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Ingénierie du logiciel — Pratique recommandée pour l'acquisition des logiciels

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IEEE Recommended Practice for Software Acquisition

Sponsor

Software & Systems Engineering Standards (C/S2ESC) Committee
of the
IEEE Computer Society

Approved 5 December 2015

IEEE-SA Standards Board

Abstract: A set of useful quality considerations that can be selected and applied during one or more steps in a software acquisition process is described in this recommended practice. The recommended practices can be applied to software that runs on any computer system regardless of the size, complexity, or criticality of the software. The software supply chain may include integration of off-the-shelf (OTS), custom, or free and open source software (FOSS). Each organization or individual using this recommended practice will need to identify the specific quality and activities that need to be included within its acquisition process.

Keywords: acquirer, custom developed, end user, FOSS, IEEE 1062™, off-the-shelf, OTS, SaaS, software acquisition process, software as a service, supplier

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Introduction

This introduction is not part of IEEE Std 1062-2015, IEEE Recommended Practice for Software Acquisition.

This introduction provides some background on the rationale used to develop this recommended practice. This information is meant to aid in the understanding and usage of this recommended practice.

This recommended practice describes the management and execution of software acquisition activities. It is intended for the following:

— Individuals or organizations that acquire software from suppliers

— Individuals or organizations that acquire software from a developer for resale to other individuals or organizations

— Individuals or organizations that influence how software is acquired from suppliers

— Suppliers interested in providing high-quality software to acquirers

This recommended practice is designed to help organizations and individuals

— Incorporate quality considerations during the definition, evaluation, selection, and acceptance of supplier software for operational use

— Determine how supplier software should be evaluated, tested, and accepted for delivery to end users

This recommended practice is intended to satisfy the following objectives:

— Promote consistency within organizations in acquiring third-party software from software suppliers

— Provide useful practices on including quality considerations during software acquisition planning

— Provide useful practices on evaluating and qualifying supplier capabilities to meet user software requirements

— Provide useful practices on evaluating and qualifying supplier software

— Assist individuals or organizations judging the quality of supplier software for referral to end users

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IEEE Recommended Practice for Software Acquisition

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1. Overview

This recommended practice is divided into six clauses. Clause 1 provides the scope of this recommended practice. Clause 2 lists references to other standards that are essential in applying this recommended practice. Clause 3 provides definitions that are either not found in other standards, or have been modified for use with this recommended practice. Clause 4 describes the options for acquiring software. Clause 5 describes the eight steps in a software acquisition process and the related quality practices that apply to acquiring software. Clause 6 describes how quality assurance can be applied to software acquisition.

This recommended practice also contains five annexes. Annex A provides a set of checklists that individuals or organizations may elect to adapt to their specific needs, Annex B provides software acquisition guidelines with respect to Software Safety Assurance and Software Information Security Assurance, Annex C provides guidelines with respect to rights in technical data software usage, Annex D provides acquisition plan guidelines, and Annex E is the bibliography.

1.1 Scope

This recommended practice describes a set of useful quality considerations that can be selected and applied during one or more steps in a software acquisition process. The recommended practices can be applied to software that runs on any computer system regardless of the size, complexity, or criticality of the software. The software supply chain may include integration of commercial-off-the-shelf (COTS), custom, or free and open source software (FOSS). Each organization or individual using this recommended practice will need to identify the specific quality and activities that need to be included within the organization's acquisition process. Security will be included as a quality attribute considered during the acquisition.

1.2 Purpose

This recommended practice is designed to help organizations and individuals incorporate quality, including security considerations during the definition, evaluation, selection, and acceptance of supplier software for operational use. It will also help determine how supplier software should be evaluated, tested, and accepted for delivery to end users. This recommended practice is intended to satisfy the following objectives:

— Promote consistency within organizations in acquiring software from software suppliers.

— Provide useful practices on including quality, security, safety and data rights considerations during acquisition planning.

— Provide useful practices on evaluating and qualifying supplier capabilities to meet user requirements.

— Provide useful practices on evaluating and qualifying supplier software.

— Assist individuals or organizations judging the quality of supplier software for referral to end users.

— Assist suppliers in understanding how the software will be evaluated, tested, and accepted for delivery to end users.

Success in acquiring high-quality software products and services from software suppliers can be achieved by doing the following things:

a) Identifying quality characteristics necessary to achieve the acquirer's objectives

b) Selecting suppliers most capable of meeting the acquisition objectives

c) Including quality considerations in the planning, evaluation, and acceptance activities

d) Developing an organizational strategy for acquiring software

e) Establishing a software acquisition process using the eight steps stated in 5.2 as a starting point

f) Putting the defined process into practice

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 1228™, IEEE Standard for Software Safety Plans.[1, 2]

ISO/IEC/IEEE Std 12207, Systems and software engineering—Software life cycle processes.

ISO/IEC/IEEE Std 15288, Systems and software engineering—System life cycle processes.

ISO/IEC/IEEE Std 15289, Content of life-cycle information products.

ISO/IEC/IEEE Std 24765, Systems and Software Engineering—Vocabulary.

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IEEE Std 1062-2015
IEEE Recommended Practice for Software Acquisition

3. Definitions and terms

For the purposes of this document, the following terms and definitions apply. The *International Standard ISO/IEC/IEEE 24765: Systems and Software Engineering—Vocabulary* should be referenced for terms not defined in this clause.[3]

3.1 Definitions

acquisition: Process of obtaining a system, product, or service.

commercial-off-the-shelf (COTS): A product available for purchase and use without the need to conduct development activities [ISO/IEC/IEEE 15289:2011].

modified-off-the-shelf (MOTS): Software product that is already developed and available, usable either "as is" or with modification, and provided by the supplier, acquirer, or a third party.

off-the-shelf (OTS): Product or system already developed and available [ISO/IEC/IEEE 15289:2011].

software-intensive system: A system for which software is a major technical challenge and is perhaps the major factor that affects system schedule, cost, and risk [IEEE Std 1362-1998 (Reaff 2007)] and [ISO/IEC/IEEE 24765:2010].

NOTE—In the most general case, a software-intensive system is comprised of hardware, software, people, and manual procedures.[4]

3.2 Use of should, may, and can

In this document, the word *should* is used to indicate a recommendation. The word *may* is used to indicate a permissible action. The word *can* is used for statements of possibility and capability.

4. Software acquisition alternatives

4.1 Introduction

Software can be acquired in three different ways or a combination of the three. It is acknowledged that any combination of these three alternatives will make the overall software project more complex and likely to be different from each other. This document does not attempt to address the combinations of these three basic software acquisition options. The software acquisition alternatives include contracting custom-developed software, obtaining the right to use off-the-shelf (OTS) software and renting software as a service (SaaS). The advantages and disadvantages of each option are summarized in Table 1.

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[3]*The International Standard ISO/IEC/IEEE 24765: Systems and Software Engineering—Vocabulary* is available at www.computer.org/sevocab.

[4]Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

4.2 Custom-developed software

Reaching an agreement, often a formal contract for the custom development is an acquisition approach where the solution to an acquirer's need is provided via hiring a supplier (outsourcing) or using an internal team to custom develop a software solution that is built to a specification or set of requirements. Following software development standards and known methods, the acquirer oversees the development, test activities, and products performed by the supplier. At acceptance, the acquirer takes ownership of the solution and possibly some of the supporting tools/methods in order to support ops/maintenance of the solution. This option includes software built from scratch and/or integrated from other existing components (e.g., reuse, modified FOSS).

4.2.1 Advantages of custom-developed software

The advantages of custom-developed software are as follows:

— The solution should match the need exactly, no more or no less.

— The acquirer can require that flexibility and maintainability be supported by the solution and by the supplier of the solution.

— The acquirer can monitor and influence the course of development/test in case changes are deemed appropriate.

— The acquirer can control and influence the related topics to the executable software solution (e.g., size, performance, information protection, authorization security, capacity) and the software development environment (language, tools, etc.).

— If a problem is reported, the acquirer can determine if the problem legitimately violates the specifications and if it does, the supplier should be responsible for fixing that problem, typically at no additional cost to the acquirer.

— Changes after acceptance are typically still under control of the acquirer via an ops/maintenance agreement with a possibly different ops/maintenance supplier.

4.2.2 Disadvantages of custom-developed software

The disadvantages of custom-developed software are as follows:

— Typically costs more than the other options.
— Typically takes more time (sometimes much more) than the other options.

4.3 Off-the-shelf (OTS) software

This is an acquisition approach where the solution to an acquirer's need is provided via purchasing and taking possession of an already built solution from a software supplier. The acquirer agrees to the seller's license agreement to use the "executable" version of the solution but typically does not have access to the source code or other information about the solution or the processes used to produce that product. In addition, the acquirer typically takes possession of the software solution and installs in on assets owned by the acquirer. In addition, the solution is typically acquired in "as is" condition, unless the supplier offers built-in tailoring of the product (and this more common than not). This option includes commercial off-the-shelf (COTS), free and open source software (FOSS) products acquired in "as is" condition, and other non-developmental items (NDI).

4.3.1 Advantages of OTS

The advantages of OTS are as follows:

— Cost is less than the custom-developed option but similar to the SaaS option.

— Time to initial operations is less than the custom-developed option and can be greater than the SaaS option.

— Since the acquirer takes possession of the solution, the control over data and access is greater than the SaaS option and about the same as the custom-developed option.

4.3.2 Disadvantages of OTS

The disadvantages of OTS are as follows:

— The terms of the generally non-negotiable license agreement constrain how the solution may be used by the acquirer, possibly to the acquirer's detriment. The solution typically includes features that attempt to enforce specific agreement terms, adding cost and complexity to the solution.

— The solution may not satisfy all of the acquirer's needs (sometimes called gaps) and it may also provide features/capabilities that are not required, not desired or even tolerable to the acquirer. The acquirer may need additional solutions, or modifications to the acquired solution, to fill these gaps. In addition, the acquirer may also need to identify and deactivate or prevent the extraneous code from activating itself.

— Sometimes, the User Interface to the solution is different from the way an acquirer is currently offering a User Interface to their current users. This can sometimes/often be solved via product tailoring.

— Typically, there will be a need to obtain support from the supplier for installation, activation, and maintenance.

— Problem reporting can be an issue, depending on the supplier's capability to accept and react to problem reports. In addition, the supplier may not even agree that because an acquirer alleges a problem exists that a legitimate problem actually does exist.

— Product changes, both fixes and upgrades, are controlled mostly by the supplier and determined by marketplace needs. Such changes may not be consistent with the acquirer's ongoing needs or timeframe.

— It is possible for the vendor to go out of business resulting in a possible loss of data.

