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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 7, *Software and systems engineering*, in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

This second edition cancels and replaces the first edition (ISO/IEC/IEEE 41062:2019), which has been technically revised.

The main changes are as follows:

— the eight steps of software acquisition were replaced by four sub-processes of software acquisition;

— discussion of the various forms of requirements and their implications was expanded;

— additional attention was given to acquisitions of services;

— alternatives to traditional methods were described for identifying prospective suppliers, structuring requests for proposals (RFPs), evaluating proposals, and negotiating contracts;

— numerous insights and tips are provided to aid in avoiding common acquisition difficulties;

— the acquisition of operations, maintenance and support services in conjunction with acquiring software products was added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

This document describes the management and execution of software acquisition activities and is intended for:

— individuals or organizations that acquire software or software services from external suppliers for operational use, including software implementation, support, and operations services;

— individuals or organizations that acquire software from external suppliers for resale to other individuals or organizations;

— individuals or organizations that influence how software and software services is acquired from suppliers or implemented, operated, and maintained by suppliers;

— suppliers interested in providing high-quality software to acquirers.

This document is designed to help organizations and individuals:

— incorporate quality considerations during the definition, evaluation, selection, implementation, acceptance, operation, and support of supplier software for operational use;

— specify how the external supply of software and software services should be specified, selected, monitored, and accepted on behalf of end users.

This document is intended to satisfy the following objectives:

— enable acquirers to more effectively acquire software that economically meets their needs;

— enable external suppliers to more effectively and economically deliver software that meets acquirers' needs;

— enable acquirers and suppliers to establish fair, understandable, suitable, and sufficient agreements for the acquisition of software;

— promote consistency within and among organizations in acquiring software from external suppliers;

— provide guidance and useful practices for enhancing the quality of acquired software and the software acquisition process;

— provide guidance and useful practices for evaluating and qualifying supplier capabilities to meet the acquirer's business and technical requirements;

— provide guidance and useful practices for evaluating, qualifying, and contracting for proposed supplier software;

— provide guidance and useful practices for evaluating and determining acceptability of software implemented by external suppliers;

— provide guidance and useful practices for specifying, evaluating, and controlling the acceptability of ongoing software services provided by external suppliers.

This document can be helpful if the software acquirer and supplier are both part of the same organization.

While many of the concepts and techniques for acquiring software from external suppliers can also be relevant for internal software development, this document is not intended to address techniques of software development, testing, or operation.

Each organization or individual using this document can identify the specific set of activities to include within the organization's acquisition process, given its legal and regulatory environment, procurement guidelines, and life cycle processes.

Software engineering — Life cycle processes — Software acquisition

1 Scope

This document describes a set of useful activities, tasks, methods, and practices that acquirers of software and related services from unrelated (external) suppliers can apply to help ensure an efficient and effective acquisition of software or software services. These practices can be applied in competitive and in sole source procurements, regardless of the type, size, complexity, and cost of the acquisition. The document can be applied to software that runs on any computer system regardless of its size, complexity, or criticality. The software supply chain can include integration of off-the-shelf (OTS), custom, software as a service (SaaS), or open-source software. Software services can include software development and sustainment (maintenance), integration, verification (testing) and operation. Security and safety are included as attributes to be considered during the acquisition. However, specific requirements for acquisition of information assurance (security), safety, and cloud services are not included.

2 Normative references

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

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

ISO/IEC/IEEE 15289, *Systems and software engineering — Content of life-cycle information items (documentation)*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

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

— IEEE Standards Dictionary Online: available at: http://dictionary.ieee.org

NOTE Definitions for other systems and software engineering terms typically can be found in ISO/IEC/IEEE 24765, available at www.computer.org/sevocab.

3.1.1
acquirer
stakeholder that acquires or procures a product or service from *a supplier* (3.1.19)

Note 1 to entry: Other terms commonly used for an acquirer are buyer, customer, owner, purchaser or internal/organizational sponsor.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.1]

3.1.2
acquisition
process of obtaining a system, product or service

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.2]

3.1.3
agile development
software development approach based on iterative development, frequent inspection and adaptation, and incremental deliveries in which requirements and solutions evolve through collaboration in cross-functional teams and through continuous stakeholder feedback

[SOURCE: ISO/IEC/IEEE 26515:2018, 3.1, modified — "software" has been added at the beginning of the definition.]

3.1.4
business objective
strategy designed by senior management to help ensure an organization's continued existence and enhance its profitability, market share, and other factors influencing the organization's success

Note 1 to entry: Capability, performance level or *process outcome* (3.1.13) to be achieved to solve a problem, take advantage of an opportunity, or meet a challenge and thereby provide benefit or value.

