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Systems and software engineering — Capabilities of issue management tools

Ingénierie du logiciel et des systèmes — Capacités des outils de gestion des écarts

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering.*

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Introduction

Issue management tools have become increasingly important in project management and been applied to a wide range of lifecycle processes, from development process to operation process. Information managed by these tools has been expanded further than ever before, such as work items and claims as well as defects. These tools need to cooperate with many other tools such as configuration management tools, build tools, etc.

There are many issue management tools on the market but with no clear definition of their category and their capabilities. Therefore, it is becoming difficult for project managers to choose the right tool.

This document provides a framework of category of issue management tools and a list of their capabilities. The capabilities are gathered from existing tools (see Annex B). This document is prepared as one of the capability series to select the appropriate tool in combination with ISO/IEC 20741 "Guideline for the evaluation and selection of software engineering tools" (see Annex A).

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Systems and software engineering — Capabilities of issue management tools

1 Scope

This document defines the capabilities of issue management tools and is used to select the most appropriate one from many issue management tools. The evaluation and selection of the issue management tools is performed in accordance with ISO/IEC 20741 which defines the general evaluation selection process and evaluation characteristics. Issue management is based on the tasks described in several activities in their processes (e.g. project assessment and control, decision management, and system/software requirements definition) of ISO/IEC/IEEE 12207.

This document is independent of development methodology or approaches (e.g. Waterfall or Agile) or lifecycle processes (e.g. implementation or operation).

2 Normative reference

There is no normative reference in this document.

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
defect
imperfection or deficiency in a work product where that work product does not meet its requirements or specifications and needs to be either repaired or replaced

[SOURCE: IEEE 1044:2009, 2]

3.2
incident
anomalous or unexpected event, set of events, condition, or situation at any time during the life cycle of a project, product, *service* (3.5), or system

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.21]

3.3
issue
observation that deviates from expectations

EXAMPLE Potential *defect* (3.1), improvement or point needing clarification.

[SOURCE: ISO/IEC 20246:2017, 3.9]

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3.4
problem
cause of one or more actual or potential *incidents* (3.4)

[SOURCE: ISO/IEC 20000-10:2018, 3.2.10]

3.5
service
means of delivering value for the user by facilitating results the user wants to achieve

[SOURCE: ISO/IEC TS 25011:2017, 3.3.1, modified — Notes 1 and 2 to entry have been removed.]

4 Object model for issue management tools

4.1 Overview of issue management

The overall structure of object model of issue management consists of the following elements:

a) issue management use case; defined in 4.2, a use case for describing issue management as an integrated activity, building on the activities and tasks described in ISO/IEC/IEEE 12207 in generic way,

b) issue management entity; defined in 4.3 and Clause 5, a set that represents identifiable information which appears in issue management tasks and described as a class in the object model, and

c) issue management tool; defined Clause 6, a tool that supports creating, referring, updating and deleting an issue management entity.

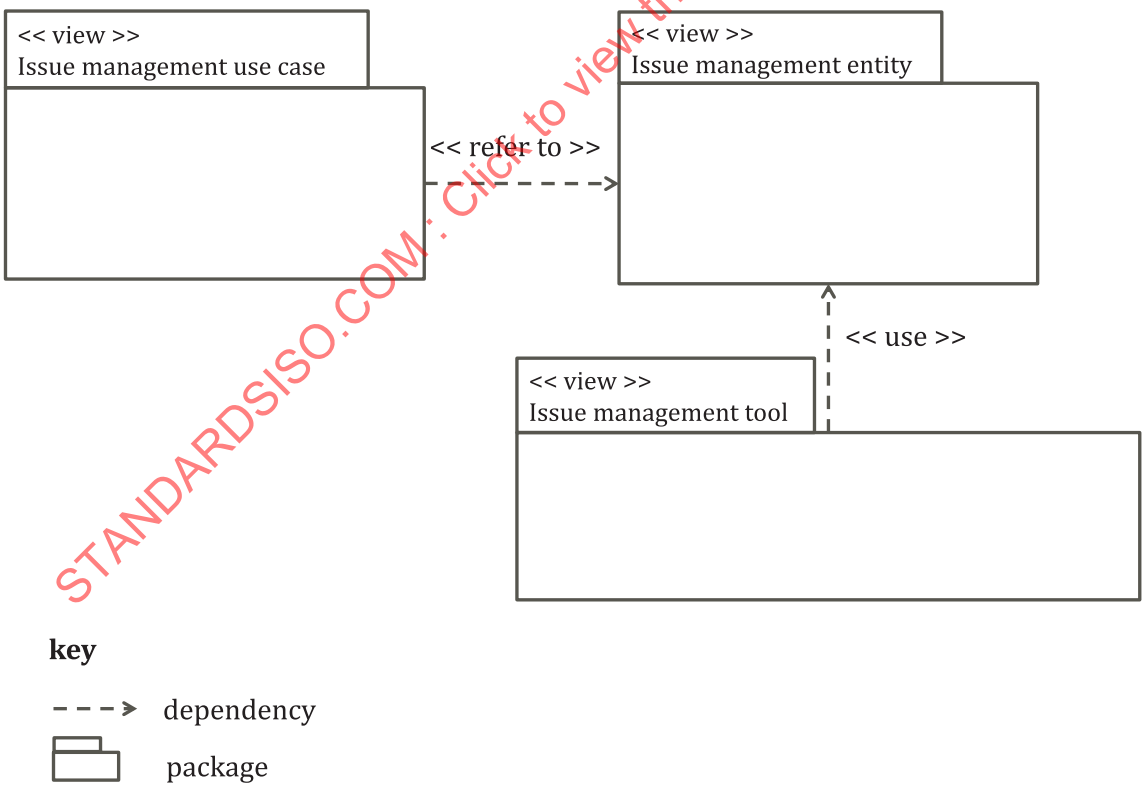

Figure 1 — Object model of issue management

The issue management entity comprises multiple entities. A set of entities is created when an issue occurs, and referred, updated through its life to keep track the status, and archived after closing the issue. There are two type of entities. One is the information of the issue itself such as issue-ID, date,

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etc. Another is the relationship information between the issue and the related artifacts such as requirements specification, source code, etc. The artifacts themselves are not included in this issue management entity.

The issue management tool takes issue management entities as the input and produces issue management entities as the output. The issue management tool effectively supports the management tasks by producing issue management entities automatically.

The object model diagrams, Figure 1 to Figure 10, are described using Unified Modeling Language (UML) 2 (ISO/IEC 19505-2).

4.2 Use case of issue management

4.2.1 Use case

Issue management is a task that is performed through the development and operation of a system. It is not defined as a process or an activity, but it is described as a task in multiple processes and activities in ISO/IEC/IEEE 12207. Therefore, these different use cases have different information related to the issue, and it is not proper to describe them all in one use case.

In this subclause, three use cases for each of the different life cycle processes are identified as follows:

a) work management in development process: the response to various issues in system development process such as requirement analysis, design definition and implementation;

b) defect management in testing process: the response to obstacles in the test process of the system;

c) incident management under operation process: the response to challenges centred on failure of the system in the operation process.