4.4 Software as a service (SaaS)

Software as a service (SaaS) is an acquisition approach where the solution to an acquirer's need is provided via an agreement with a supplier for access to a software product for a fixed amount of time and to use that software product remotely, via connection (wired, wireless, etc.) to the supplier's assets. Inputs to the remote software product are transmitted to the supplier and outcomes/results/products from using the software product are transmitted back to the acquirer. This acquisition option is part of the Cloud Computing approach (NIST Special Publication 800-145 [B12]) to software (aka renting access to products, services, infrastructure, etc.) and is frequently referred to as software as a service (SaaS).

4.4.1 Advantages of SaaS

The advantages of SaaS are as follows:

— Rapid access to products and services via Service Level Agreement (SLA) and ready to use solutions, more so than custom-developed or OTS.

— No need to provide internal computing assets to support "building or buying" the equivalent products or services, thus reducing costs and time in prep for using solution, as compared to both custom-developed and OTS.

— Typically is cheaper than custom-developed option and can be cheaper than the OTS option.

— No need to take permanent ownership of the software solution, thus reducing impacts associated with such ownership (e.g., sustainment, hardware to host solution), as in the custom-developed and OTS options.

4.4.2 Disadvantages of SaaS

The disadvantages of SaaS are as follows:

— The terms of the generally non-negotiable license agreement constrain how the solution may be used by the acquirer, possibly to the acquirer's detriment. The solution typically includes features that attempt to enforce specific agreement terms, adding cost and complexity to the solution.

— The solution may not satisfy all of the acquirer's needs (sometimes called gaps) and it may also provide features/capabilities that are not required, not desired or even tolerable to the acquirer. The acquirer may need additional solutions, or modifications to the acquired solution, to fill these gaps. In addition, the acquirer may also need to identify and deactivate or prevent the extraneous code from activating itself.

— The location of where the data is stored is not controlled by the acquirer; therefore the data (personal data, sensitive data, etc.) could be subject to the rules and regulations of the locality of the supplier.

— In the event the supplier is no longer a case of e.g., bankruptcy of supplier, potentially the acquirer's data could be lost.

— The user interface to the solution may be different from the way an acquirer is currently offering a user interface to their current users. This can sometimes/often be solved via product tailoring.

— Protection of data being transmitted in both directions due to dependency on supplier's capabilities. This may require internal protections or legal agreements if this protection should ever fail or be compromised.

— Problem reporting and problem correction of a solution, if it does not work as desired: Supplier may not agree with nature of the problem or may not be able to fix in a timely manner. Similar to OTS and more problematic than custom-developed.

— Assured access to solution due to dependency on external assets. Again, backup/alternative paths to supplier's assets may be required or legal recourse in case of loss of access. This is typically a bigger risk than for custom-developed or OTS options.

— Recovery from loss of access to or other failures of the solution may be dependent on the supplier's abilities and sometimes out of the control of the acquirer.

— Product changes, both fixes and upgrades, are controlled mostly by the supplier and determined by marketplace needs. Such changes may not be consistent with the acquirer's ongoing needs or timeframe.

— It is possible for the vendor to go out of business resulting in a possible loss of data.

Table 1—Software acquisition options

	Advantages	Disadvantages
Custom-developed software	1. The solution should match the need exactly, no more or no less. 2. The acquirer can require that flexibility and maintainability be supported by the solution and by the supplier of the solution. 3. The acquirer can monitor and influence the course of development and test in case changes are needed. 4. The acquirer can control and influence the related topics to the executable software solution (e.g., size, performance, information protection, authorization security, capacity) and the software development environment (language, tools, etc.). 5. If a problem is reported, the acquirer can determine if the problem legitimately violates the specifications and if it does, the supplier should be responsible for fixing that problem, typically at no additional cost to the acquirer. 6. Changes after acceptance are typically still under control of the acquirer via an operations/maintenance agreement with a possibly different operations/maintenance supplier.	1. Typically costs more than the other options. 2. Typically takes more time than the other options.
Off-the-shelf (OTS) software	1. Cost is less than custom-developed option but similar to the SaaS option. 2. Time to initial operations is less than the custom-developed option but greater than the SaaS option. 3. Since the acquirer takes possession of the solution, the control over data and access is greater than the SaaS option and about the same as the custom-developed option.	1. The terms of the generally non-negotiable license agreement constrain how the solution may be used by the acquirer, possibly to the acquirer's detriment. The solution typically includes features that attempt to enforce specific agreement terms, adding cost and complexity to the solution. 2. The solution may not satisfy all of the acquirer's needs (sometimes called "gaps") and it may also provide features/capabilities that are not required, not desired or even tolerable to the acquirer. The acquirer may need additional solutions, or modifications to the acquired solution, to fill these gaps. In addition, the acquirer may need to identify and deactivate or prevent the extraneous code from activating itself. 3. Sometimes the user interface to the solution is different from the way an acquirer is currently offering a user interface to their current users. This can sometimes/often be solved via product tailoring. 4. Typically, there will be a need to obtain support from the supplier for installation, activation and maintenance. 5. Problem reporting can be an issue, depending on the supplier's capability to accept and react to problem reports. In addition, the supplier may not even agree that because an acquirer alleges a problem exists that a legitimate problem actually does exist. 6. Product changes, both fixes and upgrades, are controlled mostly by the supplier and determined by marketplace needs. Such changes may not be consistent with the acquirer's ongoing needs or timeframe. 7. It is possible for the vendor to go out of business resulting in a possible loss of data.

	Advantages	Disadvantages
Software as a service (SaaS)	1. Rapid access to products and services via Service Level Agreement (SLA) and ready-to-use solutions, more so than custom-developed or OTS. 2. No need to provide internal computing assets to support 'building or buying' the equivalent products or services, thus reducing costs and time in preparation for using solution, as compared to both custom-developed and OTS. 3. Typically is cheaper than custom-developed option and can be cheaper than the OTS option. 4. No need to take permanent ownership of the software solution, thus reducing impacts associated with such ownership (e.g., sustainment, hardware to host solution), as in the custom-developed and OTS options.	1. The terms of the generally non-negotiable license agreement constrain how the solution may be used by the acquirer, possibly to the acquirer's detriment. The solution typically includes features that attempt to enforce specific agreement terms, adding cost and complexity to the solution. 2. The solution may not satisfy all of the acquirer's needs (sometimes called gaps) and it may also provide features/capabilities that are not required, not desired or even tolerable to the acquirer. The acquirer may also need to identify and deactivate or prevent the extraneous code from activating itself. 3. Sometimes the user interface to the solution is different from the way an acquirer is currently offering a user interface to their current users. This can sometime/often be solved via product tailoring. 4. Typically, there will be a need to obtain support from the supplier for installation, activation, and maintenance. 5. Problem reporting and problem correction of a solution, if it does not work as desired. 6. Recovery from loss of access to or other failures of the solution may be dependent on the supplier's abilities and sometimes out of the control of the acquirer. 7. Product changes, both fixes and upgrades, are controlled mostly by the supplier and determined by marketplace needs. Such changes may not be consistent with the acquirer's ongoing needs or timeframe. 8. It is possible for the vendor to go out of business resulting in a possible loss of data.

5. Software acquisition process

5.1 Purpose

The purpose of the acquisition process is to obtain a product or service in accordance with the acquirer's requirements.

5.1.1 Outcomes

As a result of the successful implementation of the acquisition process:

a) A request for supply is prepared.

b) One or more suppliers are selected.

c) An agreement is established between the acquirer and supplier.

d) A product or service complying with the agreement is accepted.

e) Acquirer obligations defined in the agreement are satisfied.

5.1.2 Activities and tasks

Software can be acquired as a stand-alone product, as a service, or embedded in a system consisting of a single processor or a large, complex system with many hardware items. This clause describes the activities in the software acquisition process and is applicable to the acquisition of developed software, non-developmental software (COTS, reuse, or FOSS), and software services.

5.1.3 Principal acquisition roles

There are three principal roles involved: acquirer, supplier, and end user. These roles may be performed by a single individual in a small business or by multiple people representing organizations in a large corporate or government environment. The acquirer develops the method to satisfy the identified need and the supplier provides the required product or service to the end user.

5.2 Eight steps in acquiring quality software

The software acquisition process can be described by eight steps. The activities in each step support the acquisition of high-quality software products, services or systems that meet the acquirer's requirements and expectations, including on-time and on-budget delivery.

The software acquisition process should be tailored or streamlined to the maximum extent possible taking risk into consideration. The process should be consistent with technical maturity, validated requirements, and expected level of effort and funding. The tailoring process is presented in Annex A of ISO/IEC/IEEE 12207.

Figure 1 illustrates the eight-step process described in this clause and Table 2 summarizes the process steps, along with their inputs and outputs.

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Identified Need

┌──────────────────────────────┐
│ **Step 1**. Planning the software │
│ acquisition strategy (5.3)   │
└──────────────────────────────┘

Acquisition Strategy and Acquisition Plan documented

┌──────────────────────────────┐
│ **Step 2**. Defining the acquisition │
│ and software requirements   │
│ (5.4)   │
└──────────────────────────────┘

Software system requirements documented

┌──────────────────────────────┐
│ **Step 3**. Identifying potential │
│ suppliers (5.5)   │
└──────────────────────────────┘

No potential suppliers

Potential suppliers identified

┌──────────────────────────────┐
│ **Step 4**. Preparing contract │
│ requirements (5.6)   │
└──────────────────────────────┘

No contract

RFP published

┌──────────────────────────────┐
│ **Step 5**. Evaluating proposals │
│ and selecting the supplier   │
│ (5.7)   │
└──────────────────────────────┘

Contract negotiated

┌──────────────────────────────┐
│ **Step 6**. Managing for supplier │
│ performance (5.8)   │
└──────────────────────────────┘

Software or service delivered

┌──────────────────────────────┐
│ **Step 7**. Accepting the software │
│ (5.9)   │
└──────────────────────────────┘

Software or service accepted

┌──────────────────────────────┐
│ **Step 8**. Evaluating the │
│ process and identifying   │
│ improvement opportunities   │
│ (5.10)   │
└──────────────────────────────┘