Note 2 to entry: Identifying business objective(s) is an integral part of the business or mission analysis process described in ISO/IEC/IEEE 12207:2017, 6.4.1.

Note 3 to entry: Business objectives are not the same as *business requirements* (3.1.5); business objectives are accomplished by satisfying business requirements.

[SOURCE: ISO/IEC TR 29110-5-1-4:2018, 3.5, modified — "help" has been added; notes to entry has been added.]

3.1.5
business requirement
requirement that describes in business terms what needs to be delivered or accomplished

Note 1 to entry: The business requirement is a means to achieve *business objectives* (3.1.4) and thereby provide value.

Note 2 to entry: A product, system, or item of software is not and does not determine the business requirements; rather, a product, system or item of software can be used to satisfy the business requirements.

Note 3 to entry: The term "business" here is used broadly and generically, without implying a commercial venture, and can pertain to both personal and work, for-profit and not-for-profit, and production and administrative situations.

[SOURCE: ISO 29481-1:2016, 3.4, modified — Notes to entry have been added.]

3.1.6
COTS
commercial off-the-shelf
product available for purchase and use without the need to conduct development activities

[SOURCE: ISO/IEC/IEEE 90003:2018, 3.4]

3.1.7
defect
fault or deviation from the intended level of performance of a system or software

[SOURCE: ISO/IEC 23643:2020, 3.4]

3.1.8
functional requirement
requirement that specifies a function that a system or system component performs

[SOURCE: IEEE Std 730-2014, 3.2]

3.1.9
hazard
source or situation with a potential for harm in terms of human injury or ill health (both short and long term), damage to property, damage to the environment, or a combination of these

[SOURCE: IEEE 7000:2021]

3.1.10
IT asset management
ITAM
coordinated activity of an organization to realize value from IT assets

[SOURCE: ISO/IEC 19770-1:2017, 3.3, modified — "IT" has been added in the term and the definition; the abbreviated term "ITAM" has been added.]

3.1.11
non-functional requirement
any requirement for a software-intensive system or for a software product, including how it should be developed and maintained, and how it should perform in operation, except any functional user requirement for the software

[SOURCE: ISO/IEC/IEEE 32430:—[1)], 3.1.25, modified — The abbreviated term "NFR" has been removed.]

3.1.12
off-the-shelf
OTS
product or system already developed and available

3.1.13
process outcome
observable result of the successful achievement of the *process purpose* (3.1.14)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.34]

3.1.14
process purpose
high-level objective of performing the process and the likely outcomes of effective implementation of the process

Note 1 to entry: The purpose of implementing the process is to provide benefits to the stakeholders.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.35]

3.1.15
product requirement
requirement that describes how a product, system, or item of software will satisfy a *business requirement* (3.1.5) and thereby provide value

3.1.16
safety
expectation that a system does not, under defined conditions, lead to a state in which human life, health, property, or the environment is endangered

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.48]

3.1.17
software acquisition
process that begins with the decision to obtain a software product or service with the outcome of acceptance of the software

1) Under preparation. Stage at the time of publication: ISO/IEC/IEEE PRF 32430:2024.

3.1.18
software requirement
software capability needed by a user to solve a problem or to achieve an objective

Note 1 to entry: A software requirement is a form of *product requirement* (3.1.15).

3.1.19
supplier
organization or an individual that enters into an agreement with the *acquirer* (3.1.1) for the supply of a product or service

Note 1 to entry: Other terms commonly used for supplier are contractor, producer, seller, or vendor.

Note 2 to entry: The acquirer and the supplier sometimes are part of the same organization.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.60]

3.1.20
technical requirement
requirement relating to the technology and environment for the development, maintenance, support and execution of the software

3.2 Abbreviated terms

FOSS	free and open-source software
LOU	letter of understanding
MOU	memo of understanding
NDA	non-disclosure agreement
QA	quality assurance
RFI	request for information
RFQ	request for quote
RFP	request for proposal
RPP	request for prototype proposals
SaaS	software as a service
SLA	service level agreement
SOI	system of interest
SOW	statement of work
T&M	time and materials
V&V	verification and validation

4 Software acquisition process

4.1 General

The acquirer shall perform software acquisition as specified in the process outcomes, activities, and tasks of the acquisition process required in ISO/IEC/IEEE 12207, with additional requirements as specified in

Clauses 6 through 10 and Annexes B and C. Information items (output) shall conform to the required content of ISO/IEC/IEEE 15289.

