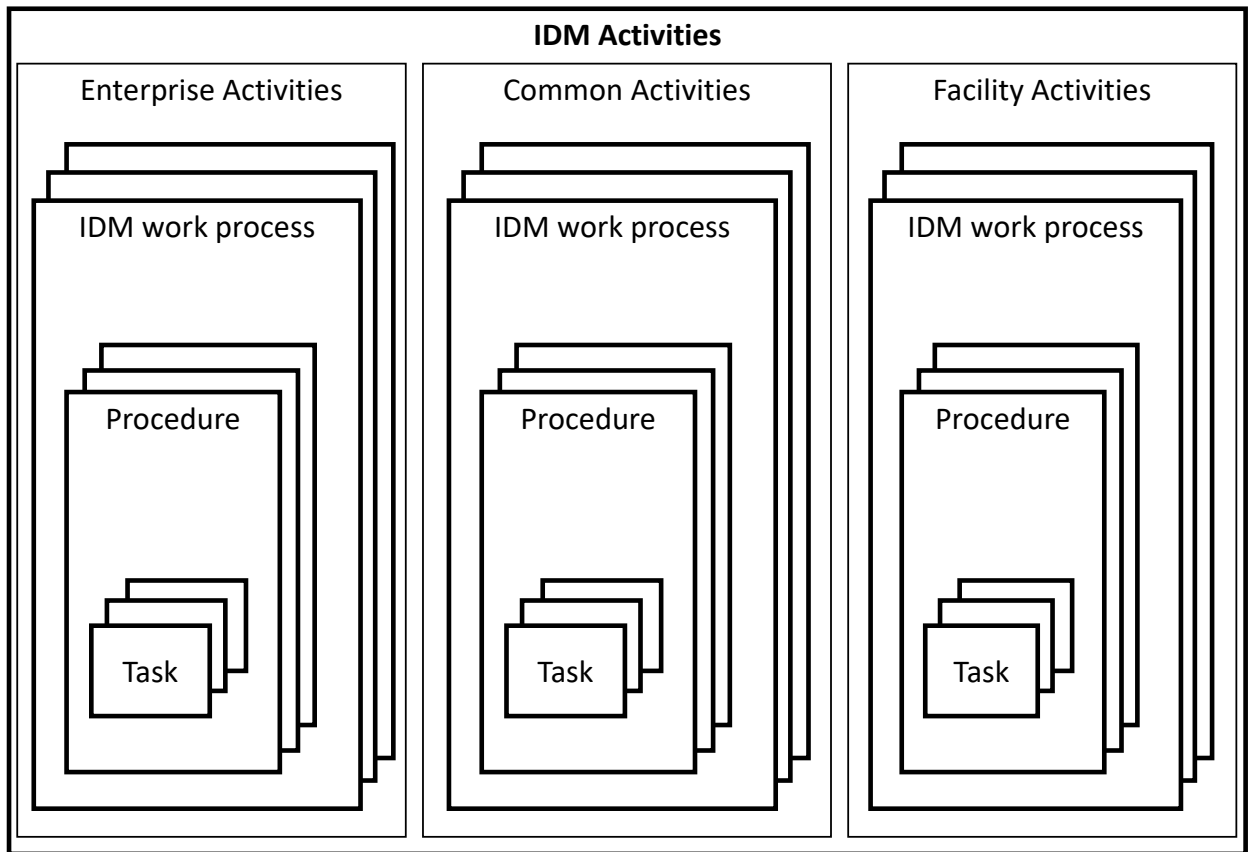


Figure 3 – Structure of IDM activities

6.4 Developing and maintaining IDM program

6.4.1 Overview

Some of the attributes of an IDM program are:

- the scope and boundary limits of an IDM program can change at any time;
- the process that creates an IDM program and the IDM program itself never ends;
- continuous development is normal for an enterprise program; and
- an enterprise program can create or utilize projects, but a project cannot create an IDM program.

An IDM program is one type of enterprise program. An IDM program consists of intangible assets such as ideas, concepts, and intellectual property.

Enterprise programs are management tools. Enterprise programs can allow sufficient management and technical focus to coordinate multiple organizations and activities inside an enterprise and external to the enterprise. The participating organizations can have competing goals in addition to common goals. An enterprise program can provide means to resolve these competing goals and coordinate common goals for maximum effectiveness.