Figure 1—Eight steps in acquiring software

Table 2—Eight steps in acquiring software

Steps in software acquisition process	Activities and Tasks	Outcomes
Step 1. Planning the software acquisition strategy (5.3)	1. Initiate a planning process. 2. Develop an acquisition strategy. 3. Develop an acquisition plan. 4. Include contracting practices. 5. Obtain acquisition services from other organizations. 6. Tailor the process.	1. High level specification of functional and non-functional requirements to confirm need for a system and guide acquisition planning is produced. 2. Acquisition plan is specified and deliberated on. 3. Acquisition plan is approved.
Step 2. Defining the acquisition and software requirements (5.4)	1. Define the software being acquired. 2. Establish supplier evaluation criteria. 3. Establish acquirer and supplier obligations. 4. Develop plans to evaluate and accept software and services. 5. Develop contingency plans.	1. The software to be acquired is defined in detail. 2. The Statement of Work (SOW) is defined and approved. 3. Software requirements are specified and approved. 4. A detailed RFP which includes acquirer and supplier obligations is produced and approved. 5. Evaluation and acceptance criteria for the software to be acquired are produced. 6. Contingency plan is drawn up and approved.
Step 3. Identifying potential suppliers (5.5)	1. Gather software supplier's information. 2. Review software supplier's information. 3. Survey uses of the supplier's software.	1. Potential supplier information is gathered and a detailed RFI report produced for each supplier visited. 2. Review report based on potential supplier's information is produced. 3. A limited number of supplier candidates are shortlisted based on the acquisition organization's policy.
Step 4. Preparing contract requirements (5.6)	1. Determine the required quality of the work. 2. Determine how payment is to be made. 3. Determine nonperformance remedies. 4. Prepare contract provisions. 5. Review contract provisions with legal counsel.	1. The desired level of quality of work is determined. 2. Payment terms are determined. 3. Remedies for non-performance are determined. 4. Contract for engaging a supplier is produced and approved. 5. Legal review opinion including caveats and limitations documented.
Step 5. Evaluating proposals and selecting the supplier (5.7)	1. Evaluate supplier proposals. 2. Visit supplier facilities. 3. Select a qualified supplier. 4. Negotiate the contract.	1. An evaluation report on proposals submitted is produced. 2. A qualified and preferred supplier is selected. 3. A contract between acquirer and supplier is negotiated and signed.
Step 6. Managing for supplier performance (5.8)	1. Manage the contract during execution. 2. Monitor the supplier's progress.	1. Performance measures or assessment results are available. 2. Adequacy of roles and accountabilities is assessed. 3. Agreement objectives are achieved. 4. Accountability in carrying out project activities and tasks. 5. Issues (including problems) in project execution are managed.
Step 7. Accepting the software (5.9)	1. Review and update the acceptance criteria. 2. Conduct a review and test of the software. 3. Manage the testing process. 4. Document the test results.	1. An acceptance testing report on delivered software solution is produced. 2. Decision to accept, reject or make changes to the delivered software solution is made.
Step 8. Evaluating the process and identifying improvement opportunities (5.10)	1. Evaluate contracting practices. 2. Evaluate software product quality. 3. Evaluate supplier performance.	1. Contracting practices evaluated and reviewed. 2. Acquired software product is evaluated. 3. Supplier performance is evaluated. 4. A detailed evaluation report is produced.

5.3 Step 1: Planning the software acquisition strategy

5.3.1 Purpose

a)   The purpose of planning the software acquisition is to define the acquisition strategy. Planning for software acquisition begins when an organization has established a need for a software system and has made the decision to acquire the software rather than to develop it in-house. This includes the activities performed to define an acquisition strategy for the software to be acquired. The acquisition strategy includes a description of what is to be acquired, the length of time estimated for implementation, and an estimate of the cost of the implementation. The acquisition strategy also includes a concept for how the software will be operated and maintained; whether by the acquirer, the supplier, or by a third party.

b)   Planning includes the definition of the acquisition plan to be used by the acquirer. The acquisition plan describes the activities that the acquisition organization should perform to acquire the software.

5.3.2 Outcomes

The outcomes of Step 1 are as follows:

—   High level specification of functional and non-functional requirements to confirm need for a system and guide acquisition planning is produced.

—   Acquisition plan is specified and deliberated on.

—   Acquisition plan is approved.

5.3.3 Activities and tasks

5.3.3.1 Initiate a planning process

Before initiating planning, the acquirer should ascertain if any established acquisition processes policies exist (preferred supplier lists, etc.) for the planning organization.

Initiate a planning process by

a)   Developing a scope for the planning process

b)   Forming a planning group and reviewing the organization's objectives

c)   Identifying the qualities a software product should possess to achieve the organization's objectives

5.3.3.2 Develop an acquisition strategy

The qualities and basic characteristics software should possess to achieve the organization's objectives should be determined in order to detail a strategy for acquiring the software. These characteristics can include high-level descriptions of functionality, as well as other characteristics such as the required time frame, estimated cost, etc. Constraints in the planned software environment can limit choices to software that is compatible with the environment and available infrastructure.

This strategy should include the following:

a)   Developing lists of capabilities (those of the acquiring organization and those of potential suppliers) that would be helpful in identifying who could provide the needed software.

b)   Identifying responsibilities that are associated with either the supplier or the acquirer.

c)   Determining the extent of the supplier's organizational involvement in providing a high-quality product (consider the strategic areas shown in Annex A, Checklist 1).

d)   Identify the potential options for acquisition and the risk, cost, and benefits for each. ISO/IEC/IEEE Std 12207 lists potential options.

e)   Custom-developed versus OTS versus SaaS: It is important that the acquirer become aware of which of these three options are viable at this point in the planning process. If experienced vendors exist, the OTS or SaaS options become important as the acquirer starts to identify such acquisition options and the necessary trade space to compare one of those options against the other.

f)   The strategy should be flexible enough to leave room for negotiations between acquirer and supplier. Suppliers may propose unanticipated solutions to the project or may wish to negotiate agreement types, responsibilities, terms and conditions, etc. The strategy should not favor any particular supplier in order to provide a fair level of competition to all potential suppliers.

5.3.3.3 Develop an acquisition plan

An acquisition plan should document the acquisition of software for a particular project and should contain the following:

a)   Requirements to determine the scope of the system to be acquired

b)   A description of how the software will be used

c)   A risk assessment and associated planned risk management actions

5.3.3.4 Include contracting practices

When establishing an acquisition process, the following should be documented as appropriate in the project's acquisition plan:

a)   Selection of contracting method(s) or agreements

b)   Preparation of contracting exhibits describing the work required, deliverables, support, training, and acceptance requirements

c)   Consideration of what support, training, and other activities will be provided by the supplier and what will be provided by acquirer's organizations

d)   Assignment of negotiation and contract administration responsibilities

e)   Milestones that will be used to monitor the project's progress and acceptance

f)   The primary responsibilities of the acquirer's organization

g)   The primary responsibilities of the supplier, including the processes that will be imposed on the supplier

h)   The method to be used to address contract changes, including but not limited to triggers for renegotiation

5.3.3.5 Obtain acquisition services from other organizations

If some of the above acquisition tasks are not performed within the acquirer's organization, help should be obtained from other organizations that can provide consultation and assistance in software contracting and negotiating.

5.3.3.6 Tailor the process

The process may be tailored to perform these tasks at a level appropriate for the complexity of the software to be acquired. For example, procurement of an off-the-shelf product may not require extensive requirements documentation, but may require a support or training agreement. Likewise, a large development project with many requirements will likely require all of the topics listed above to be addressed.

The processes that both the acquirer and supplier are required to implement may be tailored as appropriate. The amount of tailoring permissible for the supplier should be included in contract documents.

Reference to internal policies and practices may be used for additional guidance on implementing a process for acquiring high-quality software. A reference list of information currently available within the organization should be maintained.

After completing the acquisition process, lessons learned should be collected and reviewed to identify potential process improvements to meet the changing needs and objectives of the organization.

5.4 Step 2: Defining the acquisition and software requirements

5.4.1 Purpose

The purpose of defining the software requirement is to specify detailed functional and non-functional requirements for the software to be procured and use these to produce the request for proposal (RFP) and statement of work (SOW).

5.4.2 Outcomes

The outcomes of Step 2 are as follows:

— The software to be acquired is defined in detail.
— The SOW is defined and approved.
— Software requirements are specified and approved.
— A detailed RFP that includes acquirer and supplier obligations is produced and approved.
— Evaluation and acceptance criteria for the software to be acquired are produced.
— Contingency plan is drawn up and approved.

5.4.3 Activities and tasks

5.4.3.1 Define the software being acquired

The objective is to develop the requirements for the software, including functional, performance, and non-functional requirements and to obtain from the supplier(s) realistic assessments of the size, scope, and cost of the effort required for the software.

Functional requirements specify what the software should do. Performance requirements specify the performance attributes for the software, such as computational load, algorithm timing, precision, or accuracy. Non-functional requirements specify the quality attributes required for the software, such as dependability, reliability, availability, or maintainability.

The needed software, deliverables, and software support should be described as completely as possible in the RFP so that the supplier can understand and address the scope of work in the proposal. The example questions in Annex A, Checklist 2 may be used as a starting point.

IEEE Std 830™ [B5] should be used to document the requirements.

Depending upon the type of software being acquired, a request for quote or other acquisition document may be used in place of the RFP.

5.4.3.2 Establish supplier evaluation criteria

The objective is to confirm that the supplier most suited to do the work is selected.

Evaluation criteria should be developed to use in reviewing supplier proposals, identifying nonresponsive suppliers, and selecting a qualified supplier. The supplier's management qualifications, technical approach, quality assurance program, and proposed cost should be considered. The questions in Annex A, Checklist 3, may be used.

A provision should be included in the RFP requiring inspections of supplier facilities to investigate and evaluate various factors, including financial position, technical capability, experience, and quality practices.

5.4.3.3 Establish acquirer and supplier obligations

The objective is to establish and clearly state the obligations of both the acquirer and the supplier. Annex A, Checklist 4, may be used.

5.4.3.4 Develop plans to evaluate and accept software and services

Quality and maintenance plans should be developed to use in evaluating and accepting the software and services provided by the supplier. Annex A, Checklist 5, may be used.

5.4.3.5 Develop contingency plans

Contingency plans should be developed to use in the event the supplier fails to satisfy contract requirements and the contract is then terminated. The complexity of the project and the risk in achieving the contract requirement should be considered.

5.5 Step 3: Identifying potential suppliers

5.5.1 Purpose

The purpose is to identify potential suppliers of the required software through a request for information (RFI) followed by site visits to those potential suppliers.

Contact potential suppliers and schedule the itinerary for facilities visiting. Facilities visiting participants should be selected and meeting agenda should be prepared in advance. A comparison chart to record observations made during the supplier facility visit should be created. Annex A, Checklist 3, may be used. The purpose of the visiting is to verify the RFI responses matched with suppliers' operation practices, to validate products demonstration, and to review document and quality system. A presentation of the RFI response should be conducted by suppliers for critical points clarification and a management or executive level meeting will be helpful for mutual understanding of further cooperation possibility.

Identify a group of suppliers whose offers are likely to be acceptable to receive an RFP for further evaluation. Also, evaluate if a non-disclosure agreement (NDA) is required for the RFP to secure both acquirer's and supplier's confidential information.

It is important that the acquirer establishes "valid supplier" criteria and that these are shared with the supplier community. This can reduce the possibility of protests against any final supplier selection.