For convenience in this document, requirements quoted from these normative standards are shown in boxes.

Quoted requirements include the acquisition process purpose, outcomes, activities and tasks.

4.2 Purpose

The purpose of the Acquisition process is to obtain a product or service in accordance with the acquirer's requirements [ISO/IEC/IEEE 12207:2017, 6.1.1.1]

This document applies primarily to the software acquisition process, for the acquisition of software products and services from external suppliers.

4.3 Outcomes

The following outcomes shall apply to the acquisition of software and software-related services:

a) A request for supply is prepared. b) One or more suitable 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. [ISO/IEC/IEEE 12207:2017, 6.1.1.2]

Operation and maintenance of the supplied software or consumption of the supplied services consistent with the contract are examples of delivered software and services. Some or all of such activities can be performed by the acquirer, by the supplier of the acquired software and services, or by a subsequently and separately engaged third-party supplier.

4.4 Structure of the software acquisition process

4.4.1 Software acquisition sub-processes

The software acquisition process consists of four major sub-processes within which relevant activities may be performed in a more flexible, less sequential manner:

a) planning and request for proposals (RFP);

b) evaluation, selection, and contracting;

c) implementation and acceptance;

d) acquisition of operations, maintenance, and support.

NOTE 1 The acquisition of operations, maintenance, and support sub-process pertain only to essentially an additional acquisition of such services in conjunction with acquisition of an executable software product to which such services pertain. Operations, maintenance, and support services that are obtained in their own right separately from acquiring the executable software product(s) to which the services pertain are treated like any acquisition of software services and are not addressed in the associated operations, maintenance, and support sub-process.

Each sub-process includes its purpose, outcomes, and activities and tasks in addition to activities for security, risk management, process improvement, and verification and validation (V&V).

Figure 1 illustrates the four sub-processes of the software acquisition process, along with supporting life cycle processes.