An IDM program provides a convenient name and model for the enterprise and facility level structures that can make IDM work as planned. However, IDM programs can be very different

from one enterprise to the next. IDM can be a separate identified management activity in one enterprise, and part of a more diverse program in another enterprise. The structure will work most effectively if it is customized to fit the management style and resource deployment in an enterprise.

6.4.2 IDM program structure

The result of IDM program development is a clearly documented management mandate and commitment. The mandate and commitment provide the basis for the management and technical focus necessary for efficient and effective management of intelligent devices.

The planning identifies an organizational structure and a functional structure as a basis of IDM program implementation which is compared against the mandate, revised as necessary, then input to improve the IDM program design.

A functional IDM program structure is illustrated in Figure 4.

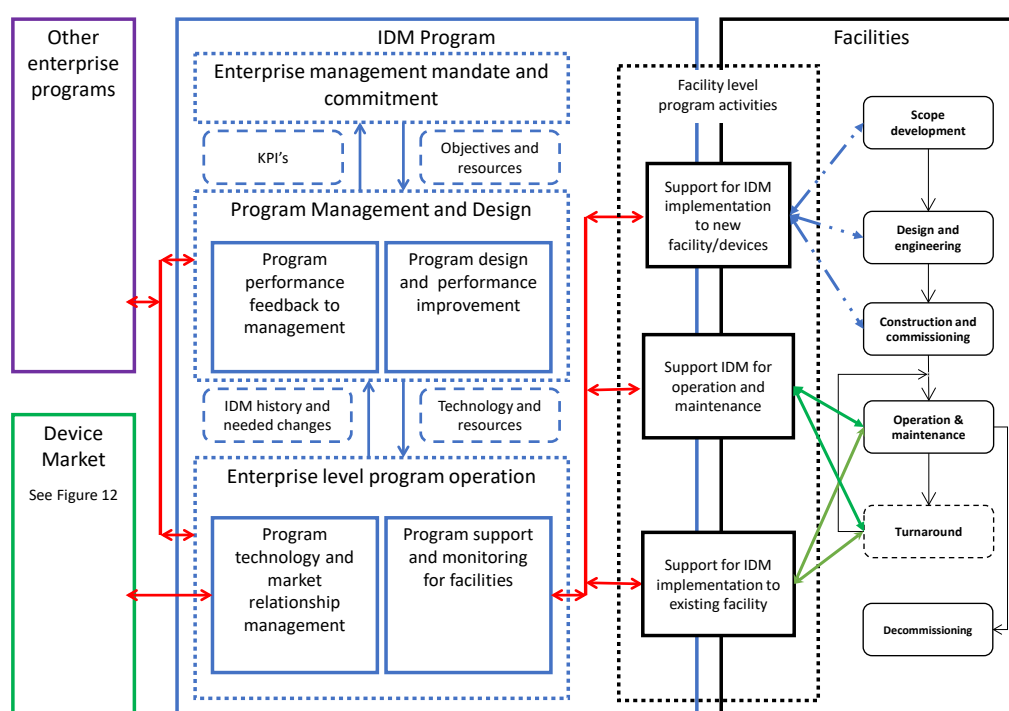


Figure 4 – IDM program functional structure

The IDM program functional structure is shown for reference only and represents functions, information exchange, and relationships that are a part of the formal processes for IDM.

The results of IDM development become a part of the permanent enterprise management mandate and commitment that will be kept current through the IDM program life cycle. IDM program development does not have to be complete before commencing implementation.

6.4.3 IDM program life cycle

6.4.3.1 IDM program phases

Programs can be developed to meet an anticipated need or to address an existing need. IDM programs mostly fall into the existing need category.

1136 IDM activities are in use by an enterprise from the time that the first intelligent device is
1137 evaluated for use, until the time that the last intelligent device is removed from service.
1138 Removing the last intelligent device from service is not anticipated in the normal course of
1139 events.

1140 When intelligent devices are first used, the devices are normally evaluated and supported by
1141 highly qualified personnel familiar with new technology. Only a few devices are in use, and ad-
1142 hoc work processes and procedures are often used.

1143 When the technology has matured, many different types of devices can be in use in many
1144 diverse applications. Critical skills for support can be in short supply, and the aging devices
1145 will eventually require updating or replacement with newer technology. The processes for the
1146 initial use of new technology will become inefficient and ineffective for support of mature
1147 technology. Formal processes that can serve an enterprise wide need can save money, lower
1148 risk, and simultaneously improve performance. An IDM program is a natural outcome of efforts
1149 to make use of formal processes to manage intelligent devices.