Custom-developed vs OTS vs SaaS can be summarized as follows:

a) Custom-developed: If custom built software is an option, then determining the past performance of a potential supplier in the domain (e.g., communications, spacecraft, IT) is important.

b) OTS/SaaS: If OTS or SaaS is an option, determining the satisfaction of the user community of the product/service is important. This can sometimes be accomplished by interacting with product/service user groups for a given product/service.

5.5.2 Outcomes

The outcomes of Step 3 are as follows:

— Potential supplier information is gathered and a detailed RFI report produced for each supplier visited.

— Review report based on potential supplier's information is produced.

— A limited number of supplier candidates (e.g., 3) are shortlisted based on the acquisition organization's policy.

5.5.3 Activities and tasks

5.5.3.1 Gather software supplier's information

Prepare an RFI/market survey and/or user survey form to collect software suppliers' information. Collect any information to assist further evaluation and mitigate the acquisition risk.

The RFI should consist of general company and domain specific information.

a)   General company information includes company size, founder/executives, location(s), subsidiaries, product roadmap, service cost, financial information (capital and/or statements), and quality process/system. Annex A, Checklist 3 may be helpful.

b)   Domain specific information such as domain specific technology/knowledge, expertise, development resources, patent list, and test equipment is required for further evaluation. Information from Annex A, Checklist 2 may be helpful.

The RFI and user survey needs to be managed to determine who should receive it. The supplier list may be obtained from technical alliance membership lists, exhibition and/or trade publications, consultants, supplier-chain management (refer to ISO/IEC/IEEE 12207). The user list can be obtained from suppliers' website, consultant, or other stakeholders' recommendation.

A task owner should be assigned to distribute the RFI and/or user survey form to appropriate suppliers or users. She/he should also be responsible for collecting the RFI and user survey response. The RFI and user survey form should define the deadline for response submission.

5.5.3.2 Review software supplier's information

Review the general company information and filter out those are not appropriate for the software to be acquired. The criteria, especially security and/or financial, should be defined according to organization's acquisition strategy, information from Annex A, Checklist 3 may be helpful.

Review domain specific information and user survey responses. The acquirer's project team should define criteria for the technical related thresholds such as quality process maturity level, person-years of expertise team experience, domain knowledge scope, patent(s) protection coverage, etc.

If a supplier has been contracted with before, review the suppliers' performance and commitment fulfillment.

The suppliers identified with capability insufficiency and/or bad user experience should be eliminated from the potential suppliers list. Suppliers without the capability to handle a large effort on their own may be awarded a portion of a project, as an encouragement to small businesses or to apply specific expertise.

5.5.3.3 Survey users of the supplier's software

One indicator of the quality and effectiveness of a software product is the number of satisfied companies currently using the software. Users can provide information on volume throughput planning and system degradation, and important insights on correcting software failures. The nature, quality, speed, and reliability of maintenance may be determined by exploring other users' experiences. The following should be considered:

a)   Establishing functional and performance requirements.

b)   Evaluating software product against the functional and performance requirements of item a).

c)   Evaluating the adequacy of the development process including the activities of quality assurance, configuration management, verification and validation, reliability measurement, documentation, and maintenance.

When preparing to contact users about a product, the questions suggested in Annex A, Checklist 6, may be used. This checklist can be easily modified to fit the acquirer's needs.

5.6 Step 4: Preparing contract requirements

5.6.1 Purpose

The purpose is to prepare a detailed contract for the engagement of the chosen supplier.

5.6.2 Outcomes

The outcomes of Step 4 are as follows:

— The desired level of quality of work is determined.

— Payment terms are determined.

— Remedies for non-performance are determined.

— Contract for engaging a supplier is produced and approved.

— Legal review opinion including caveats and limitations documented.

5.6.3 Activities and tasks

5.6.3.1 Determine the required quality of the work

The objective is to prepare a contract that describes the expected quality level of the finished work. The following should be included:

a) Describe in the contract's statement of work the relationship between the supplier and acquirer, and who has responsibility for each task. The list of supplier and acquirer obligations developed from Annex A, Checklist 4, may be used (see 5.5.3).

b) Describe in the contract what will be delivered, and what constitutes satisfactory and timely performance by the supplier (see Annex A, Checklist 7.).

c) Specify who is authorized to make changes in the contract and to answer supplier questions.

d) Consider providing in the contract means to monitor the supplier's progress. To do this, divide the development effort into logical work steps. The more undefined the software is, the closer the steps should be at the outset. The acquirer's approval should be required for each step before the development is allowed to continue to the next step. Identify performance as well as functional specifications.

e) Specify what measures will be used to determine the acceptability of the product or service. Service contracts often include service level agreements (SLA) that define an acceptable level of service. Agreements for developed software can require acceptance testing in the acquirer's environment.

f) Specify the measures of reliability and quality by which the supplier's work will be evaluated. The list of quality objectives developed from Annex A, Checklist 5, may be used.

g) Specify the criteria for software evaluation. The list of criteria developed from Annex A, Checklist 10, may be used.

5.6.3.2 Determine how payment is to be made

The objective is to create a contract that ties supplier payments to contract deliverables (see Annex A, Checklist 8).

5.6.3.3 Determine nonperformance remedies

An objective of this step is to prepare a contract that provides the acquirer the right to terminate the contract if the supplier cannot perform according to the contract's terms. The satisfactory performance and acceptance testing criteria developed from Annex A, Checklist 7, can be used to identify work that does not meet contract requirements.

Include a provision requiring the supplier to deliver, at contract termination, all agreed deliverables.

Complex projects where there is significant risk in achieving the contract requirements should include a provision that requires the supplier to deposit with an escrow agent source code, documentation and other material deemed appropriate by the acquirer.

5.6.3.4 Prepare contract provisions

Contract provisions should be developed according to the acquirer's needs. Consideration should be given to the following when preparing the contract:

— Review the objectives previously described in 5.5.1. Select those provisions that represent the acquirer's business practices that influence or contribute to obtaining a high-quality product.

— Identify the contracting method most appropriate for acquiring software products or services from suppliers.

— Incorporate in the agreement the acquirer selected provisions. Review existing agreements and consider including favorable contract provisions used successfully in the past.

— Incorporate in the agreement appropriate contract exhibits describing the work required, deliverables, support, and training (see Annex A, Checklist 2) and the acceptance requirements (see Annex A, Checklist 7, Checklist 10, and Checklist 12).

5.6.3.5 Review contract provisions with legal counsel

During the review of the contract provisions, modify existing provisions in the agreement as required. When these modifications affect any of the intellectual property or other legal provisions, then these modified provisions should be reviewed with the organization's legal counsel.

— SaaS: When renting access to a software product, typically a Service Level Agreement is involved as part of the contracting effort.

— OTS: When buying an OTS product, not only are contracts involved, but purchase agreements and license agreements typically are also required. It is important that the consequences of these various contractual devices are well understood.

— Custom-developed: In custom-developed systems, a documents needing legal counsel review (i.e., SOW, data rights, purchase agreements, license agreements, IP) are required. For government acquisition, regulations such as the Federal Acquisition Regulation (FAR) are important to understand and incorporate.

5.7 Step 5: Evaluating proposals and selecting the supplier

5.7.1 Purpose

The purpose is to confirm that a skilled and responsible supplier is selected. The supplier qualification and selection process is established as a part of the software acquisition process.

a)   Evaluate supplier proposals.

b)   Visit supplier facilities.

c)   Select a qualified supplier.

d)   Negotiate the contract.

5.7.2 Outcomes

The outcomes of Step 5 are as follows:

—   An evaluation report on proposals submitted is produced.

—   A qualified and preferred supplier is selected.

—   A contract between acquirer and supplier is negotiated and signed.

5.7.3 Activities and tasks

5.7.3.1 Evaluate supplier proposals

Use the evaluation criteria established in the acquirer's proposal evaluation standards to review supplier's responsiveness to the software requirements, deliverables, and software support requirements described in the RFP. Consider the supplier's management qualifications, technical approach, quality assurance program, and proposed cost estimate.

If the supplier proposes the use of existing software products, the list of questions in Annex A, Checklist 10, may be helpful.

Consider any results observed during supplier demonstrations at the supplier's site or the acquirer's site, and supplier facility visits.

Determine for whom the supplier has produced work. Solicit comments from the supplier's prior customers. The questions in Annex A, Checklist 6, may be used as a guide.

Costs should be compared to other supplier's prices and schedules. Caution should be exercised when the supplier's proposed costs are much higher or lower than the average of all costs received.

Suppliers that are not completely responsive to the requirements in the RFP should be eliminated from further consideration.

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5.7.3.2 Visit supplier facilities

During the proposal evaluation period, visit supplier facilities to investigate and evaluate various factors, including financial position, technical capability, experience, and quality practices. See Annex A, Checklist 3, for ideas on evaluating supplier capabilities.

Determine whether supplier's staff has experience with the problem domain for the software to be acquired, the required languages, and with the software and hardware to be used during development. Review resumes of personnel who would be assigned to the project and conduct interviews, if needed.

Determine whether any changes are under consideration that might impact the progress of the development project, i.e., changes in organization, moving of supplier offices, or change in ownership.

5.7.3.3 Select a qualified supplier

Summarize the results achieved from supplier evaluations, demonstrations, and visits to supplier facilities and compare the results against the proposal evaluation standards. Select a qualified supplier from the best two or three candidates and begin negotiations.

5.7.3.4 Negotiate the contract

Negotiate the contract to develop, produce, and/or deliver the software with the supplier representative who has final negotiating authority. Negotiations should be based upon the existence of adequate written specifications; a definition of the obligations and responsibilities of the supplier and acquirer; the time frames in which the work is to be accomplished; and a balance of the responsibilities, risks, and benefits to both parties.

During the negotiating process, identify any problems and misunderstandings, examine potential uncertainties, allocate the risks, and protect both parties. Consideration should be given to the following when negotiating the contract:

a) Provide a means of avoiding disputes and of resolving disputes that may arise

b) Provide for investing only a minimum amount of funds before the quality of the supplier's work or product is demonstrated

c) Provide for a maximum total price, payment amounts, or total value of the contract

Confirm the right of using intellectual property of acquired software and the remedy process if intellectual property infringement occurs on the acquired software to protect acquirer's product delivery.

The acquirer should negotiate necessary maintenance supplements with the supplier to extend the acquisition software lifecycle though the sustainability is not included in the acquisition process.

Define the process of invoking and escalating urgent/critical events (delivery schedule slipped, critical/quality issue, payment delay, response time, etc.) to the supplier management for prioritization and resolution.

The review comments from business, finance, legal, procurement, and technical stakeholders should be consolidated for negotiation reference.

Compare contract against related or previous contracts for organization acquisition policy/strategy consistency.