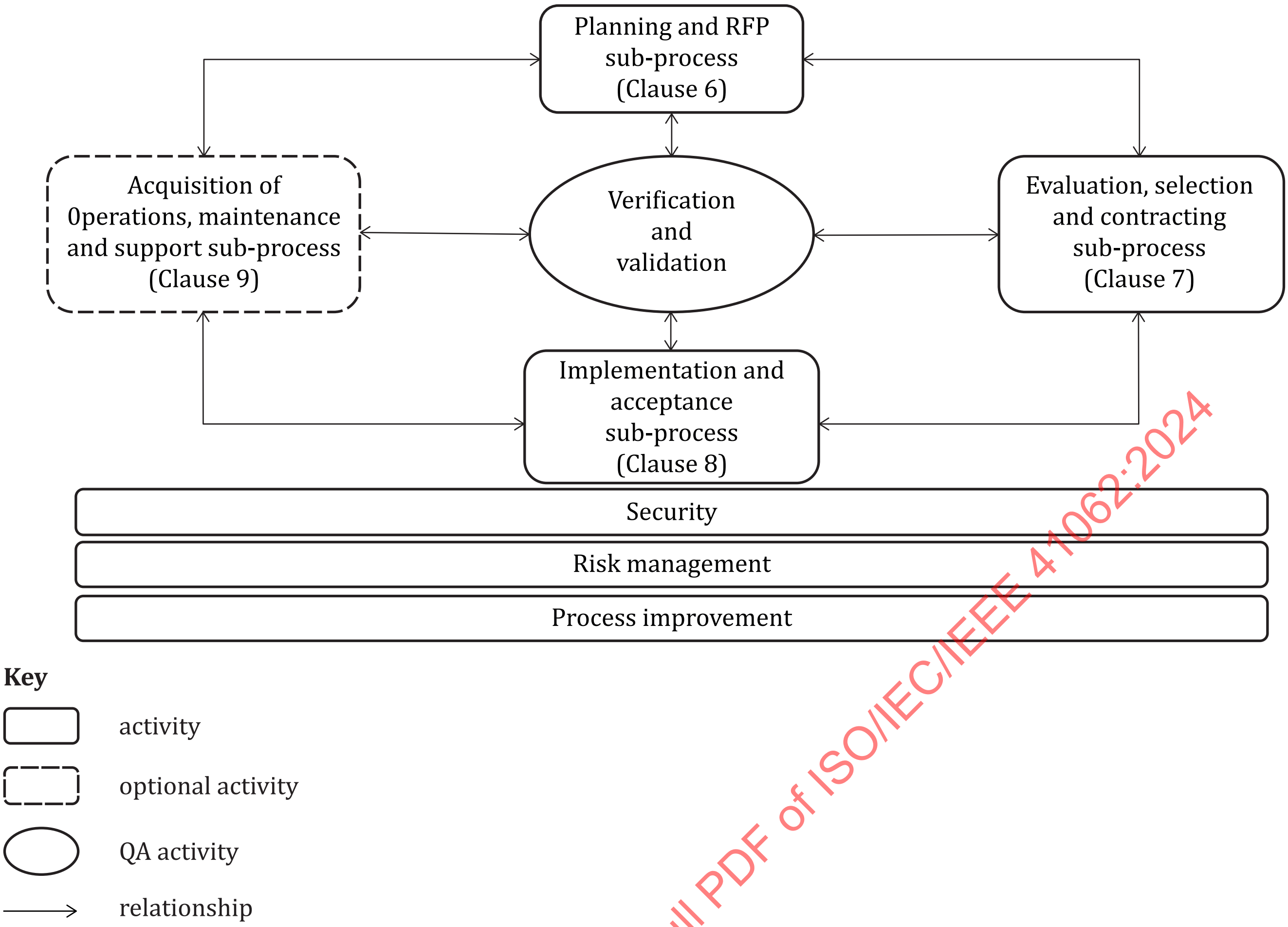

Figure 1 — Software acquisition sub-processes

Table 1 illustrates the alignment of the four sub-processes described in this clause to ISO/IEC/IEEE 12207.

Table 1 — Alignment with the acquisition activities in ISO/IEC/IEEE 12207

ISO/IEC/IEEE 12207 acquisition activities	Sub-processes in this document
a) Prepare for the acquisition	Planning and RFP
b) Advertise the acquisition and select the supplier	Evaluation, selection and contracting
c) Establish and maintain an agreement	Evaluation, selection and contracting
d) Monitor the agreement	Implementation and acceptance
e) Accept the product or service	Implementation and acceptance
a) Prepare for the acquisition b) Advertise the acquisition and select the supplier c) Establish and maintain an agreement d) Monitor the agreement e) Accept the product or service	Acquisition of operations, maintenance and support

NOTE 2 The operations, maintenance and support sub-process pertains to the acquisition of such services for an executable software product or SaaS.

4.4.2 Defining the acquisition process

A software acquisition's effectiveness and efficiency generally are enhanced by following an explicit and well-conceived acquisition process. Many organizations already have and thus can readily apply a defined software acquisition process. Other organizations may define their software acquisition process, which may include formalizing existing but undocumented or informal processes, before proceeding with a particular acquisition. In either case, the acquirer should regularly review its software acquisition process and revise it as appropriate.

A software acquisition process may include the following tasks.

a) Identify the need for software or services.

b) Define relevant top-level requirements to meet the need.

c) Identify alternative ways to obtain software or services meeting the requirements.

d) Estimate the capability, effort, time, cost, and risk of each alternative.

e) If an acquisition is to be pursued, develop a request for proposals (RFP) or request for prototype proposals (RPP) for the software or services with the chosen alternatives.

f) Publish and distribute the RFP or RPP to interested prospective suppliers.

g) Respond to questions and comments, clarifying or amending the RFP or RPP as needed.

h) Receive and evaluate proposals from prospective suppliers, including requesting clarifications and additional information from them. Clarify or amend the RFP or RPP as needed, giving prospective suppliers the opportunity to modify their proposals as needed.

i) Identify the supplier whose final proposal is responsive and most advantageous overall to the acquirer and finalize execution of a formal contract for the proposed software.

j) If a formal contract cannot be executed within a reasonable time with the identified supplier, pursue execution of a formal contract with the next most advantageous responsive supplier for their proposed software and so forth as needed until either a satisfactory formal contract has been executed or the acquisition is terminated for lack of a suitable supplier or other business reasons.

k) Monitor and assist the supplier's implementation of the contracted software or services.

l) Perform relevant evaluation of the delivered software or acceptability of services, providing the supplier reasonable opportunity to address deficiencies.

m) Pay agreed-upon amounts to the supplier, usually in response to full or partial accepted software or services delivery. Declare the contract completed upon final delivery and payment.

n) If the supplier also has been engaged to perform continuing operation, maintenance, or support services of the acquired software, assist the supplier to assume such roles and oversee the acceptability of the supplier's ongoing performance.

o) As appropriate, transition or end the supplier's role, paying amounts due.