1150 When developing an IDM program, some up-front work can identify enterprise goals and needs.
1151 This will evolve into an operation phase as the IDM program develops. In the operation phase,
1152 some implementation work will be necessary at the enterprise level and at the facility level.
1153 The exact nature of the starting point, end point, and evolution will depend on the enterprise.

1154 There is no set formula for IDM program development. However, some general principles will
1155 identify common steps in the process. The development steps presented below are logical
1156 steps. These steps can overlap in time, and the development is often iterative.

1157 A simplified model for an IDM program is shown in Figure 5 below. This model is accurate for
1158 cases where an IDM program is established to meet an anticipated need or when the IDM
1159 program is established after a need is revealed through issues with an installed base.

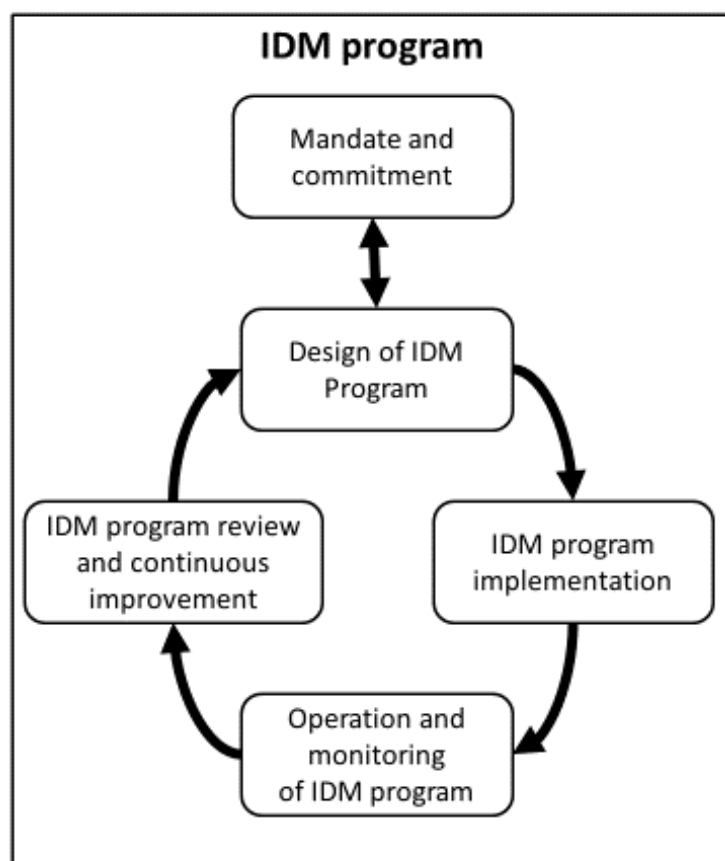


Figure 5 – IDM program life cycle phases

Figure 5 shows the continuous improvement “Plan-Do-Check-Act” process that is crucial to IDM program success. Continuous improvement is necessary to manage change inherent to the underlying technology and the long timespan for facility installations.

6.4.3.2 Goals scope and objectives

When an enterprise decides to move to formal IDM work processes and procedures, the first step is documenting the goals, scope, and objectives:

- goals give guidance on future direction and provide motivation;
- scope identifies boundary conditions and can be used to develop external interfaces; and
- objectives provide measurable targets that can be used to measure success and identify unmet needs.

The goals, scope, and objectives will need to be periodically reviewed and updated as conditions change.

6.4.3.3 Gaps, opportunities, and priorities

With a clear mandate, a first step in IDM program development is often assessment and gap analysis. Assessment can include:

- technology installed base;
- tools for managing the technology;

- 1180 • skill resources; and
- 1181 • other enterprise programs, technical, or management focus areas that impact IDM.

1182 The outcome following assessment and gap analysis is identification of opportunities and a
1183 prioritization process to design the IDM program. The prioritization is generally based on
1184 opportunities for cost saving and risk reduction.

1185 Enterprises are rarely homogeneous. Some parts of the enterprise can have more extensive
1186 gaps than others, and for the impact of those gaps can be different across the enterprise.

1187 The gap analysis forms the basis for IDM program development, planning, and implementation.
1188 Strategic and tactical decisions are needed before the IDM program can start.