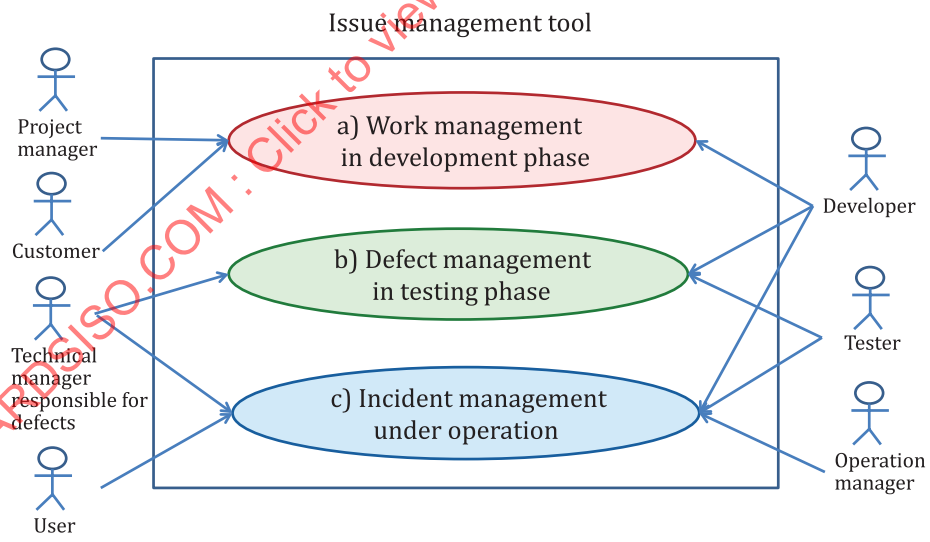

Figure 2 — Use case diagram of issue management

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4.2.2 Use case scenarios

4.2.2.1 Use case scenario of work management in system development process

In system development process, various issues occur and need to be properly managed. For example, in the requirement analysis process, a number of questions are raised against the initial analysis results, and those questions need to be tracked until it is resolved. In case of design review, once the design is complete, a review task is scheduled, and the results are tracked. The details of the review task are defined in ISO/IEC 20246. Work product reviews, and the capabilities of the review tool are defined in ISO/IEC 23396. After the review, the unresolved issues by the review will be taken over as general issues during the system development process. In this way, issues arise for different processes, different actors, different work products and considerations, but in most cases the form of use case scenario is the same. Figure 3 shows the work management use cases that are commonly handled during the system development process.

a) The project manager instructs work and assigns it to the assigned customer or developer.

b) The assigned customer or developer performs the assigned work and report the results.

c) The project manager approves the result and the work content is completed.

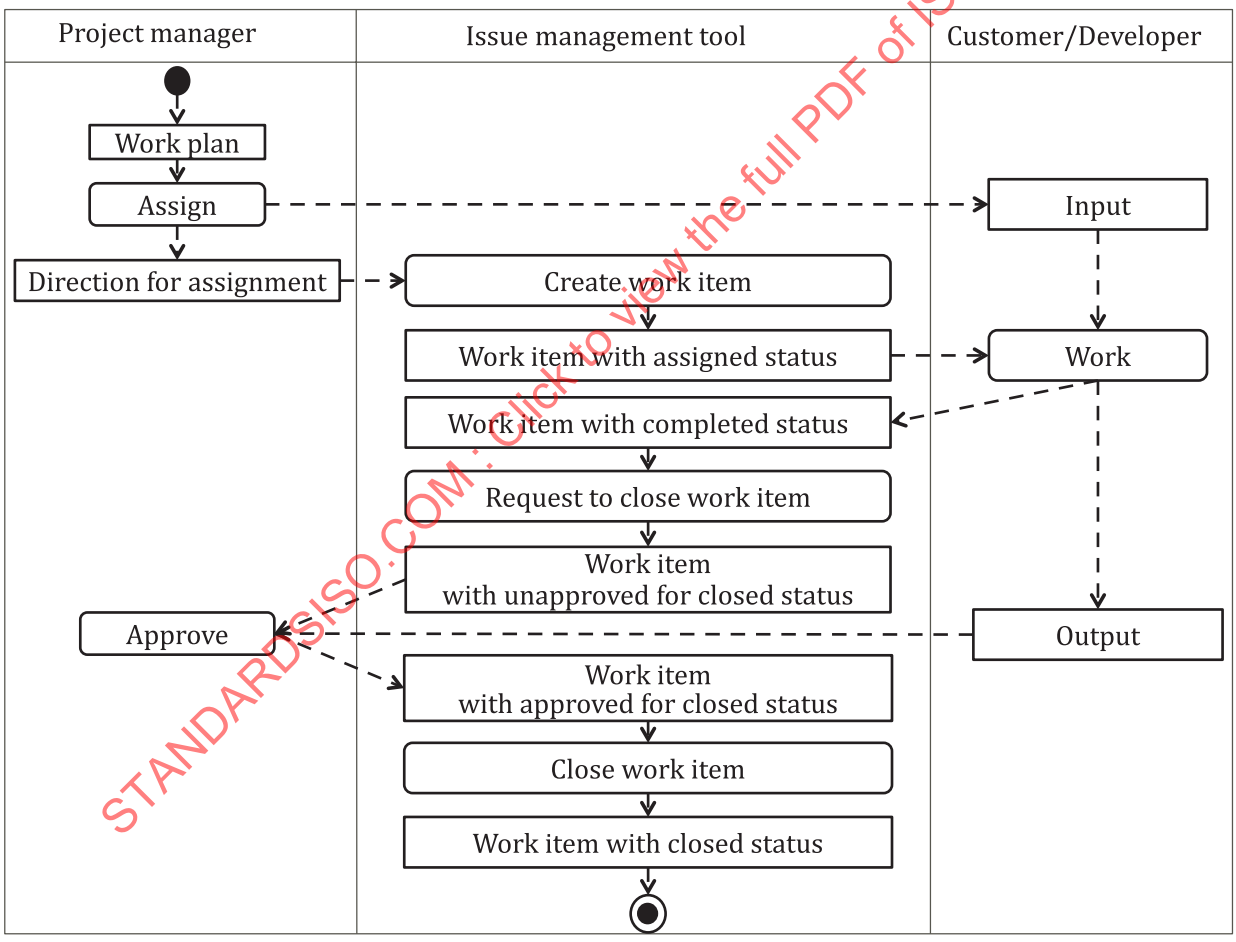

Figure 3 — Activity diagram of work management

Table 1 notes that input, output, and actors are different from the use cases in work management in system development process.

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Table 1 — Explanation for the use cases in work management in system development process

Process	Name of actor	Input	Output
Requirement analysis (to customer)	Customer	Research items	Result of research
Requirement analysis (to developer)	Developer (system analyst)	Research items	Result of research
Design definition	Developer (designer)	Requirement	Design
Implementation	Developer (programmer)	Design	Source code

4.2.2.2 Use case scenario of defect management in testing process

Issue management can be used for managing defects which are found during dynamic testing. The actors are the technical manager responsible for defects, developer, tester, and system shown in Figure 4. These actors work in the following scenario.

a) The tester tests the system. In the event of a defect, the tester will create a defect work item.

b) The technical manager responsible for defects approves the defect work item and assigns the correction of the defect to the developer.

c) The developer identifies the cause of the defect assigned by the technical manager responsible for defects and corrects the system.

d) The developer retests with the corrected test system and reports the result to the technical manager responsible for defects.

e) The technical manager responsible for defects confirms the modified system, approves that the issue has been resolved, and closes it.