4.4.3 Tailoring the acquisition process

A software acquisition involves two parties: acquirer and supplier. The acquirer's software acquisition process may be tailored or streamlined to fit the acquirer's specific needs and circumstances, taking risk into consideration. The process should be consistent with the acquirer's technical maturity and validated requirements and expected level of effort and funding.

NOTE The tailoring process is further explained in ISO/IEC/IEEE 12207:2017, Annex A.

The extent to which the acquisition process is tailored depends on the nature and risk of the underlying acquisition. For example, procurement of a proven standard off-the-shelf product typically does not require extensive requirements documentation; some acquisitions may require a support or training agreement with additional suppliers; and a large development project with many requirements may require more extensive documentation and specification.

Reference to relevant internal policies and practices may be used for additional guidance on implementing a process for acquiring high-quality software. A knowledge base 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 Software acquisition alternatives

5.1 General

Acquiring software from an external supplier is an alternative to developing the software internally or continuing without new or changed software. As shown in Figure 2, acquirers may acquire custom software, off-the-shelf (OTS) software, open-source software (OSS) which often is free (FOSS), software as a service (SaaS), or related services, including analysis, design, development/implementation, testing, maintenance, support, and operations. Moreover, acquirers may acquire custom software by having software developed from scratch, or by having off-the-shelf software, or their own software, modified in a material fashion. Similarly, software as a service can be acquired and implemented without modification or subject to modification. Modifications can include other off-the-shelf and open-source software. Acquirers can themselves modify acquired software; however, modifications by the acquirer are not considered part of the acquisition. This document does not address acquisition of contract staff, where the contracted staff members function as extensions of the acquirer's internal staff.

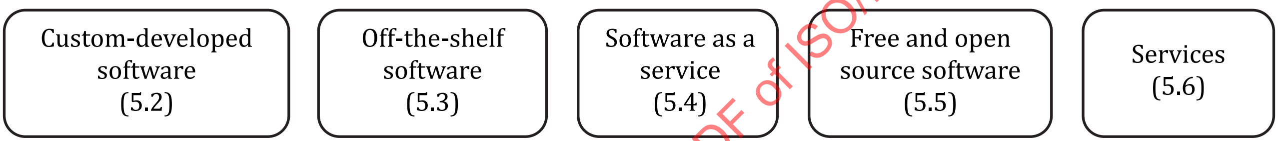

Figure 2 — Software acquisition alternatives

5.2 Custom-developed software

5.2.1 General

An acquirer seeking a custom approach to meeting its needs can develop the software internally or acquire the software by contracting with an external supplier to develop it, either from scratch or by modifying existing software. Custom development can combine a variety of custom software components and approaches, often in conjunction with acquiring existing software products, in which case characteristics of custom-developed software pertain to the parts of acquired existing software products affected by custom development.

Custom development is likely to be performed in accordance with one or more software development methodologies or life cycles, which may be specified in the contract. When methodology is not so specified, it is left to the discretion of the supplier, for whom having control over development practices can impact the supplier's productivity and overall performance. The contract also usually requires that the supplier deploy the identified methodologies in accordance with the acquirer's or supplier's policies or identified standards.

A well-structured development agreement should provide that the developer is responsible for all work required to complete the development other than enumerated tasks specifically retained by the acquirer. Importantly, the acquirer should retain only those responsibilities that it is better positioned to perform than is the supplier, such as defining its business requirements and performing user acceptance testing. An acquirer may engage a supplier's assistance defining the acquirer's business requirements; and in general, to avoid conflicts of interest, such a supplier of requirements definition services often is precluded from proposing to deliver software to meet the acquirer's business requirements.

5.2.2 Advantages of custom-developed software

The advantages of custom-developed software are as follows.

— The acquirer can achieve capabilities which cannot be achieved as effectively by internal development or by using existing software, such as off-the-shelf products. Such capabilities can include unique functionality, ease of integration with current business and development processes, meeting performance levels and other quality factors (often called "non-functional requirements" or "ilities"), and integration with other systems and software.

— A particular supplier can have specific knowledge, skills, or technology not available internally to the acquirer.

— The acquirer can have greater control over the software development, can monitor the course of development/test and, depending on the terms of the development agreement, more flexibly change its requirements or other aspects of development – though often at additional cost.

— The acquirer installs the software on its own infrastructure or controls the decision regarding the infrastructure on which the software is deployed, giving the acquirer greater control over operations and access to its data.