1189 **6.4.3.4 Plans, resources, and organization**

1190 During the planning step in IDM program formation, some temporary technical and
1191 management staffing can be required. This could involve research and development for
1192 identified technical gaps or tool development and establishment of external supply relationships
1193 to meet the long term needs for technology and personnel.

1194 As plans, technology, and work processes become available, field trials can be useful in testing
1195 IDM program operation before more widespread roll out. The field trial phase can identify areas
1196 for further development as well as benefits of formal IDM processes.

1197 Strategic decisions are needed for IDM program support and tools to serve the needs of
1198 facilities. These strategic decisions are not easy to change as they drive long term support
1199 optimization and set fixed cost budgets. These decisions also affect enterprise and facility
1200 organization structure.

1201 Common support options include:

- 1202 • support within a facility;
- 1203 • support within a group of facilities with a common location or business group;
- 1204 • support at an enterprise level; and
- 1205 • combinations of the above.

1206 The above support options can utilize a combination of:

- 1207 • in-house permanent staff;
- 1208 • contracted or temporary assistance; and
- 1209 • support provided by device suppliers.

1210 Decisions about support do not need to be the same for every location or group of facilities in
1211 an enterprise. They are often tailored to the type of facility and local conditions. An enterprise
1212 program can incorporate a variety of support strategies and still offer all benefits expected of
1213 the IDM program.

1214 A long term support strategy needs to be defined during scope development. A major decision
1215 for IDM planning is the amount and type of dedicated resources that are deployed at the facility.
1216 Many facilities cannot support full time local resources for every skill or function necessary for
1217 long term support of the facility.

1218 Remote monitoring centers have been established for monitoring of assets to assist local
1219 resources. IDM can support remote monitoring since diagnostics can be collected and
1220 analysed remotely. Use of remote support needs a cooperative local and remote support

1221 structure with clear roles and responsibilities for each. This structure also requires significant
1222 infrastructure and personnel resources to be able to monitor devices securely from a remote
1223 location. Decisions about local and remote support will have an impact on how the IDM program
1224 is designed as well as the work processes to support IDM.

1225 **6.4.3.5 IDM program operation**

1226 After the project has been completed and turned over to operations, the IDM program enters
1227 the longest life cycle phase associated with ongoing operations. Unfortunately, the
1228 technologies associated with IDM do not remain stagnant and therefore continuous monitoring
1229 of the effectiveness of the IDM program is critical to success.

1230 Important components of IDM program operations and monitoring include:

- 1231 • support staff training;
- 1232 • metrics; and
- 1233 • ongoing communication with all stakeholders (user, supplier, enterprise experts, etc.).

1234 Effective implementation of the above provide the information necessary for the IDM program's
1235 continuous improvement.

1236 Using the information gathered from KPI's and related metrics obtained from the IDM
1237 monitoring program lays the groundwork on which continuous program improvements can be
1238 made.

1239 Sharing information between and across facilities as well as the enterprise leads to
1240 development of best practices that can be implemented in the next IDM program renewal cycle.

1241 **6.5 Supplier management**

1242 **6.5.1 Coordination with suppliers**

1243 Changes in device technology and device model revisions can be disruptive to IDM in a facility
1244 and to implementation in projects. Management of these changes requires cooperative efforts
1245 between users and suppliers. This effort is a significant part of an IDM program.

1246 **6.5.2 Intelligent device life cycle management**

1247 IDM is an integral part of multiple life cycles of an enterprise. This clause describes four life
1248 cycles and the relationship of IDM to these life cycles. The four life cycles are overlapping and
1249 interdependent. This is typical of enterprise life cycles that are incorporated into an enterprise
1250 program. Four life cycles are:

- 1251 • IDM program life cycle;
- 1252 • Facility life cycle;
- 1253 • Device life cycle; and
- 1254 • Device technology life cycle.