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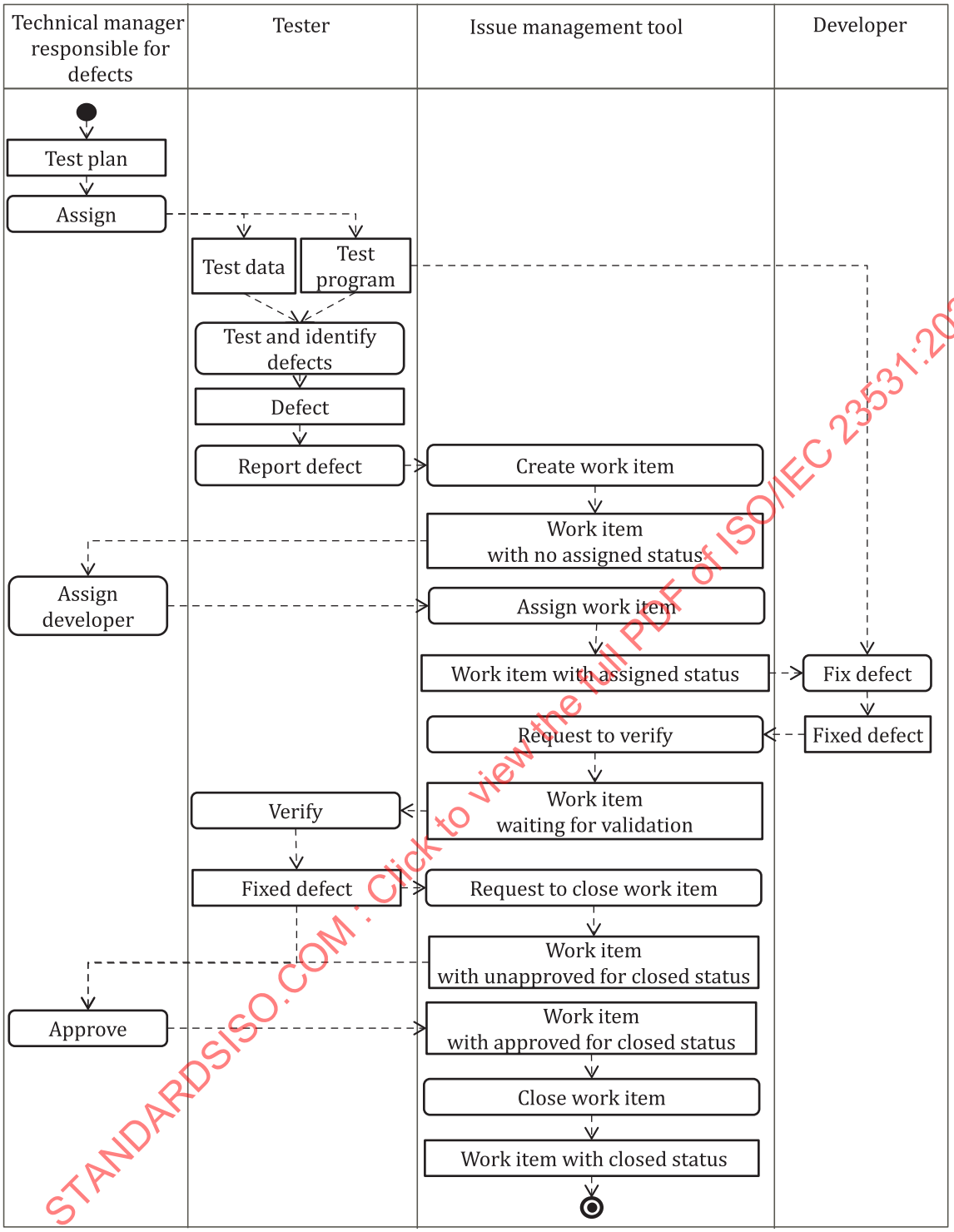

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Figure 4 — Activity diagram of defect management in testing process

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4.2.2.3 Use case scenario of incident management in a system under operation

Issue management can be used for user concerns during operations. The actors are the user, operation manager, technical manager responsible for defects, developer, tester, and system in Figure 5. These actors work in the following scenario.

a) If the user finds an incident using the system, the user notifies the operation manager of the incident contents.

b) The operation manager receives a notification from the user and creates an incident report.

c) The technical manager responsible for defects approves the incident report and assigns the work to solve that issue to the developer.

d) The developer identifies the cause of the issue assigned by the technical manager and corrects the system under test environment.

e) The tester retests the modified system of the test environment and reports the result to the technical manager.

f) The technical manager checks the modified system and if it is confirmed to be fixed then approves it and requests the developer to release it.

g) With the approval of the technical manager, the developer releases the modified system to the operation environment.

h) The technical manager confirms that the issue has been resolved in the operation environment and reports to the user that the incident has been resolved.

i) The user confirms that the incident has been resolved in the operation environment and contacts the operation manager.

j) The operation manager closes the incident report.

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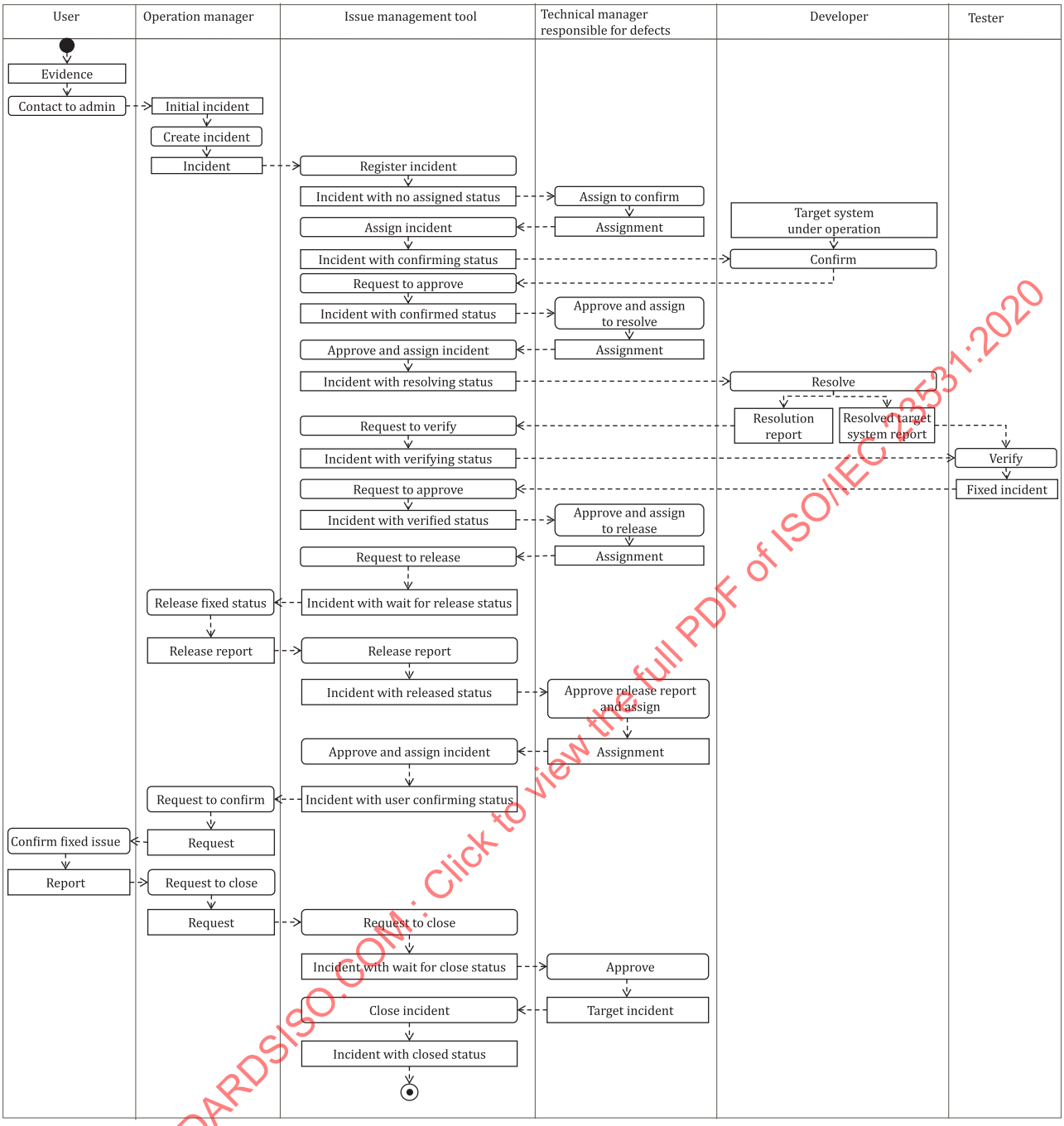

Figure 5 — Activity diagram of IT service management

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4.3 Object model of issue management entity

4.3.1 General

Figure 6 shows a detailed view of the issue management entity shown in Figure 1. As explained in the use case in 4.2, there are three use cases that differ depending on the life cycle process, and information specific to each use case and common information are handled. In Figure 6, information commonly used in all use cases is represented as a namespace called Common, and information handled in each use case is represented as namespaces called Work Management, Defect Management, and IT Service Management. Furthermore, Common is imported and used in each use case.