5.2.3 Disadvantages of custom-developed software

The disadvantages of custom development include that it typically:

— increases the risk that the implementation is not successful, especially with regard to areas requiring specialized skills and knowledge, including newer technologies, security, and compliance with laws, regulations, and standards;

— costs more than the alternatives;

— takes more time than the alternatives;

— can incur intellectual property rights issues, including when open-source or other third-party software is incorporated within the customized software or where the supplier applies possibly proprietary techniques or resources in the custom development.

5.3 Off-the-shelf (OTS) software

5.3.1 General

An acquirer may satisfy some or all of its requirements, including security and other non-functional requirements, by acquiring and implementing existing (OTS) software on assets owned by it or on a third-party's infrastructure. OTS software can be acquired directly from the software's owner/author or sometimes from a third-party supplier, vendor, or system integrator which the software's owner/author has authorized to supply to acquirers.

Existing software is typically licensed in 'as is' condition, although many OTS software products include capabilities for built-in 'tailoring' of the product to choose from limited sets of predefined capabilities variations. In addition, the supplier of OTS software often provides some maintenance changes to all users of the product, typically for an additional annual charge. Some OTS software includes source code which enables more extensive customization by the acquirer or suppliers. Such customization runs the risk of conflicting with the product's capabilities that its supplier supports and can result in more effort and time than initially planned.

The preponderance of OTS software acquisition involves "shrink wrapped" software or "apps" where the acquirer ordinarily has no direct relationship with the supplier. Thus, the acquirer takes the entire burden of responsibility for determining whether the product satisfies their needs, often without adequate information. The producer of the software makes no promises to the acquirer that the product meets the acquirer's specific needs. Therefore, the acquirer should clearly and accurately identify their needs. This document's treatment of OTS software pertains to products warranting a more explicit and conscious acquisition process than consumer products and usually involves the acquirer's more direct interactions with the supplier.

5.3.2 Advantages of OTS software

The typical advantages of OTS software are as follows:

— is less costly to acquire and implement than to develop and implement custom software;

— can be implemented and elevated to production more rapidly than custom developed software (although this can take more time to implement and elevate than SaaS);

— has less risk that the software will not satisfy requirements because the acquirer can observe and evaluate the software prior to agreeing to acquire it;

— compared to SaaS, gives the acquirer greater control over the decision regarding the infrastructure on which the software is deployed, control over operations and access to its data.

5.3.3 Disadvantages of OTS software

The disadvantages of OTS software are as follows.

— Depending on the parties' relative leverage, it can be difficult for the acquirer to negotiate favourable license terms, and the negotiated license terms can limit the acquirer's use of the software.

— The software can partly satisfy the acquirer's needs, so that additional solutions, or modifications to the acquired solution, are needed to fill these gaps. Moreover, the software can provide features or capabilities that are not required or desired and that add cost and complexity to the solution. The acquirer can be unable to modify the OTS software accordingly to address differences from the acquirer's needs or can incur extra costs, delays, and risks attempting to do so.

— The acquirer often decides to make changes to its business processes and other systems to realize the benefits of the OTS software. Such changes, or failing to make such changes, can take time, be costly, and increase risks to business effectiveness, especially where users resist such changes.

— Maintaining software written by someone else is inherently risky.

— Typically, support for the software comes from the supplier or a third-party familiar with the software for installation, maintenance, and operational support. Realization of the benefits of the software depends in part on the quality of such services, which in turn rely on the supplier or other third party's capability and capacity, and the terms negotiated by the acquirer, on the one hand, and the supplier or other third party, on the other hand.

— Upgrades, new releases, and new versions are controlled by the supplier and determined by marketplace needs. Such changes can be inconsistent with the acquirer's needs. Moreover, supplier maintenance can be dependent on the acquirer implementing such upgrades, new releases and new versions which can be incompatible with the acquirer's then current environment.

— Because the acquirer usually is dependent on the supplier of OTS software for the software's support, maintenance, and upgrades, the acquirer is continually at risk of no longer receiving suitable support, maintenance, and upgrades necessary for the continued successful use of the software. In some such instances, the acquirer can lose access to its data. Such risks often are realized when the OTS supplier changes business directions or ceases to operate. Contractual provisions, such as software escrow, may in some cases mitigate such risks. However, an acquirer can find itself in the unexpected position of having to support software which it had acquired in part because of the anticipated availability of supplier support at reasonable rates.

5.4 Software as a service (SaaS)

5.4.1 General

An acquirer can satisfy some or all of its requirements by acquiring software as a service (SaaS) which provides the acquirer remote access to an operational version of the software on the supplier's infrastructure or on infrastructure of a third-party under contract with the supplier. 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 typically using external networks or the internet. This acquisition option is not limited to but frequently is part of the cloud computing approach (the ISO/IEC 22123 series) to software (i.e. renting access to products, services, infrastructure, etc.).