The acquirer should adjust the contract consideration in accordance with custom-developed/OTS/SaaS acquisition model.

If negotiations with the selected supplier fail to produce a contract that will assure delivery of a quality product on time and properly supported, consider opening negotiations with an alternate supplier.

5.8 Step 6: Managing for supplier performance

5.8.1 Purpose

The purpose of managing for supplier performance is to determine the status of the work and process execution to help assure that performance is consistent with the agreement and milestones are met.

5.8.2 Outcomes

The outcomes of Step 6 are as follows:

— Performance measures or assessment results are available.

— Adequacy of roles and accountabilities is assessed.

— Agreement objectives are achieved.

— Accountability in carrying out project activities and tasks.

— Issues (including problems) in project execution are managed.

5.8.3 Activities and tasks

The acquirer and supplier should cooperate within the agreed terms of the contract. The acquirer should manage delivery of the software product through reviews and audits as specified in the agreement. The frequency of reviews depends on the size, risk, and previous performance of the effort (ISO/IEC/IEEE 12207). Consideration should be given to the following when managing a contract:

a) The acquirer should provide any required work product (e.g., equipment, software, machine time, and reference materials) to the supplier within the specified time frames so that the supplier is not delayed. When provided, the work products should be complete and accurate to provide a basis for the supplier's work. Any discrepancies should be dealt with immediately.

b) Management should create an environment within the organization that supports the supplier's efforts. Internal disagreements should be resolved in-house by management and not left for the supplier to encounter.

c) An individual should be appointed to deal with the supplier on all aspects of the contract. If possible, the same person who previously worked with the supplier should be kept on the project throughout the contract. All discovered problems should be resolved. The individual appointed to deal with the supplier will be responsible for confirming that all discovered problems (e.g., during the reviews) "are identified, analyzed, managed, and controlled to resolution" (ISO/IEC/IEEE 12207).

d) An open line of communication should be maintained with the supplier. A representative of the acquirer should be closely involved in the development and provide continuous feedback to the acquirer. Undocumented informal communication can lead to additional costs; therefore any changes in the scope of work should be handled by amending the contract.

e)   Depending on the type of contract, performance information can be used for award fees determination. Consideration should be given to the following when monitoring supplier progress:

1)   The representative of the acquirer closely involved in all the development should participate in the planning of each iteration, at development reviews at the end of each iteration (or other segment of work), and manage the delivery of contract products yet to be delivered.

2)   Use measures (e.g., of reliability) specified in the contract to evaluate the supplier's work.

f)   Regular and continuous feedback to the supplier on supplier performance (see Annex A, Checklist 7) in terms of overall progress and on handling problems, should be provided.

g)   The acquirer should maintain a process for risk management in order to manage the risk of contract default.

5.9 Step 7: Accepting the software

5.9.1 Purpose

The purpose of software acceptance is to manage the acceptance of the software product by the acquirer by following an acceptance testing process that has been agreed to by both the acquirer and supplier. Acceptance begins when the acquirer receives the completed product. The acquirer determines whether the product meets all functional, performance, and non-functional requirements. This process may include tests conducted in the supplier's development environment and tests conducted in the acquirer's operational environment. When the acquirer has determined that the software product meets the requirements of the contract, the software product is accepted, including any documentation or other support provided from the supplier. Before accepting the software, the processes in 5.9.2 through 5.9.4 should be completed.

5.9.2 Outcomes

The outcomes of Step 7 are as follows:

—   An acceptance testing report on delivered software solution is produced.

—   Decision to accept, reject or make changes to the delivered software solution is made.

5.9.3 Activities and tasks

5.9.3.1 Review and update the acceptance criteria

The objective is to confirm that all acceptance criteria have been satisfied. Review and update the acceptance criteria for the software product. When the software is ready to be accepted, Annex A, Checklist 12, may be used. All remedies should be reviewed in case the supplier fails to perform. When accepting software, final payment should not be made to the supplier until it has been certified that all the software deliverables meet contract specifications and that all acceptance criteria have been satisfied. If nonperformance is encountered, exercise the contract provisions to withhold or reduce payments to the supplier. To minimize losses and time delays, if the contract is terminated, exercise the acquirer's contingency plans.

5.9.3.2 Conduct a review and test of the software

The objective is to review and test to confirm that the software meets contract specifications. Software testing is beyond the scope of this document, ISO/IEC/IEEE 29119 parts 1 to 4, and IEEE Std 1012™ [B6] provide requirements and guidance. Consideration should be given to the following when reviewing and testing the software:

a)   Acceptance criteria provided as a part of supplier performance standards should be kept meaningful and current.

b)   Evaluations and tests should be conducted to detect the differences between existing and required conditions and to evaluate the features of the software (e.g., conformance to specifications, standards, performance, portability, or functionality).

c)   Consideration should be given to conducting a system-level test, particularly when the software is to be used in another system. Once it has been determined the test is needed, then it should be included in the acceptance criteria.

d)   Final acceptance criteria should include testing results to verify conformance to standards, performance, and quality of the software in a user environment.

e)   The quality, conformance to standards and maintenance plans developed for the project should be used in evaluating and accepting the software and services provided by the supplier.

5.9.3.3 Manage the testing process

The acquirer should confirm that an appropriate amount of effort and cost is applied to ensure high-quality software. Consideration should be given to the following during software testing:

a)   When evaluating a software product, the list of questions in Annex A, Checklist 10, may be helpful in considering significant factors that would have some impact on the quality of the product. This list is also useful when preparing requirements for a fully developed software effort (see 5.5.1). This list may be tailored by adding other factors and questions that are important to the acquirer's organization.

b)   When testing a software product, the acquirer should have a role in the testing process. Annex A, Checklist 11, may be used in defining that role.

5.9.4 Document the test results

The acquirer should update and review the test results against the software specifications. The review should include: conformance to specifications, standards, performance, portability and functionality. Test results should be used as the acceptance or rejection of the software.

5.10 Step 8: Evaluating the process and identifying improvement opportunities

5.10.1 Purpose

The purpose of the acquisition evaluation is

—   To assess how well the software solution meets the identified need and software requirements

—   To assess how well the software acquisition process was handled and suggest improvements otherwise.

An analysis should be conducted on the software acquisition contract to evaluate contracting practices, evaluate product quality, notably quality in use, as for example, user satisfaction with the product, and evaluate supplier performance. The evaluation should result in usable information for future acquisitions.

5.10.2 Outcomes

The outcomes of Step 8 are as follows:

— Contracting processes are evaluated and reviewed.

— Acquired software product is evaluated.

— Supplier performance is evaluated.

— A detailed evaluation report is produced.

5.10.3 Activities and tasks

5.10.3.1 Evaluate contracting practices

Consideration should be given to the following when evaluating contracting practices:

a) Identify practices that are ineffective or inefficient and need to be changed.

b) Identify and retain practices that produced good results.

c) Identify additional practices that need to be developed and implemented.

5.10.3.2 Evaluate software product quality

The objective is to determine the quality of the deployed product. Before starting to evaluate product quality, the acquirer should define the criteria for the evaluation starting with the criteria defined in Step 1 (5.3) and written in the contract agreement. Emphasis should be placed on quality in use and user satisfaction in particular. Acquirers are advised to follow models like ISO/IEC 25000 series for product quality.

Consideration should be given to the following when assessing product quality:

a) Evaluate user satisfaction with the software.

b) Record the actual amount of software maintenance work that is needed after the software is put into use.

c) Record data about other software product qualities that in the minimum should be the specified in the contract agreement. A product quality model and measures are defined in the ISO/IEC 25000 families of standards, particularly the quality in use model. A product evaluation process for acquires is described in ISO/IEC 14598-4 that can be used with the ISO/IEC 25000 families.

d) Follow the organization defined measurement process.

5.10.3.3 Evaluate supplier performance

When evaluating supplier performance, retain performance data (from Step 7) on the individual supplier for future reference. Also, record the maturity level, or capability levels of the supplier. This information could be obtained, for example, from a software process evaluation of the possible suppliers during contracting.

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6. Quality assurance for software acquisition

6.1 Objectives of quality assurance in software acquisition

The acquisition of software should aim to achieve the desired or intended acquirer goals and objectives. Quality assurance (QA) in the acquisition of software facilitates the achievement of the goal(s) through of the following (specific objectives):

— Reducing risk in the software acquisition processes and activities.

— Ensuring the acquired software solution conforms to requirements and are acceptable to the acquirer and end user.

— Enabling acquirer selection teams to identify contractors whose methodologies and processes in architecting and delivering software solutions are compliant with known standards and are most likely to produce the desired results.

6.2 Implementing quality assurance in software acquisition

It is recommended that QA activities be performed in every step of the software acquisition process. The quality assurance approach will depend on the software acquisition option that is chosen or implemented. A detailed quality assurance plan reflective of the software acquisition option is necessary to detail specific quality assurance activities during the software acquisition process. These activities help ensure the acquisition processes and methods are monitored and evaluated to avoid mistakes or defects. Such activities may simply involve checking activities/processes/results of a given stage /process against known ISO/IEC and IEEE standards.

Table 3 includes recommended quality assurance activities for each step in the software acquisition process.

Table 3—Recommended quality assurance activities

Steps in software acquisition process	Recommended quality assurance activities	Applicable standards/guidelines
Step 1. Planning the software acquisition strategy (5.3)	1. Check completeness and compliance of the defined strategy/approach 2. Compile quality assurance plan.	PMBOK ISO/IEC/IEEE 12207 ISO/IEC 16326 [B13]
Step 2. Defining the acquisition and software requirements (5.4)	1. Check that requirements specifications are unambiguous and comply with standards.	ISO/IEC 29148
Step 3. Identifying potential suppliers (5.5)	1. Check compliance of potential supplier's processes against known standards to determine level of likelihood to succeed. 2. Evaluate capability of potential supplier in terms of software development service delivery record.	ISO/IEC 29110 [B17] ISO/IEC 15504-2 [B11] ISO/IEC 15504-5 [B12] IEEE Std 1012 [B6]
Step 4. Preparing contract requirements (5.6)	1. Check completeness of contract specification and seek legal advice.	ISO/IEC/IEEE 12207
Step 5. Evaluating proposals and selecting the supplier (5.7)	1. Check solution against requirements.	
Step 6. Managing for supplier performance (5.8)	1. Evaluate software/solution design and trace to requirements. 2. Evaluate database design and trace to requirements.	ISO/IEC/IEEE 12207 ISO/IEC/IEEE 12207 IEEE Std 1012 [B6]
Step 7. Accepting the software (5.9)	1. Assemble user acceptance test cases to support verification of requirements. 2. Evaluate results of acceptance tests conducted using the acceptance test cases. 3. Check completeness of user manuals.	ISO/IEC 25051 [B15] ISO/IEC/IEEE 29119 [B10] IEEE Std 1012 [B6] IEEE Std 730 [B4]
Step 8. Evaluating the process and identifying improvement opportunities (5.10)	1. Monitor performance against requirements. 2. Monitor and observe quality in use	ISO/IEC/IEEE 12207 ISO/IEC/IEEE 15288 ISO/IEC 25050 [B13]

Annex A

(informative)

Checklists for quality software acquisition processes

Checklists in this annex are provided to assist organizations in establishing an organization's own software acquisition process. These checklists are intended to help organizations think about relevant issues to specific organization and software acquisition efforts. The checklists are not applicable to every acquisition and should be tailored to a specific software acquisition effort.