Detailed attributes of each entity are described in Clause 5.

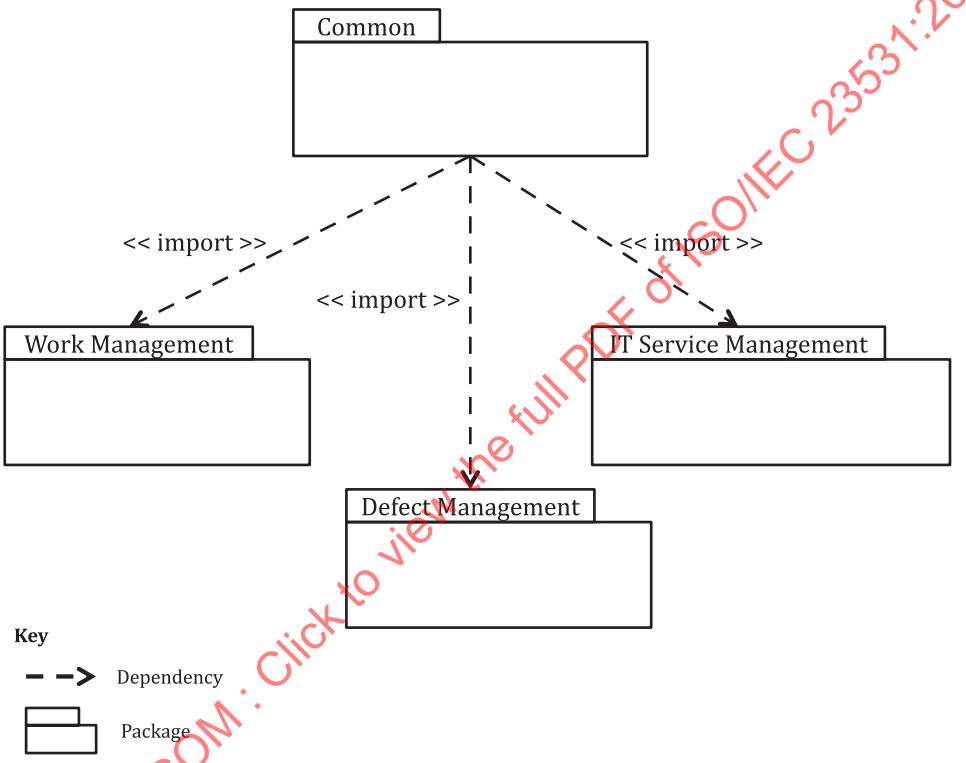

Figure 6 — Four name space of issue management entity

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4.3.2 Common entities

As shown in Figure 7, entities common to each issue management use case scenario can be defined with five classes. Issue records the issue and manages it. Status maintains the state the instance of Issue has. Target System is the subject or the source of Issue. Trigger represents the activities or circumstances in which the issue is found. Report collectively represents states of multiple instances of Issue. Status usually has a hierarchical structure depending on the organizations and responsibilities to be approved.

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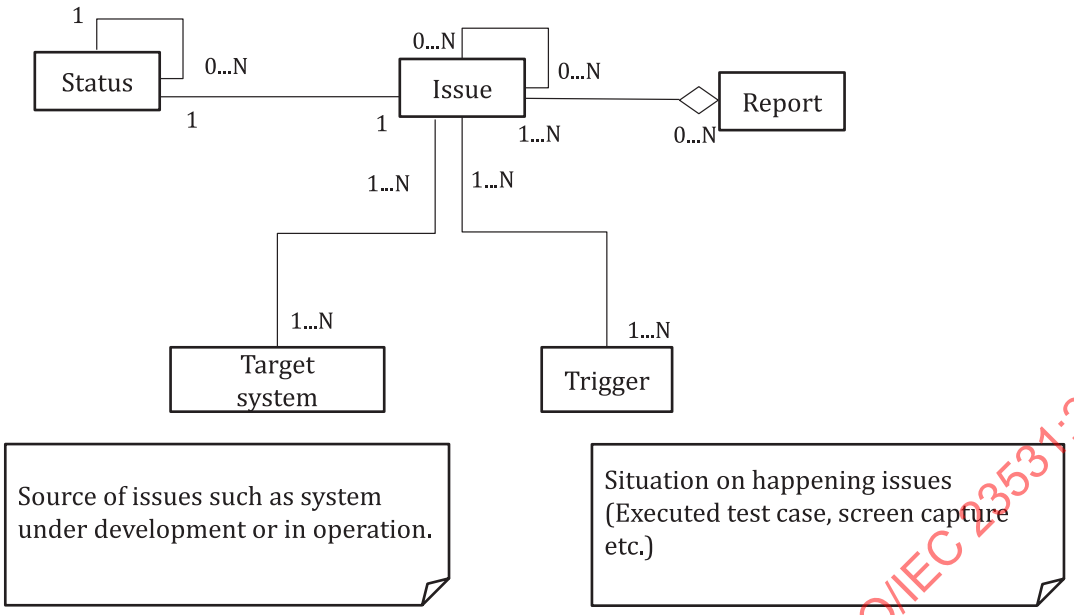

Figure 7 — Class diagram of Common entities

4.3.3 Work Management entities

Work Management includes several entities as shown in Figure 8. These are defined as the subclasses of four classes which are imported from Common. Issue which is imported from Common is inherited to Work Item which is found as a result of consideration in the development process. Target System which is imported from Common is inherited to Artifact which is created for the target system. Artifact is inherited to and detailed as Requirement, Design Document, Program and Research Result. Trigger which is imported from Common is inherited to Work Plan. Report which is imported from Common is inherited to Unfinished Work Item List and To-do List.

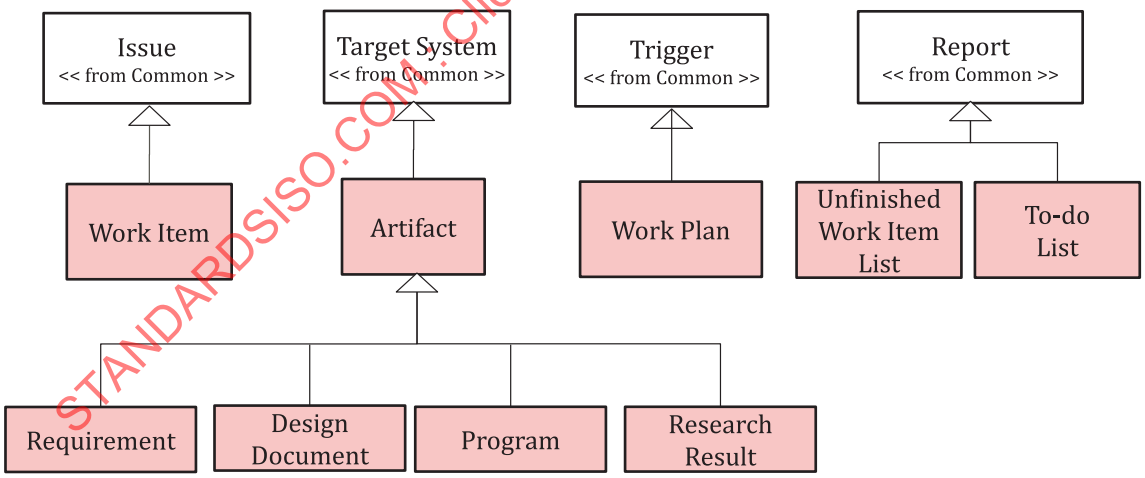

Figure 8 — Class diagram of Work Management entities

4.3.4 Defect Management entities

Defect Management includes several entities as shown in Figure 9. These are defined as the subclasses of four classes which are imported from Common. Issue which is imported from Common is inherited to Defect. Target System which is imported from Common is inherited to Artifact which is created for the target system. Artifact is inherited to and detailed as Requirement, Design Document and Program. Report which is imported from Common is inherited to Defect Status List which shows the status of