5.4.2 Advantages of software as a service (SaaS)

The advantages of SaaS are as follows.

— As with OTS, there is less risk that the software will not satisfy requirements than custom software because it can be observed in operation prior to acquisition.

— Typically, SaaS can be implemented more rapidly than OTS or custom software.

— Typically, there is no need for the acquirer to provide internal computing assets to support developing, operating, maintaining, and supporting the equivalent products or services, thus reducing costs and time in preparation for using the solution, as compared to both custom-developed and OTS.

— Typically, implementation of SaaS is less risky than is implementation of OTS or custom software. The SaaS supplier assumes more of the risk compared to in-house operations.

5.4.3 Disadvantages of SaaS

The disadvantages of SaaS are as follows.

— Unless the acquirer is a major customer, or the acquirer otherwise has unusual leverage over the supplier, the terms of the license agreement are likely to be non-negotiable, which can constrain how the solution may be used by the acquirer, possibly to the acquirer's detriment. Thus, it can be especially important for the agreement to protect the acquirer from future issues such as price increases over time, changes to service terms, untimely obsolescence, and undetected cyber vulnerabilities.

— The solution may not satisfy all of the acquirer's needs; 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 but have little ability to do so.

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

— In the event the supplier ceases to operate (e.g. bankruptcy of supplier), the acquirer may have no way to continue its related necessary business operations and may lose its data, especially if the contract fails to contain adequate provisions for segregating the acquirer's data from other customers' data. The potential exists for loss of product functionality and product support.

— The acquirer often has to make changes to its business processes and other systems to realize the benefits of the software. Such changes can take time, be costly, and increase risks to business effectiveness, especially when users resist such changes.

— Use of external networks can amplify concerns for data protection and solution performance. These are concerns for all software but can be exacerbated by using SaaS.

— Access to the solution can be problematic due to dependency on external assets. Operational performance, and even availability, can be affected by technology outside the acquirer's control, such as network access and capabilities. Again, the acquirer may have greater control if it, or a third-party in contract with it, is responsible for controlling access.

— Upgrades, new releases, and new versions are initiated mostly by the supplier and determined by marketplace needs. Such changes can be inconsistent with the acquirer's ongoing needs. Moreover, supplier maintenance may be dependent on the acquirer implementing such upgrades, new releases and new versions which can be incompatible with the acquirer's then-current environment, needs, or timeframe.

5.5 Free and open-source software (FOSS)

5.5.1 General

Free and open-source software (FOSS) is a unique form of OTS software. While there can be free software that is not open-source and there can be open-source software that is not free, the combination (FOSS) is common and has special characteristics relevant to acquisition. Some software can be available for free use, but without access to source code. Some licenses do not allow modification. Such software is not considered FOSS, is not discussed herein, and should be acquired with the greatest of care, especially since it often is used to transmit malware.

An acquirer pays nothing for the FOSS and receives the source code so that the acquirer thereafter may modify the code to meet the acquirer's needs. Ordinarily modifications are made to the code base so that future acquirers receive the updated version of the source code, which includes this acquirer's updates.

Acquiring FOSS in some ways resembles acquisition of a consumer product, which also is taken "as is," but differs in the following points. FOSS generally has no identifiable producer or other party taking responsibility for the software being acquired. Thus, the FOSS is acquired from "the community" rather than from a specific supplier. Typically, the use of FOSS is governed by acceptance of some general FOSS contracting conditions rather than through formal contracting with a supplier.

An acquirer considering the acquisition of FOSS should define its requirements as if it were considering acquiring custom, OTS or SaaS and carefully consider the extent to which the FOSS meets its needs. However, when acquiring FOSS, the acquirer does not prepare a request for proposals (RFP), because there is no supplier to respond. Thus, the acquirer is responsible for determining whether the FOSS meets the acquirer's needs and has essentially no recourse in case of problems with it.

Evaluating the adequacy of FOSS can be difficult. While the acquirer can review the source code in its entirety before selecting it, a large code base can make such detailed evaluation impractical. More workable descriptions of the software can be limited and of questionable accuracy, especially since often the version being acquired can include changes made by other acquirers or interested parties in the community. Another aspect that can influence the selection of a FOSS component is the license of use, which can guide the final acquisition (even if the component is free) to avoid further legal problems.

The acquirer or supplier should participate in an open-source license compliance program to help build trust between organizations exchanging software solutions with open-source software libraries.