Table A.1—Checklists supporting the eight steps in acquiring software

Steps in software acquisition process	Checklists
Step 1. Planning the software acquisition strategy (5.3)	A.1 Organizational strategy
Step 2. Defining the acquisition and software requirements. (5.4)	A.2 Define the software A.3 Supplier selection evaluation A.4 Supplier and acquirer obligations A.5 Quality and maintenance plans
Step 3. Identifying potential suppliers (5.5)	A.1 Organizational strategy A.3 Supplier selection evaluation A.6 User survey
Step 4. Preparing contract requirements (5.6)	A.2 Define the software A.4 Supplier and acquirer obligations A.5 Quality and maintenance plans A.7 Supplier performance standards A.8 Contract payments A.10 Software evaluation
Step 5. Evaluating proposals and selecting the supplier (5.7)	A.7 Supplier performance standards A.9 Monitor supplier progress
Step 6. Managing for supplier performance (5.8)	A.7 Supplier performance standards A.9 Monitor supplier progress
Step 7. Accepting the software (5.9)	A.10 Software evaluation A.11 Software testing A.12 Software acceptance

A.1 Checklist 1: Organizational strategy

a)   Who is the preferred party to provide software support?   Supplier ❏ Acquirer ❏

b)   Is maintenance documentation necessary?   Yes ❏ No ❏

c)   Should user training be provided by the supplier?   Yes ❏ No ❏

d)   Will acquirer's personnel need training?   Yes ❏ No ❏

e)   When software conversion or modification is planned:

  1)   Will supplier manuals sufficiently describe the supplier's software?   Yes ❏ No ❏

  2)   Will specifications be necessary to describe the conversion or modification requirements and the implementation details of the conversion or modification?   Yes ❏ No ❏

  3)   Who will provide these specifications?   Supplier ❏ Acquirer ❏

  4)   Who should approve these specifications?   Yes ❏ No ❏

f)   Should source code be provided by the supplier so that modifications can be made?   Yes ❏ No ❏

g)   Who will own the IP (Intellectual property) for the software product

h)   Are supplier publications suitable for end users?   Yes ❏ No ❏

  1)   Will unique publications be necessary?   Yes ❏ No ❏

  2)   Will unique publications require formal acceptance?   Yes ❏ No ❏

  3)   Are there copyright or royalty issues?   Yes ❏ No ❏

i)   Will the software be evaluated and certified?   Yes ❏ No ❏

  1)   Is a survey of the supplier's existing customers sufficient?   Yes ❏ No ❏

  2)   Are reviews and audits desirable?   Yes ❏ No ❏

  3)   Is a testing period preferable to demonstrate that the software and its associated documentation are usable in the intended environment?   Yes ❏ No ❏

  4)   Where will the testing be performed? _____

  5)   Who will perform the testing? _____

  6)   When will the software be ready for acceptance? _____

j)   Will supplier support be necessary during initial installations of the software by end users?   Yes ❏ No ❏

k)   Will subsequent releases of the software be made?   Yes ❏ No ❏

  1)   If so, how many? _____

  2)   Will there be compatibility with each other?   Yes ❏ No ❏

l)   Will the acquired software require rework whenever operating system changes occur?   Yes ❏ No ❏

  1)   If so, how will the rework be accomplished? _____

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A.2 Checklist 2: Define the software

a)   When is the software required? _____

b)   What is the budget for the software? _____

c)   What are the key functions the software should perform _____

d)   What are the key organizational capabilities needed to produce the software? _____

e)   What are the key responsibilities of the acquirer? _____

f)   What are the key responsibilities of the supplier? _____

g)   What are some options for the software solution, and what are the risks and benefits of each potential solution? _____

h)   Rate the importance of the following aspects of the software being acquired

   1)   Functional specification   Important ❐ Not Important ❐

   2)   Capability specification including performance,   Important ❐ Not Important ❐
        physical characteristics, and environmental conditions
        under which the software is to perform.

   3)   Interfaces external to the system and software   Important ❐ Not Important ❐

   4)   Qualification requirements   Important ❐ Not Important ❐

   5)   Safety specifications including those related to   Important ❐ Not Important ❐
        methods of operation and maintenance, environmental
        influences, and personnel injury.

   6)   Security specifications including those related to Important ❐ Not Important ❐
        compromise of sensitive information

   7)   Human-factors engineering (ergonomics) specifications Important ❐ Not Important ❐
        including those related to manual operations,
        human-equipment interactions, constraints on
        personnel, and areas needing concentrated human
        attention, that are sensitive to human errors and
        training

   8)   Data definitions and database requirements   Important ❐ Not Important ❐

   9)   Installation and acceptance requirements of the   Important ❐ Not Important ❐
        delivered software product at the operation and
        maintenance site(s).

   10) User documentation requirements.   Important ❐ Not Important ❐

   11) User operation and execution requirements.   Important ❐ Not Important ❐

   12) User maintenance requirements.   Important ❐ Not Important ❐

   13) Any known constraints or parameters   Important ❐ Not Important ❐

i)   Rate the importance of the deliverables to be included with the software being defined and who is responsible for the format of each deliverable

   1)   Software architecture   Important ❐ Not Important ❐
                                                          Acquirer format ❐ Supplier format ❐

   2)   Software design documentation   Important ❐ Not Important ❐
        (including database design, if relevant)   Acquirer format ❐ Supplier format ❐

3)   Software description   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

4)   Source code listings   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

5)   User documentation   Important ❐ Not Important ❐
(ISO/IEC/IEEE 26514 should be used to create   Acquirer format ❐ Supplier format ❐
user documentation)

6)   Support documentation   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

7)   Sales and promotional material   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

8)   List of current users (existing software product)   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

9)   Off-the-shelf product documentation   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

10)   Software release documentation   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

11)   Software test documentation   Important ❐ Not Important ❐

                                                      Acquirer format ❐ Supplier format ❐

j)   Rate the importance of the software support to be provided with the software being defined

    1)   User training   Important ❐ Not Important ❐

    2)   Internal training   Important ❐ Not Important ❐

    3)   Installation support   Important ❐ Not Important ❐

    4)   Post-installation support   Important ❐ Not Important ❐

    5)   Correction of errors   Important ❐ Not Important ❐

    6)   Modifications, when requested   Important ❐ Not Important ❐

    7)   Software warranty   Important ❐ Not Important ❐

    8)   Documentation warranty   Important ❐ Not Important ❐

    9)   New releases of the software   Important ❐ Not Important ❐

    10)   Free and open source software (FOSS) products used   Important ❐ Not Important ❐

A.3 Checklist 3: Supplier selection evaluation

Financial soundness

    a) Can a current financial statement be obtained for examination?   Yes ❐ No ❐

    b) Is an independent financial rating available?   Yes ❐ No ❐

    c) Has the company or any of its principals ever been involved

       in bankruptcy or computer-related litigation?   Yes ❐ No ❐

    d) How long has the company been in business? _____

    e) What is the company's history? _____

Experience and capabilities

    a) List by job function the number of people in the company. _____

    b) List the names of sales and technical representatives

       and contact persons for support. _____

    c) Can they be interviewed?   Yes ❐ No ❐

    d) List the supplier's software products that are sold and the number of

       installations of each. _____

    3) Is a list of users available?   Yes ❐ No ❐

Development and control processes

    a) Are software development practices and standards used?   Yes ❐ No ❐

    b) Are software development practices and standards adequate?   Yes ❐ No ❐

    c) Are the currently used practices written down?   Yes ❐ No ❐

    d) Are documentation guidelines available?   Yes ❐ No ❐

    e) How is testing accomplished? _____

    f) Are the security procedures adequate?   Yes ❐ No ❐

    g) Does the supplier have any software related certifications

       or maturity/capability level ratings?   Yes ❐   No ❐

       List the certifications and/reference models and ratings achieved _____

Technical assistance

    a) What assistance is provided at the installation time?

    b) Can staff training be conducted on site?   Yes ❐ No ❐

    c) To what extent can the software and documentation be modified

       to meet user requirements? _____

    d) Who will make changes to the software and documentation? _____

    e) Will modification invalidate the warranty?   Yes ❐ No ❐

    f) Are any enhancements (software and documentation) planned or in process?   Yes ❐ No ❐

    g) Will future enhancements be made available?   Yes ❐ No ❐

Quality practices

    a) Are the development and control processes followed?   Yes ❐ No ❐

    b) Are requirements, design, and code reviews used?   Yes ❐ No ❐

    c) If requirements, design, and code reviews are used, are they effective?   Yes ❐ No ❐

    d) Is a total quality program in place?   Yes ❐ No ❐

    e) If a total quality program is in place, is it documented?   Yes ❐ No ❐

    f) Does the quality program assure the product meets specifications?   Yes ❐ No ❐

    g) Is a corrective action process established to handle error corrections

       and technical questions?   Yes ❐ No ❐

    h) Is a configuration management process established?   Yes ❐ No ❐

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Maintenance service
   a) Is there a guarantee in writing about the level and quality of maintenance
     services provided?   Yes ❐ No ❐
   b) Will ongoing updates and error conditions with appropriate
     documentation be supplied?   Yes ❐ No ❐
   c) Who will implement the updates and error corrections? _____
   d) How and where will the updates and error corrections be implemented? _____
   e) What turnaround time can be expected for error corrections? _____

Product usage
   a) Can a demonstration of the software be made at a user site?   Yes ❐ No ❐
   b) Are there restrictions on the purposes for which the product may be used?   Yes ❐ No ❐
   c) What is the delay between order placement and delivery of the product? _____
   d) Can documentation be obtained for examination now?   Yes ❐ No ❐
   e) How many versions or releases of the software are there? _____

Product warranty
   a) Is there a warranty period?   Yes ❐ No ❐
   b) What are the warranty conditions? _____
   c) Does successful execution of an agreed-upon acceptance test initiate the
     warranty period?   Yes ❐ No ❐
   d) Does a warranty period provide for a specified level of software
     product performance for a given period at the premises where it is installed?   Yes ❐ No ❐
   e) How long is the warranty period? _____