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the issues. Trigger which is imported from Common is inherited to Testing to discover defects. Testing consists of the sub classes which are Test Plan, Test Environment, Test Program, Test Data and Test Result.

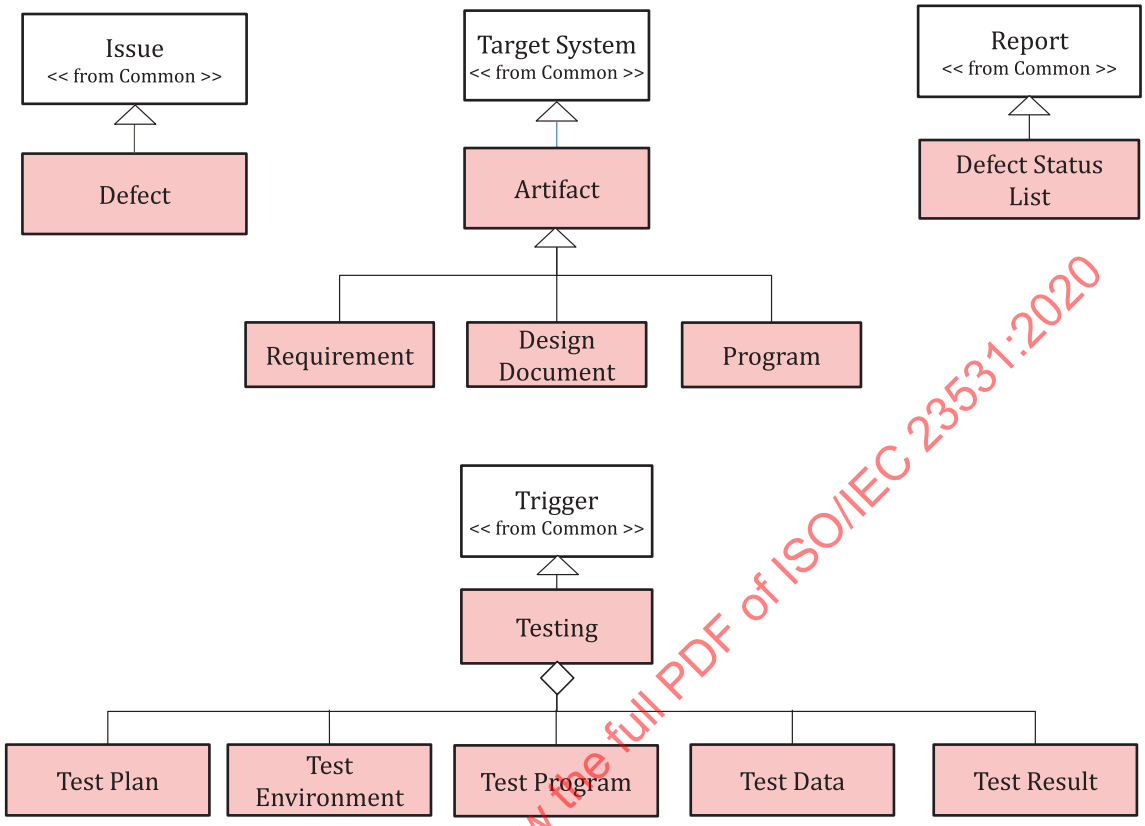

Figure 9 — Class diagram of Defect Management entities

4.3.5 IT Service Management entities

IT Service Management includes several entities as shown in Figure 10. These are defined as the subclasses of four classes which are imported from Common. Status which is imported from Common is inherited to Internal Approved Status. Issue which is imported from Common is inherited to Incident. Target System which is imported from Common is inherited to System Under Operation. Trigger which is imported from Common is inherited to Evidence. Evidence is inherited to and detailed as Claim, Screen Capture, Screen Operation, and Input Data.

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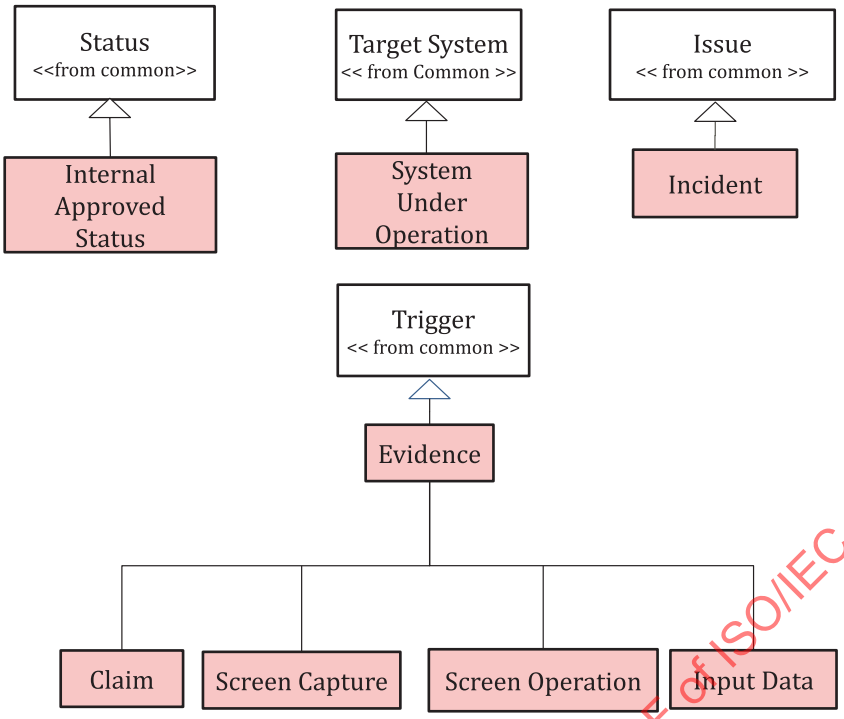

Figure 10 — Class diagram of IT Service Management entities

4.4 Categories of capability of issue management tool

A category of issue management tool capability is determined by the type of use case scenario. The capability which processes common entities described in 4.3.2 that are commonly handled by the three use cases is defined as common capabilities. Each capability to process each of the three sets of entities described in 4.3.3, 4.3.4, and 4.3.5 is defined as work management capabilities, defect management capabilities, and IT service management capabilities, respectively (see Figure 11). Work management capability is to handle information on the tasks of development process. Defect management capability is to handle information about defects that occurred in testing process. IT service management capability is to handle information about incidents to which the user faces on the operation of IT services.