1255 The IDM program life cycle can cover the life cycles of multiple facilities as shown in Figure 6

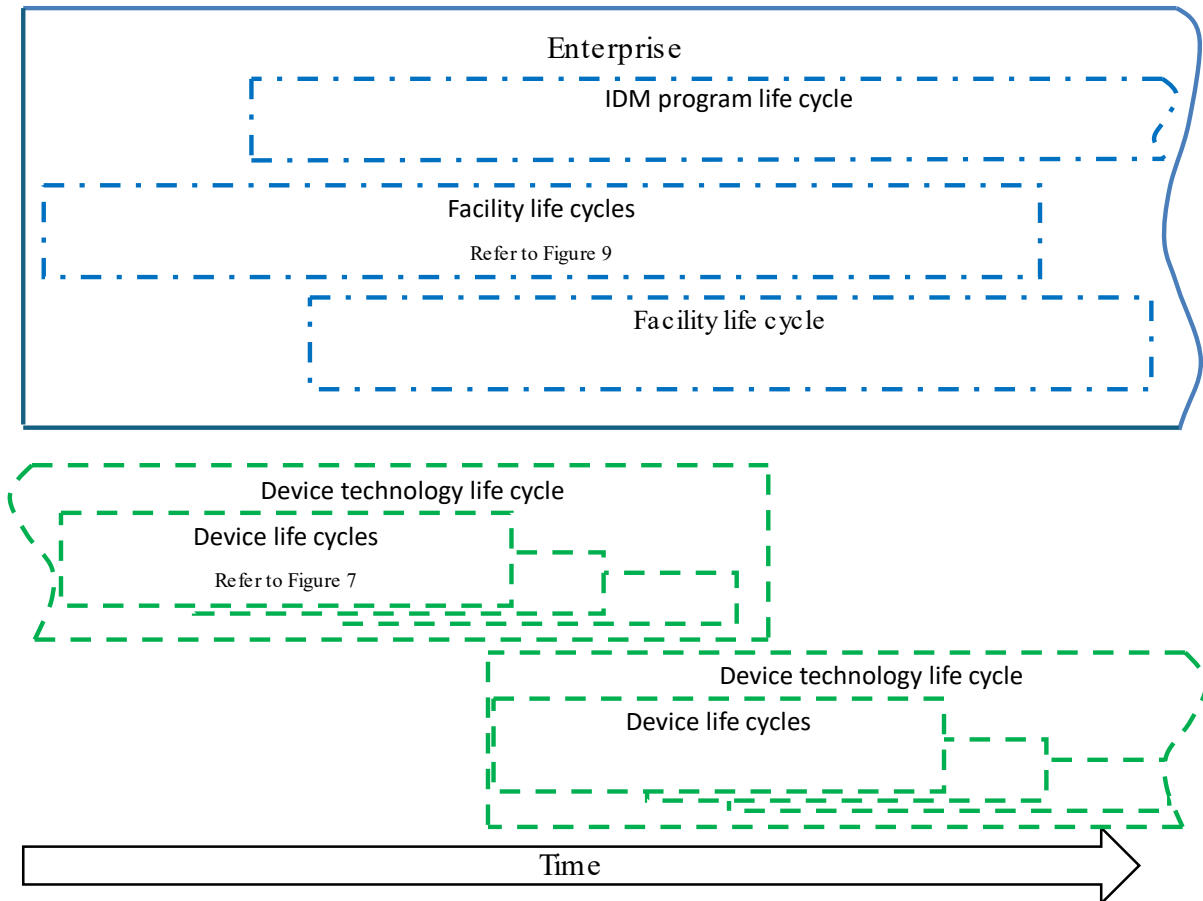


Figure 6 – Timing relationship between life cycles

In practice, the IDM program can be initiated after a facility is already in the operation phase of its life cycle. Implementation of IDM can be introduced in operating facilities to synchronize existing work processes and establish needed structures. Establishing IDM in an operating facility is challenging and is often beyond the capability of a facility's engineering and maintenance personnel.

While this document illustrates an efficient and mostly linear process for new facilities, most enterprises can modify this to meet the needs of their existing facilities. The end result is very similar, but the implementation can be modified to match the starting point for each facility. For instance, most existing facilities have intelligent devices installed, but they might not have these devices connected to monitoring systems. Small facility implementation projects can rectify gaps in installed monitoring systems so that work processes can be put in place and an IDM program can be established. For these facilities, an audit of installed base capability and deficiency starts as a basis for scope development.

Another structural modification can be done by enterprises that operate a single facility. For these enterprises, the IDM program life cycle and facility life cycle can be the same.