Costs
   a) What pricing arrangements are available? _____
   b) What are the license terms and renewal provisions? _____
   c) What is included in the acquisition price or license fee? _____
   d) What costs, if any, are associated with a warranty period? _____
   e) What is the cost of maintenance after the warranty period? _____
   f) What is the cost of modifications? _____
   g) What is the cost of enhancements? _____
   h) Are updates and error corrections provided at no cost?   Yes ❐ No ❐

Contracts
   a) Is a standard contract used?   Yes ❐ No ❐
   b) Can a contract be obtained now for examination?   Yes ❐ No ❐
   c) Are contract terms negotiable?   Yes ❐ No ❐
   d) Are there royalty issues?   Yes ❐ No ❐
   e) What objections, if any, are there to attaching a copy of these checklist
     questions with responses to a contract? _____

Other legal/regulatory issues
   a) Who owns the intellectual property of the software designs? _____
   b) Is the software under any form of export control?   Yes ❐ No ❐

A.4 Checklist 4: Supplier and acquirer obligations

a)   Definition of software development framework

1)   Were development steps to be accomplished by the supplier identified?   Yes ❐ No ❐

2)   Was a product (deliverable) included at the end of each step that demonstrates that the step has been satisfactorily completed, e.g., surveys, feasibility studies, development plans, architecture and detail designs, test data and test plans, the actual programs, user documentation, support publications, and integration/acceptance test results?   Yes ❐ No ❐

3)   Were milestones that should be satisfied before the development is allowed to continue to the next step identified?   Yes ❐ No ❐

4)   Were the acquirer obligations included in the same milestone chart as the supplier obligations?   Yes ❐ No ❐

b)   Definition of the relationships between the supplier and acquirer

1)   Were the relationships between the supplier and acquirer identified?   Yes ❐ No ❐

2)   Were responsibilities for each task identified?   Yes ❐ No ❐

c)   Who is responsible for the following?

1)   Publication and expense of user documentation   Supplier ❐ Acquirer ❐ N/A ❐

2)   Publicity releases   Supplier ❐ Acquirer ❐ N/A ❐

3)   Software distribution to end users   Supplier ❐ Acquirer ❐ N/A ❐

4)   Notices and reports, if specified   Supplier ❐ Acquirer ❐ N/A ❐

5)   New software that replaces old software   Supplier ❐ Acquirer ❐ N/A ❐

6)   Appointment of a representative for
Supplier_____
Acquirer_____

A.5 Checklist 5: Quality and maintenance plans

Identify the contents of a quality plan.

a) What are the quality objectives?
    1) Documentation is usable.   Yes ❒ No ❒
    2) Warranty is adequate.   Yes ❒ No ❒
    3) Software possesses functional capabilities that are required.   Yes ❒ No ❒
    4) Software is verified to properly perform its functional capabilities. Yes ❒ No ❒

b) What are the evaluations and tests planned to satisfy the quality objectives?
    1) Demonstration   Yes ❒ No ❒
    2) User survey   Yes ❒ No ❒
    3) Inspection   Yes ❒ No ❒
    4) Test   Yes ❒ No ❒
    5) Documentation review   Yes ❒ No ❒

c) Who is responsible for conducting the evaluations and tests?
    1) Supplier   Yes ❒ No ❒
    2) Acquirer   Yes ❒ No ❒
    3) Third party   Yes ❒ No ❒

d) For which of the following items is test documentation required?
    1) Test plans   Yes ❒ No ❒
    2) Test procedure   Yes ❒ No ❒
    3) Test data   Yes ❒ No ❒
    4) Test results   Yes ❒ No ❒

Identify what a maintenance plan should contain.

a) What are the maintenance objectives?
    1) Support documentation is usable.   Yes ❒ No ❒
    2) Technical support is available.   Yes ❒ No ❒

b) What is included in the technical support?
    1) Error corrections   Yes ❒ No ❒
    2) Modifications   Yes ❒ No ❒
    3) New releases of software   Yes ❒ No ❒
    4) Updating of user documentation   Yes ❒ No ❒
    5) Installation assistance   Yes ❒ No ❒
    6) Training   Yes ❒ No ❒

c) The responsibility of providing technical support on a timely basis.
    1) Who provides technical support during the   Supplier ❒ Acquirer ❒ Third- party ❒
       warranty period?
    2) Who provides technical support after the   Supplier ❒ Acquirer ❒ Third- party ❒
       warranty period?
    3) Who pays for the cost of the technical support? Supplier ❒ Acquirer ❒ Third- party ❒

d) What acquirer responsibilities are obtained or satisfied by other organizations?
    1) Internal organization(s)   Yes ❒ No ❒
    2) Third party   Yes ❒ No ❒

A.6 Checklist 6: User survey

Operation

a) Is the system easy to use?   Yes ❐ No ❐

b) What is the level of technical knowledge required to use and maintain the system? _____

c) Have there been any serious operator complaints?   Yes ❐ No ❐

d) Was adequate operator and support training given?   Yes ❐ No ❐

e) How long did it take the acquirer's operator to become familiar with the system? _____

Reliability

a) How long has the system been in use? _____

b) During this time, how many updates, error corrections, and enhancements have there been? _____

c) Was the documentation supplied?   Yes ❐ No ❐

d) How many errors have been encountered during this time? _____

e) What parts of the system are particularly error-prone? _____

f) What other parts of the system have become unusable and for how long? _____

g) What errors can be made that will bring the system down? _____

h) In the event of an error, are there any recovery procedures?   Yes ❐ No ❐

i) How long does it take for recovery? _____

j) Is a diagnostic package available on site to verify that the system functions properly?   Yes ❐ No ❐

k) Are supplier backup facilities available?   Yes ❐ No ❐

Maintenance service

a) How reliable and accessible is the supplier? _____

b) Are supplier person personnel competent in solving problems?   Yes ❐ No ❐

c) What is the average turnaround time between an error report call and the supplier's response? _____

d) Are backup procedures adequate?   Yes ❐ No ❐

e) How long does backup take? _____

Performance

a) What are the daily transaction volumes? _____

b) How long does daily processing take? _____

c) What size are the acquirer's files? _____

d) How many users can be on the system before response time becomes sluggish, and how serious is the degradation? _____

e) How have multiple-user degradation problems been solved? _____

f) Is the acquirer's print capacity adequate?   Yes ❐ No ❐

g) Are there any terminal lockouts when the printer is running?   Yes ❐ No ❐

h) What is the envisioned response time? _____

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Flexibility

a) What software product modifications have been done? _____

b) Who did the modifications? _____

c) Are changes done on site?   Yes ❏ No ❏

d) If the changes are not done on site, where are they done? _____

e) How long did changes in each area take? _____

f) What fully developed software has been added? _____

g) Who added the software? _____

h) How long did it take? _____

i) Were there any interface problems?   Yes ❏ No ❏

j) How has the system been expanded or upgraded? _____

k) How successful was the conversion? _____

l) How much time was involved? _____

m) How much cost was involved? _____

n) How many personnel were involved? _____

Installation

a) Was the system installed as planned?   Yes ❏ No ❏

b) How long did installation take? _____

c) How much did installation cost? _____

d) Was supplier installation training adequate?   Yes ❏ No ❏

e) Was supplier installation support competent and complete?   Yes ❏ No ❏

f) Was the system cut over smoothly?   Yes ❏ No ❏

g) What anomalies, if any, marred the installation? _____

h) What environmental changes were required to install the system? _____

Costs

a) What unanticipated charges were incurred during installation and training? _____

b) What unanticipated charges were incurred after installation and training? _____

c) Is the acquirer's service agreement cost-effective?   Yes ❏ No ❏

d) What have new product enhancements from the supplier cost? _____

e) What charges, if any, have been incurred to update or correct software? _____

f) How much does customized software work cost? _____

g) Does customized software work also include updated documentation?   Yes ❏ No ❏

h) In what areas is the system to be most cost-effective? _____

i) In what areas is the system to be least cost-effective? _____

Security

a) Are user and file security levels adequate?   Yes ❑ No ❑

b) Can unauthorized transactions or programs be run?   Yes ❑ No ❑

c) Are accounting audit controls satisfactory?   Yes ❑ No ❑

d) Do accounting audit controls satisfy the acquirer's accountant?   Yes ❑ No ❑

Documentation

a) Is the documentation accurate?   Yes ❑ No ❑

b) Is the documentation adequate?   Yes ❑ No ❑

c) Is the documentation kept up to date?   Yes ❑ No ❑

Miscellaneous

a) Why was the system purchased? _____

b) Would the system be bought today if you were in the market for a system?   Yes ❑ No ❑

c) What changes would you make? _____

d) What changes do you think realistically could have been
implemented? _____

e) What did you learn from other users of the system? _____

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A.7 Checklist 7: Supplier performance standards

Describe what constitutes satisfactory performance by the supplier. Satisfactory performance should be quantified in terms of all known requirements and constraints.

Performance criteria

a) Approach to meet software functional requirements is defined. Yes ❐ No ❐
b) Approach to meet software quality requirements is defined. Yes ❐ No ❐
c) Growth potential or expansion requirements of the system are defined. Yes ❐ No ❐
d) Test and acceptance criteria that are to be met are defined. Yes ❐ No ❐
e) Programming language and design practices to be followed are defined. Yes ❐ No ❐
f) Documentation standards to be followed are defined. Yes ❐ No ❐
g) Ease of modification, including the correction of vulnerabilities, is addressed. Yes ❐ No ❐
h) Maximum computer resources allowed, such as memory size and number of
   users, are defined. Yes ❐ No ❐
i) Throughput requirements are defined. Yes ❐ No ❐

Evaluation and test

a) Software possesses all the functional capabilities required. Yes ❐ No ❐
b) Software was tested for security vulnerabilities. Yes ❐ No ❐
c) Software performs each functional capability as verified by the following method(s):
   — Documentation evaluation Yes ❐ No ❐
   — Demonstration Yes ❐ No ❐
   — User survey Yes ❐ No ❐
   — Test Yes ❐ No ❐
   — Some formal method Yes ❐ No ❐
   — Results of the performed reviews Yes ❐ No ❐
d) Software errors and vulnerabilities revealed are documented. Yes ❐ No ❐
e) Software performs all system-level capabilities as verified by a system test. Yes ❐ No ❐

Correction of discrepancies

a) Supplier documents all identified discrepancies. Yes ❐ No ❐
b) Supplier documents all identified vulnerabilities. Yes ❐ No ❐
c) Supplier establishes discrepancy correction and reporting. Yes ❐ No ❐
d) Supplier indicates warranty provisions for providing prompt and appropriate corrections. Yes ❐ No ❐