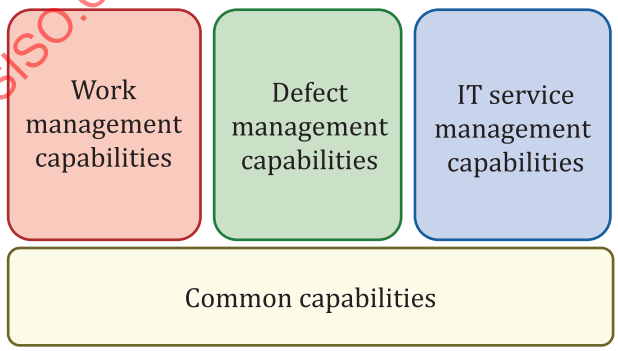

Figure 11 — Category of issue management tool capabilities

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5 Category of issue management entity

5.1 Overview

Entities handled in issue management are defined in this clause. Common entities and the three specific entities are defined as subclauses.

5.2 Common entities

In issue management, every use case is managed by five entities Issue, Status, Target System, Trigger, and Report.

a) Issue

The occurred issue is recorded and managed as one instance of Issue. Normally, the identifier, the name, the description of the content, the occurrence date and time, name of a person whom an issue is assigned to, the priority, the related file, the comment of the participant, and the resolution time limit are recorded. In addition, influence degree, progress rate, etc. may be recorded in some cases.

b) Status

The status of the issue is recorded and managed as one instance of Status. Normally, an assignment identifier, a state identifier, a state name, a responsibility to approve, an approver, and an approval date and time are recorded.

c) Target System

Information related to the object in which the issue occurred is recorded and managed as one instance of Target System. Normally, objects are different depending on categories, and there is no information handled in common.

d) Trigger

Information on the cause of the issue is recorded and managed as an instance of Trigger. Normally, objects are different depending on categories, and there is no information handled in common.

e) Report

A set of issues corresponding to an arbitrary condition is recorded and managed as one instance of Report together with the result of the statistical processing and calculation of the set of issues. Normally, conditions to be specified, calculation and statistical processing are different from the purpose of use. And there is no information handled in common.

5.3 Work Management entities

Information of Common entities and specific to work management is recorded and managed as one instance of Work Management entities. See Table 2 for the attributes which are held by each entity.

5.4 Defect Management entities

Information of Common entities and specific to defect management is recorded and managed as one instance of Defect Management entities. See Table 2 for the attributes which are held by each entity.

5.5 IT Service Management entities

Information of Common entities and specific to IT service management is recorded and managed as one instance of IT Service Management entities. See Table 2 for the attributes which are held by each entity.

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5.6 Summary of issue management entities

Issue management entities are summarized and the relation between attributes of entity and ISO/IEC/IEEE 15289:2019 is shown as Table 2.

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Table 2 — Summary of entities

Category	Common entity name	Category specific entity name	Explanation of entity	Attribute name	Explanation of attribute	Relation to ISO/IEC/ IEEE 15289:2019
Common	Issue	-	Record and manage the occurred issue as one instance.	Identifier	A value that uniquely identifies an assignment	
				Name	Name of the issue	
				Description	A text explaining the contents of the issue	
				Occurred time	Date and time when the issue occurred	10.21 c), 10.37 c)
				Assigned to	Name of person whom the issue is assigned to	10.21 h), 10.37 h)
				Priority	Priority of the issue	
				Related files	Files related to the issue	
				Comment from related persons	Comment from persons who have related with the issue.	
				Response	Response for the issue	10.21 f), 10.37 f)
				Deadline for resolution	Deadline to resolution of the issue	10.21 h), 10.37 h)
				Impact	Degree of impact from the issue	10.21 f), 10.37 f)
				Occurred project	Name of the project in which the issue occurred.	
				Related project	Name of the project which is related to the issue.	
				Related users	Identifier or name of the user who is related to the issue.	
				Estimated time for resolution	Estimated time which is required to resolve the issue.	
				Progress	Degree of progress by end of resolution.	
				Start date	Date on which the assignee had started resolving the issue	
				Expected date for resolution	Expected date on which the assignee finish resolving the issue.	10.21 h), 10.37 h)
				Identifier of related issues	Identifier of the other issues related to the issue. Issues which is similar to the issue or is required to be resolved before resolution of the issue, is specified.	
				Related keyword	Keyword related to the issue	
				Sensitivity	Data to limit the users who can access the issues from the viewpoint of confidentiality. For instance, users, responsibilities and sets of these elements which can access an issue can be set.	

NOTE The column of "Relation to ISO/IEC/IEEE 15289:2019" shows clauses and subclauses which describe the entity or the attribute in ISO/IEC/IEEE 15289:2019.

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Table 2 *(continued)*

Category	Common entity name	Category specific entity name	Explanation of entity	Attribute name	Explanation of attribute	Relation to ISO/IEC/ IEEE 15289:2019
	Status	-	Record and manage the status and the responsibility of the approval as one instance together with the identifier of the issue. Generally, multiple people approval is required to approve one state.	Identifier	Identifier to be identified the related issue	
				Name of status	Name of status of the issue	10.21 k), 10.37 k)
				Approvable responsibilities	Responsibility being able to approve for changing status of the issue	10.21 j), 10.37 j)
				Date approved	Approved date and time	10.21 c), 10.37 c)
				Approver	Information about approver	10.21 j), 10.37 j)
	Target System	-	Records and manages information on the object related to the issue where the issue occurred together with the identifier of the issue. Usually what should be recorded and managed is different from each category.	-	-	10.21 d), 10.37 d)
	Trigger	-	Records and manages information on the cause which made the issue happened together with the identifier of the issue. Usually what should be recorded and managed is different from each category.	-	-	
	Report	-	The set of issues matched with the specific condition. Usually the status of the issues is specified as the condition.	Identifier	Identifier to identify report	10.21 a), 10.37 a)
				Set of the identifiers of the issues	A set of identifiers of the issues matched with the specified condition.	
				The specified condition to filter issues.	The condition to filter and manage a set of issues as a report.	
Defect Management	Target System	Requirements	In the requirements for the target system, the part related to the occurred issue.	Identifier	Identifier to identify the requirement.	
				Occurred version	The version in which the issue occurred.	
				Content	Content of the requirement	
		Design Documents	In the design document for the target system, the part related to the occurred issue.	Identifier	Identifier to identify the design.	
				Occurred version	The version in which the issue occurred.	
				Content	Content of the design	
		Program	In the programs for the target system, the part related to the occurred issue.	Identifier	Identifier to identify the program	
				Affected version	The version affected by the issue	
				Occurred version	The version in which the issue occurred	
				Scheduled resolution version	The version in which the issue will be resolved	
				Occurred environment	The environment in which the issued occurred	
				Probability of risk occurrence	Probability for risk occurrence when the issues are managed as risks.	

NOTE The column of "Relation to ISO/IEC/IEEE 15289:2019" shows clauses and subclauses which describe the entity or the attribute in ISO/IEC/IEEE 15289:2019.

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Table 2 *(continued)*

Category	Common entity name	Category specific entity name	Explanation of entity	Attribute name	Explanation of attribute	Relation to ISO/IEC/ IEEE 15289:2019
				Frequency of risk occurrence	Frequency of risk occurrence when the issues are managed as risks.	
				Alias	Alias is the different name for the issue which has originally. Alias enable to manage some issues caused by one reason as one name.	
				Source code	Source code in which the issue occurred.	
				Build definition	Script for building the target system in which the issue occurred.	
				Build number	Identifier to identify the build of the target system in which the issue occurred.	
				Result of build	Result of build for the target system in which the issue occurred	
	Trigger		This entity records and manages the information about reason for the issue with the identifier of the issue. The information which Trigger Entity in Common Category records and manages and specific information in Defect Management Category such as Screen shot when the issue occurred are recorded and managed.	Screen shot	Screen shot when the issue occurred	
	Report		Manage the report which is required for defect management	List of similar issues	List of similar issues	10.21 i), 10.37 i)
				List of status of the issue	List of status of the issue	
Work Management	Issue		The occurred issue is recorded and managed as on instance. The information which Issue Entity in Common Category records and manages and specific information in Work Management Category are recorded and managed. Identifier to identify the type of the issue is recorded as Type of Issue. For instance, Defect and Task is recorded and managed as the different type of issue.	Identifier of the type of the issue	Identifier to identify the type of the issue	
				Name of the type of the issue	Name of the type of the issue	
				Attribute of the type of the issue	Name and data type of attributes which the type of the issue has.	
				List of the status of the issue	List of the status which the issue belonging to the specific type of the issue has.	
				Status transition of type of the issue	List of the status transition which is happened in a type of an issue.	