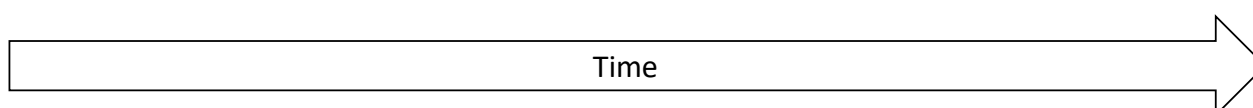
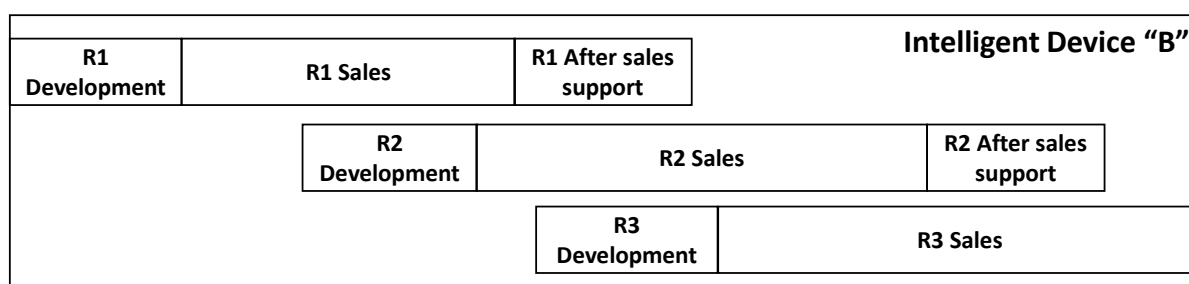
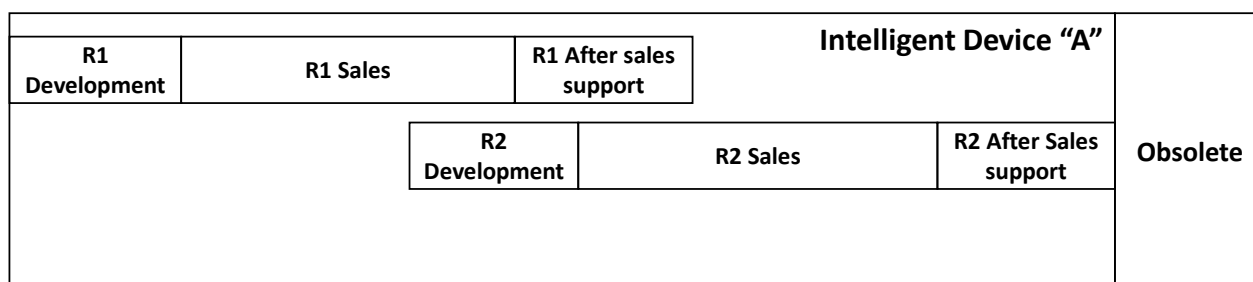
An IDM program requires investment in infrastructure regardless of whether it is installed in a single facility or across the enterprise. IDM infrastructure can be shared and integrated with other enterprise programs.

The shortest of the IDM life cycles is typically the device life cycle. Normally, device life cycles come in releases or model changes that allow migration from one model to the next. However, the entire series of models is typically shorter than the life of a facility.

1279 A device life cycle consists of phases as listed below and shown in Figure 7:

- 1280 • device development phase;
- 1281 • device sales phase;
- 1282 • after-sales support phase; and
- 1283 • obsolete phase.

1284 NOTE The detail of the life cycle of a device type model is specified by IEC 62890.



1285 **Figure 7 – Timing relationship between IDM device life cycles**

1286 Intelligent devices are built with a wide variety of features and options in addition to their basic
 1287 function. While the additional features provide value, they also add complexity and preclude
 1288 interchangeability. These devices generally do conform to some standards and have some level
 1289 of interoperability, but the added features require additional management requirements. Each
 1290 intelligent device requires the use of software and/or metadata components and therefore
 1291 revision management is an example of an additional management.

1292 As intelligent devices go through model revisions, new features tend to be added and
 1293 complexity tends to increase. When intelligent devices are compared between different
 1294 manufacturers, they support similar functions and features, but their configuration or
 1295 programming can be incompatible. Enterprises and suppliers have significant incentives to
 1296 manage device diversity and device evolution to make configuration management and
 1297 maintenance as simple as practical. Some of the benefits of IDM related to device life cycle
 1298 are shown in Table 2 below.

1299 Device changes cannot be synchronized with major revisions of the facility. Suppliers and
1300 users of intelligent devices need to cooperate in making these changes manageable. Device
1301 revisions can require minor or significant IACS upgrades to accommodate the revision and
1302 maintain functionality and performance. For some of the simple changes, the migration can be
1303 automated by IACS tools. For more complex upgrades, advanced planning can eliminate the
1304 negative effects that can result from unplanned device migration while assuring clearer work
1305 processes with simpler MOC in facilities.