Acceptance criteria

a) All discrepancies are corrected. Yes ❐ No ❐
b) All detected vulnerabilities are corrected. Yes ❐ No ❐
c) Prompt and appropriate corrections are provided. Yes ❐ No ❐
d) Satisfactory compliance to contract specifications is demonstrated by evaluations
   and tests. Yes ❐ No ❐
e) Satisfactory compliance to contract specifications is demonstrated by field tests. Yes ❐ No ❐
f) All deliverable items are provided. Yes ❐ No ❐
g) Corrective procedures are established for correction of errors found after delivery. Yes ❐ No ❐
h) Satisfactory training is provided. Yes ❐ No ❐
i) Satisfactory assistance during initial installation(s) is provided. Yes ❐ No ❐

A.8 Checklist 8: Contract payments

Rate the payment provisions that help ensure the maximum chance for success and reward the supplier for achieving satisfactory progress.

a) Provide for investing only a minimum amount of funds before the quality of the suppliers work is demonstrated.　　Important ❒　Not Important ❒

b) Provide separate due dates and costs for each deliverable.　　Important ❒　Not Important ❒

c) Identify allowable printing expenses associated with publishing user documentation.　　Important ❒　Not Important ❒

d) Identify allowable travel and per diem expenses.　　Important ❒　Not Important ❒

e) Stagger the frequency and amount of supplier payments to coincide with major milestones, test results, or achievements.　　Important ❒　Not Important ❒

f) Identify the amount and method of determining incentive payments associated with significant results, achievements, costs, or schedules.　　Important ❒　Not Important ❒

g) Consider the complexity of the project and the risk in achieving the contract requirements.　　Important ❒　Not Important ❒

h) Include a dollar amount limit on royalty payments. Consider the amount of a fully paid license fee when setting the limit on royalties.　　Important ❒　Not Important ❒

i) Confirm that payments are limited to those copies of the software products and deliverables actually provided by the supplier and are not tied to forecasted quantity or dollar volumes.　　Important ❒　Not Important ❒

j) Withhold payment for incomplete or unacceptable work.　　Important ❒　Not Important ❒

k) Reduce payment if certain requirements are not met.　　Important ❒　Not Important ❒

l) Reduce payment to the supplier by the amount of any deliverables (e.g., documentation) specified in the contract but not produced.　　Important ❒　Not Important ❒

m) Withhold as a final payment some reasonable percentage of the entire contract dollar value to help ensure that the supplier follows through on all deliverable items and corrects all discrepancies.　　Important ❒　Not Important ❒

A.9 Checklist 9: Monitor supplier progress

Rate the actions that would confirm adequate visibility of supplier progress.

a) Use the specified time frames that are established in the contract to determine whether the suppliers development is on schedule.   Important ❐   Not Important ❐

b) Review all work at the end of each completed development step to determine if it conforms with contract specifications.   Important ❐   Not Important ❐

c) Decide if the suppliers approach is technically feasible.   Important ❐   Not Important ❐

d) Render timely management decisions on all alternatives presented by the supplier.   Important ❐   Not Important ❐

e) Once a step is approved, freeze that work step until development is complete to stabilize the base for succeeding work steps.   Important ❐   Not Important ❐

f) Apply acceptance testing to completed steps as well as at the end of the development effort.   Important ❐   Not Important ❐

g) Use the measures of reliability and quality specified in the contract during step 5 (see 4.2) of the acquisition process to evaluate the supplier's work.   Important ❐   Not Important ❐

h) Assess the suppliers performance in terms of the satisfactory performance criteria as specified in the contract during step 5 (see 4.2).   Important ❐   Not Important ❐

i) Provide some means for regular and continuous feedback to the supplier on supplier performance in terms of overall progress on handling problems.   Important ❐   Not Important ❐

j) Delivering is being done as specified in the contract (e.g., at the end of each iteration)?   Important ❐   Not Important ❐

A.10 Checklist 10: Software evaluation

Functionality

a) Does the basic function of the software meet the acquirer's needs?   Yes ❒ No ❒

b) Are its overall capabilities consistent with the requirements of the acquirer's application?   Yes ❒ No ❒

c) Can the software be run under the acquirer's operating system?   Yes ❒ No ❒

Performance

a) Is the performance adequate for the acquirer's needs?   Yes ❒ No ❒

b) Are believable performance figures available?   Yes ❒ No ❒

c) How many users can be on the system before it begins to slow down? _____

d) What verifiable evidence is available showing that the supplier has tested performance issues in a suitable environment? _____

Reliability

a) Does the product have a clean, modular design?   Yes ❒ No ❒

b) Has it been in actual use long enough to make sure that most of its bugs have been cleaned up?   Yes ❒ No ❒

c) Are there errors that a user can make that will bring the system down?   Yes ❒ No ❒

d) What are the recovery capabilities? _____

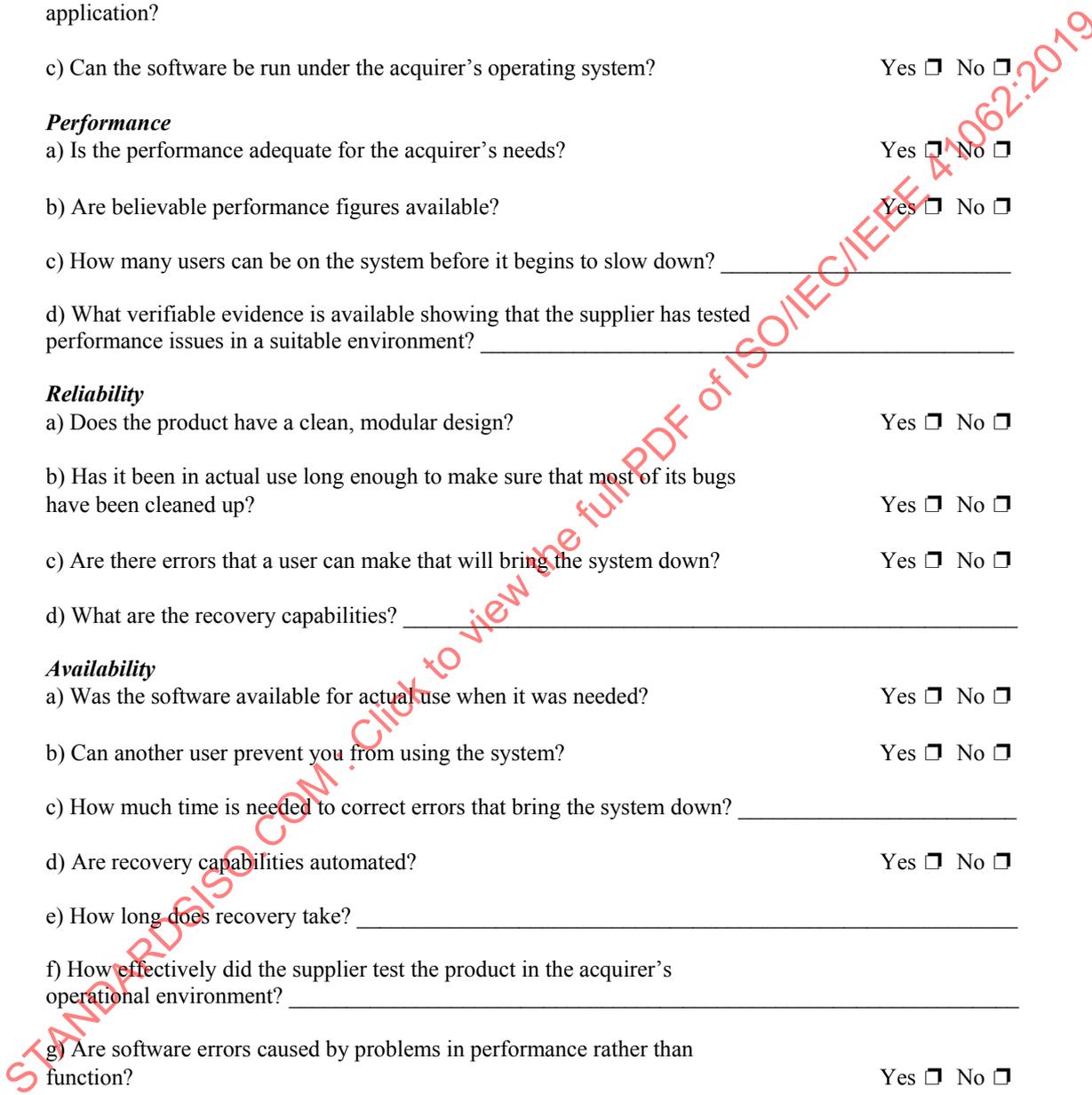*Availability*

a) Was the software available for actual use when it was needed?   Yes ❒ No ❒

b) Can another user prevent you from using the system?   Yes ❒ No ❒

c) How much time is needed to correct errors that bring the system down? _____

d) Are recovery capabilities automated?   Yes ❒ No ❒

e) How long does recovery take? _____

f) How effectively did the supplier test the product in the acquirer's operational environment? _____

g) Are software errors caused by problems in performance rather than function?   Yes ❒ No ❒

Ease of modification

a) Are the software's input, output, and processing capabilities flexible enough to accommodate the changing requirements of the acquirer's business?   Yes ❒ No ❒

b) Can the software be adapted to new applications?   Yes ❒ No ❒

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Serviceability
a) Is the software available in source code form?   Yes ❐ No ❐

b) If the supplier will be doing maintenance, how reliable and accessible
is the company? _____

c) What level and quality of maintenance will the supplier provide? _____

d) Is this guaranteed in writing?   Yes ❐ No ❐

e) Are sets of test data available with adequate documentation about how to
use them and about what results to expect?   Yes ❐ No ❐

f) What are the opinions of past and present users? _____

Ease of installation
a) How difficult will it be to install the software? _____

b) What type of training and orientation will be needed? _____

c) Will data tables need to be converted?   Yes ❐ No ❐

d) Can the supplier provide procedures for the installation and conversion process?   Yes ❐ No ❐

e) How much assistance will the supplier furnish during the process? _____

Ease of use
a) Will the software be easy to use?   Yes ❐ No ❐

b) Is it designed for straightforward operation with a well-documented operating
procedure?   Yes ❐ No ❐

c) Are the reports and screen displays it produces reliable, informative, and
easy to interpret?   Yes ❐ No ❐

d) Are help screens provided?   Yes ❐ No ❐

e) Will the users be enthusiastic about this product?   Yes ❐ No ❐

Adequacy of documentation
a) Is the user documentation complete and up to date?   Yes ❐ No ❐

b) Is the user documentation easy to read and understand?   Yes ❐ No ❐

Cost to acquire and use
a) What was the total cost of acquiring and using the software product? _____

b) Are direct costs included for the price of the software?   Yes ❐ No ❐

c) Are direct costs included for the price of the documentation?   Yes ❐ No ❐

d) What is included in the indirect costs?

 —   Modifying the software   ❐