NOTE The column of "Relation to ISO/IEC/IEEE 15289:2019" shows clauses and subclauses which describe the entity or the attribute in ISO/IEC/IEEE 15289:2019.

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Table 2 *(continued)*

Category	Common entity name	Category specific entity name	Explanation of entity	Attribute name	Explanation of attribute	Relation to ISO/IEC/ IEEE 15289:2019
IT Service Management	Target System		The information about the target system in which the issue occurred is recorded and managed. The information which Target Entity in Common Category records and manages and the specific information in IT Service Management such as Affected version, The occurred version, The scheduled resolution version, The environment in which the issue occurred, Probability of risk and Frequency of risk are recorded and managed as Target entity in this specific category.	Affected version	The version affected by the issue.	
				Occurred version	The version in which the issue occurred.	
				Scheduled resolution version	The version in which the issue will be resolved.	
				Occurred environment	The environment in which the issue occurred.	
				Probability of risk	Probability of risk when the issue is managed as risk.	10.21 e), 10.37 e)
				Frequency of risk	Frequency of risk when the issue is managed as risk.	
	Trigger		The information about the reason for the issue is recorded and managed. The information which Trigger Entity in Common Category records and manages and the specific information in IT Service Management such as reporter are recorded and managed as Trigger Entity in IT Service Management. Furthermore, the shared memo with service provider internally can be recorded and managed.	Shared internal memo	Shared memo with the service provider internally	10.21 l), 10.37 l)
				Reporter	Name of person in charge of reporting the issue	
				Name of organization on customer side	Name of organization on customer side which receive the report of the issue.	
	Status		The status of approval for the issue can be recorded and managed as Status Entity in IT Service Management as Status Entity in specific category.	Status of internal approval	The status of approval in the service provider.	

NOTE The column of "Relation to ISO/IEC/IEEE 15289:2019" shows clauses and subclauses which describe the entity or the attribute in ISO/IEC/IEEE 15289:2019.

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6 Capabilities of issue management tools

6.1 Overview

This clause defines the capability of the issue management tool. The capability is divided into four categories in 4.4: common capabilities, work management capabilities, defect management capabilities, and IT service management capabilities. Table 3 summarizes all capabilities defined below. Some capabilities are defined in both common capabilities and other categories, and these relationships are also shown as cross references in Table 3 to clarify correspondence.

a) Issue management

Capability belonging to issue management is the capability which executes the use case defined in 4.2 and which is used by actor in each use case such as developer. Furthermore, capabilities are categorized from the viewpoint of managing entity as following.

1) Registering/referring/updating issue

The capability is updating, referring and updating issue. It creates and updates the issue entity in the object model shown in Clause 4.

2) Status transition of the issue

The capability is transiting status of the issue. It creates and updates the status entity in the object model shown in Clause 4.

3) Reporting

The capability is creating report about issue management and issue itself. It creates and updates the report entity in the object model shown in Clause 4.

4) Trace

The capability is referring and editing the target issues. It refers and updates the target system in the object model shown in Clause 4.

5) Communication

The capability is auxiliary and helps for communicating among people related to issues and exchanging information with other tools. Architecture of interface to other tools should be disclosed.

EXAMPLE In the case of files to be used for information exchange, a general-purpose format such as CSV format can be used.

b) Administration capability

To be able to be operated suitably for the target environment, administration capability includes setting for operation and customizing issue management.

1) Setting for operation

The capability is setting issue management tool to be operated suitably for the target environment.

2) Customizing issue management

The capability is customizing issue management tool to be operated suitably for the target environment.

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6.2 Common capabilities

Capabilities which are common in all three categories defined in 4.4 such as the following are defined as common capabilities. Tool capabilities both required and recommended are provided and are summarized in Table 3.

a) Issue management capability

1) Registering/referring/updating issues

The capability shall be registering, referring, and updating attributes as follows.

— Name

— Explanation

— Occurred date and time

— Assigned to

— Priority

— Related files

— Response

The capability which registers, refers, and updates attributes as follows should be included.

— Impact

— Occurred project

— Related project

— Related users

— Estimated time to be resolved

— Deadline of resolving issue

— Progression

— Start date for resolution

— Expected date for resolution

— Related issues

— Related key words

— Sensitivity

To easily register a similar issue in what has occurred before, the capability of creating the issue based on what has occurred before should be included.

2) Status transition of the issue

The capabilities shall be able to do the following.

— Status transition

This capability shall be able to change the status of the issue such as opening or closing the issue. When the status of the issue is changed, the date and executor shall be able to be recorded as historical data.

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The following capability should be included.

— Application and approval for the status transition

This capability is to execute status transition based on two types of the responsibilities which are applicant for status transition and approver. When the applicant requests status transition and the approver gives approval, the status transition of the issue is executed. Capability to attach files together with the request should be included when an applicant requests status transition.

3) Reporting

The capabilities shall be able to do the following.

— Showing list of unfinished issue

The capability is showing the list of issues which are the status of the issue as not resolved.

— Showing change history

The capability is showing the list of change history which includes the status change of the issue, the changes for the attributes, etc.

The following capabilities should be included.

— Showing progress

This capability is showing quantitative progress for resolving issue.

— Showing result of trend analysis for the issues

This capability is showing relationship with the attributes of the issues and number of issues.

— Showing the list of the issues which has not been finished for a long term.

Showing the list of the issues which has not been finished yet and has passed specific days from the occurred date.

— Showing the list of issues for each assigner

This capability is showing the list of the issues for each assigner.

— Showing workload

This capability is showing number of issues assigned for each assigner.

— Showing passed time from start resolving the issue

This capability is showing passed time form start resolving the issue.

— Defining dashboard

This capability is defining content and layout of dashboard which shows the status of issues managed in the organization.

4) Trace

This capability is referring and updating the related outcomes to the issue. For instance, there is a capability which downloads source code related to the issue from asset management and refers and updates the source code.

5) Communication

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The capabilities shall be able to do the following.

— Registering/referring the comment to the issue

This capability is being able to register and refer the comment to the issue.

The following capabilities should be included.

— Notifying change of the status

This capability is notifying specific user when change for the status of the issue is happened.

— Importing and exporting issue entities

This capability is importing or exporting issue entities from or to other tools. It also should include manipulating issue entities through API (application programming interface) called by other tools.

— Importing and exporting status entities

This capability is importing or exporting status entities from or to other tools. It also should include manipulating status entities through API called by other tools.

— Importing and exporting report entities

This capability is importing or exporting report entities from or to other tools. It also should include manipulating report entities through API called by other tools.

— Importing and exporting target system entities

This capability is importing or exporting target system entities from or to other tools. It also should include manipulating target system entities through API called by other tools.

— Importing and exporting trigger entities

This capability is importing or exporting trigger entities from or to other tools. It also should include manipulating trigger entities through API called by other tools.

b) Administration capability

1) Setting for operation

The capability shall be able to do the following.

— Registering user

This capability is registering user of the issue management tool.

The following capabilities are expected.

— Registering project

This capability is registering new project to the issue management tool.