1306 **6.5.3 Device technology life cycle**

1307 Each successive generation of device technologies (and the IACS they are integrated with)
1308 need different skills and processes for maintenance along with the major differences in design.
1309 MOC is needed with each revision. History suggests that this pattern will continue with new
1310 generations of device types based on new technologies.

1311 Device technology changes can be disruptive to facilities. Technology changes provide
1312 opportunities for new functions and improved performance providing incentive for change.
1313 Technology change also causes obsolescence of devices forcing changes that can be
1314 inconvenient because of timing and cost. The device technology life cycles start and end at
1315 different times than facility life cycles and the different timing can be a problem for IDM. For
1316 instance:

- 1317 • a refinery unit was built in the 1940's with float and liquid mercury pressure sensing
1318 devices;
- 1319 • the facility was rebuilt in the early 1960's with force balance pneumatic devices;
- 1320 • the facility was rebuilt again in the 1980's with analogue electronic devices; and
- 1321 • the facility was rebuilt again in the early 2000's with intelligent devices.

1322 IDM manages technology selection for new facilities and determines when updates are needed
1323 for existing facilities. In addition, multiple technologies and families of devices are normally
1324 used concurrently within a facility. Technology management is an ever changing and complex
1325 challenge.

1326 Major changes in device technology are disruptive but relatively infrequent. An IDM program
1327 tracks technology and plans for the timing and rate of new technology adoption. The temporal
1328 relationship between device and technology life cycles is shown in Figure 7.

1329 Disruptive technology changes also affect the device supplier market. IDM programs need to
1330 have a robust set of suppliers for devices and long-term relationships with suppliers to
1331 maximize device benefits and minimize support cost. Changing device technology or suppliers
1332 is disruptive and costly. However, given the right conditions strategic changes are vital to the
1333 ongoing health of the organization.

1334 Intelligent devices do not operate as isolated entities. They are assembled into systems with
1335 devices from multiple manufacturers. Interoperability is a requirement for these multi-supplier
1336 systems. IDM plays a vital role in assuring long term interoperability.

1337 There are many small changes that are a routine part of the normal device life cycle. New
1338 hardware and software are a routine and normal occurrence for device manufacturers. These
1339 small changes can create significant MOC issues for facilities, but an IDM program can make
1340 these changes simple and easy to manage.

1341 Device manufacturers face a difficult logistical burden trying to keep facilities informed of
1342 changes, and device changes often show up in facilities without the tools and support
1343 necessary to make a smooth transition involving minor configuration changes. To address the
1344 support problem:

- device manufacturers issue new configuration metadata files for the new device;
- device manufacturers can also issue new configuration templates for new features;
- suppliers or manufacturers can provide automated tools for configuration migration for a new device revision;
- tests can be done to assure that system integration issues are not generated by the changes;
- an IDM program can deliver a package of support tools to facilities in advance of or as a prerequisite for new or revised device delivery;
- support tools can make pre-packaged and tested engineering migration available for device replacement; and
- suppliers or manufacturers can provide revised or additional training on the new capabilities.

6.6 Developing and maintaining IDM work process templates

Templates are a useful means of ensuring completeness and consistency of work process and procedure documentation. Completeness ensures that necessary content is covered. Consistent style and content organization makes implementation of work processes and procedures easier and ensures consistent understanding. This further promotes the use of templates and the likelihood of templates being completed properly. Accuracy and execution of the process or procedure for the associated template is also improved.

Templates can take several forms a:

- generic form that has instructions for filling out the form but no example content;

NOTE 1 These templates identify minimum requirements for content.

- general form that has been modified for a particular purpose but has only minimum generic content; and
- completed form that serves as an example.

NOTE 2 The example can be used for a particular application with minimum modification and with simpler instructions (mostly identifying modification requirements).

As templates become more complete, they can reduce the cost of implementation as well as improve the quality of the result.

Because intelligent devices and their capabilities continually change, work process templates also need to be maintained and continuously improved.

IDM programs can add value and reduce cost by maintaining a library of templates for use by multiple facilities.

NOTE 3 Part 2 details the content requirements for templates for work processes.

6.7 IDM program management and design

6.7.1 Resource management

IDM program management and design improvements are activities that support proper utilization of budget and staff resources, and proper introduction of technology changes and support tools. The responsibility and authority needed to make IDM effective and efficient resides within this function.