— Registering sub project

This capability is registering sub projects which use the issue management tool. Sub projects have parent-child structures with projects as parents.

— Setting user authority

This capability is limiting capability that can be used by each user and the issues that can be referred by each user.

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— Adding add-in

This capability is being able to add capability by adding module.

— Setting add-in

This capability is setting the behaviour of capability which is added as an add-in by parameters.

— Defining template for report

This capability is creating the template for the report.

2) Customizing issue management

The capabilities shall be able to do the following.

— Defining the type of the issue

This capability is defining the attributes which the issue has.

— Defining the status for each type of the issue

This capability is defining the status which can be in each type of issue and the condition which is required to transit to the other status.

The following capabilities are expected.

— Definition of approval authority for issue state transition

This capability is defining approval authority for issue state transition.

— Defining the template for content of notification on status transition

This capability is defining the template for content of notification on status transition. To implement this capability, notifying the change of the status shall be implemented.

6.3 Work management capabilities

Work management capabilities shall cover the capabilities defined as common capabilities in 6.2 and the capabilities which are specific to the work management category.

a) Issue management capability

1) Registering/referring/updating issue

The capability shall be able to register, refer, and update attributes as follows in addition to the common capability.

— Type of the issue

— The attributes defined for type of the issue

2) Communication

— Importing and exporting issue entities

This capability should import or export information about issue such as work item ID, occurred time, and description from or to other tools.

— Importing and exporting status entities

This capability should import or export information about status such as status of work item from or to other tools.

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— Importing and exporting report entities

This capability should import or export information about report such as a list of unfinished work items from or to other tools.

— Importing and exporting target system entities

This capability should import or export information about target system such as design document ID from or to other tools.

— Importing and exporting trigger entities

This capability should import or export information about trigger such as a work plan from or to other tools.

b) Administration capability

1) Setting for operation

The capabilities defined as common capabilities in 6.2 and the capabilities which are specific to the work management category shall be implemented.

— Setting type of issue used by project

This capability is selecting type of issue for each project.

— Registering template for each project

This capability is specifying defining such as type of issue and template of report as the project standard.

2) Customizing issue management

The capability defined as common capabilities in 6.2 and the capabilities which are specific to the work management category shall be implemented.

— Registering name for type of the issue

This capability is customizing the status transition of issue and managing it with specific name.

6.4 Defect management capabilities

Defect management capabilities shall cover the capabilities defined as common capabilities in 6.2 and the capabilities which are specific to the defect management category.

a) Issue management capability

1) Registering/referring/updating issues

The capability shall be able to register, refer, and update attributes as follows in addition to the common capability.

— Affected version

— Occurred version

— Scheduled resolution version

— Occurred environment (software component, hardware etc.)

— Screen capture

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Furthermore, the capability which registers, refers, and updates attributes as follows should be included.

— Probability of risk occurrence

— Frequency of risk occurrence

— Alias

— Source code

— Build number

2) Trace

— Source code management

This capability is managing source code in which the issue occurred.

— Build

This capability is building source code in which the issue occurred.

3) Communication

— Importing and exporting issue entities

This capability should import or export information about issue such as defect ID, occurred time, and description from or to other tools.

— Importing and exporting status entities

This capability should import or export information about status such as status of a defect from or to other tools.

— Importing and exporting report entities

This capability should import or export information about report such as a status list of defects from or to other tools.

— Importing and exporting target system entities

This capability should import or export information about target system such as program ID from or to other tools.

— Importing and exporting trigger entities

This capability should import or export information about trigger such as test cases, test data and test results from or to other tools.

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6.5 IT service management capabilities

The capability defined as common capabilities in 6.2 and the capabilities which are specific to the IT service management category shall be implemented.

a) Issue management capability

1) Registering/referring/updating issue

The capability shall be able to register, refer, and update attributes as follows in addition to the common capability.

— Affected version

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— Occurred version

— Scheduled resolution version

— Occurred environment (software component, hardware etc.)

— Probability of risk occurrence

— Frequency of risk occurrence

— Reporter

Furthermore, the capability which registers, refers, and updates attributes as follows should be included.

— Type of the issue

— The attributes defined in type of the issue

— Shared internal memo

2) Status transition of the issue

— Internal approval for status transition

3) Communication

— Importing and exporting issue entities

This capability should import or export information about issue such as incident ID, occurred time, and description from or to other tools.

— Importing and exporting status entities

This capability should import or export information about status such as status of an incident from or to other tools.

— Importing and exporting report entities

This capability should import or export information about report such as a list of incidents from or to other tools.

— Importing and exporting target system entities

This capability should import or export information about target system such as program ID and occurred version from or to other tools.

— Importing and exporting trigger entities

This capability should import or export information about trigger such as reporter ID and description from or to other tools.

b) Administration capability

1) Setting for operation

The capability defined as common capabilities in 6.2 and the capabilities which are specific to the IT service management category shall be implemented.

— Setting type of the issue used by project

This capability is selecting type of issue for each project.

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— Registering project template

This capability is specifying defining such as type of issue and template of report as the project standard.

2) Customizing issue management

The capability defined as common capabilities in 6.2 and the capabilities which are specific to the IT service management category shall be implemented.

— Name of type of the issue

This capability is customizing the status transition of issue and managing it with specific name.

6.6 Summary of capabilities

Capabilities of issue management tools are summarized in Table 3.

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Table 3 — Summary of capabilities

Capabilities			Category of capabilities			
Capability group 1	**Capability group 2**	**Capability**	**Common**	**Defect management**	**Work management**	**IT service management**
(1) Issue management capability	(1-1) Registering/referring/updating issue	Registering/referring/updating name of the issue	R			
		Registering/referring/updating description of the issue	R			
		Registering/referring/updating occurred date and time	R			
		Registering/referring/updating name of person whom the issue is assigned to	R			
		Registering/ Referring/ Updating priority	R			
		Registering/referring/updating related files	R			
		Registering/referring/updating response	R			
		Registering/referring/updating impact	E			
		Registering/referring/updating occurred project	E			
		Registering/referring/updating related project	E			
		Registering/referring/updating related user	E			
		Registering/referring/updating estimated time for resolution	E			
		Registering/referring/updating deadline for resolution	E			
		Registering/referring/updating progress	E			
		Registering/referring/updating start date	E			
		Registering/referring/updating expected date for resolution	E			
		Registering/referring/updating related issues	E			
		Registering/referring/updating related keyword	E			
		Registering/referring/updating sensitivity	E			
		Registering new issue from existing issue	E			
		Registering/referring/updating affected version		R		R
		Registering/referring/updating occurred version		R		R

Key

R required and shall be implemented

E expected and should be implemented

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Table 3 *(continued)*

Capabilities			Category of capabilities			
Capability group 1	**Capability group 2**	**Capability**	**Common**	**Defect management**	**Work management**	**IT service management**
		Registering/referring/updating scheduled resolution version		R		R
		Registering/referring/updating occurred environment(Software component, hardware etc.)		R		R
		Registering/referring/updating probability of risk occurrence		E		R
		Registering/referring/updating frequency of risk occurrence		E		R
		Registering/referring/updating alias		E		
		Registering/referring/updating source code		E		
		Registering/referring/updating build number		E		
		Registering/referring/updating screen shot		R		
(1) Issue management capability	(1-1) Registering/referring/updating issue	Registering/referring/updating type of the issue			R	E
		Registering/referring/updating the attributes defined in the type of the issue			R	E
		Registering/referring/updating reporter				R
		Registering/referring/updating shared internal memo				E
		Registering/referring/updating name of organization on the customer side				E
	(1-2) Status transition of the issue	Status transition	R			
		Application and approval for the status transition	E			
		Internal approval for status transition				E

Key

R required and shall be implemented

E expected and should be implemented

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