NOTE ISO/IEC 5230 specifies requirements of an open-source license compliance program.

Moreover, there can be no reliable or even available support for the acquired version. On the other hand, since source code is included, the acquirer can make its own changes – at its peril. The total cost of FOSS includes costs for customizing and installing code, converting/creating data, and training. Although FOSS can be zero cost to acquire, it can drive higher than anticipated maintenance and sustainment costs throughout a system's life cycle.

5.5.2 Advantages of FOSS

The advantages of FOSS are as follows.

— Typically, the FOSS is free, although the cost after modification and implementation can be more than the cost of other alternatives.

— In many cases there are big communities supporting the development of new functionalities and updates of FOSS software.

— A variety of public software licenses exists that fit for different types of users and organizations.

5.5.3 Disadvantages of FOSS

The disadvantages of FOSS are as follows.

— There is no warranty that FOSS software can be updated or maintained. This can also happen in proprietary or SaaS software but typically not during the term of any contract providing for maintenance and support.

— The search for the right FOSS can be time consuming, given the many repositories.

— The FOSS is unlikely to meet all the needs of the acquirer and extra development and integration effort is likely required.

— There can be a lack of documentation explaining how to integrate and use the software.

— There is no certainty that the applicable open-source communities address problems when reported.

— The acquirer does not have the control of the FOSS and its different versions.

— Obligations to contribute custom modifications of the software to the community can be inconsistent with the acquirer’s or supplier's interests or capabilities.

— Intellectual property rights issues can arise, especially when a piece of OSS is incorporated within other acquired software.

— Adapting and integrating FOSS is sometimes difficult and total cost can exceed that of other approaches.

5.6 Services

Rather than requiring a COTS or custom-developed software product, software acquisition can result in obtaining ongoing services for almost every software life cycle process, such as project management, software architecture, requirements engineering, programming, testing, quality assurance, and post-development services such as installation, software operation, and maintenance (both corrective and adaptive). Software acquisition was formerly considered as acquiring an executable software product; and services the supplier performed were typically treated as incidental to producing the executable software product. Such services include programming, testing, analysis, project management, and installation. In addition, this document recognizes and separately addresses post-development services: operating, maintaining, or support acquired along with executable software products.

Many software acquisitions primarily involve acquiring software services rather than as incidental or related to acquiring identified executable software products. Such acquired services often are referred to as “outsourcing”. Consequently, this document also addresses acquisition of such software services where the supplier has control over and responsibility for performing services. For some acquired services, there can be considerations specific to the services which need to be addressed explicitly in the acquisition.

EXAMPLE ISO/IEC/IEEE 26512 provides guidance for the acquisition of documentation and documentation services and the ISO/IEC 20000 series provides requirements and guidance for a service management system.

NOTE This document does not address staff augmentation, wherein the supplier supplies personnel to perform similar software services, but under the direction and control of the acquirer.

When the services are for a particular project, it usually is somewhat easier to define the requirements for the supplier than when the supplier is being engaged to perform services “in the capacity” of an entire function for the acquirer. For example, a supplier often is engaged to act as the acquirer’s entire software development or testing function, essentially standing in the place of an internal unit. In such a situation, the supplier can be held accountable for performing expected activities in a suitable manner and with reasonable skill; but without a more specific definition of required results, the supplier cannot be held responsible for whether such activities in fact produce the acquirer’s desired results. Mechanisms should be included to define the supplier’s promised results as well as the activities aimed at achieving such results, typically on an ongoing basis during the duration of the acquired services. Agreements should define the character and quantity of work the supplier is obliged to perform, as well as mechanisms to measure quality and address changes, including the circumstances and procedures for changing the payment due the supplier. A metric such as function points provides a standardized way for defining the expected quantity of work.

6 Planning and RFP sub-process

6.1 Purpose

The purpose of the planning and RFP sub-process is to determine whether to acquire software to meet a need, determine an acquisition strategy if acquisition is indicated, and initiate the acquisition by preparing and distributing a request for proposals (RFP) to supply software or services that meet the need.

Figure 3 summarizes the key activities and outputs of the planning and RFP sub-process. Planning the acquisition starts by forming a team to manage and carry out the acquisition. The organization may decide to engage assistance for the team at this point. Other teams may engage assistance at a later point or rely entirely on internal resources. The team gathers relevant data regarding the acquirer's business needs and analyses the make vs. buy feasibility of alternative approaches for meeting those needs. If the analysis indicates that none of the approaches is feasible or that the acquirer is best served by developing (making) a software solution itself, the acquisition goes no further.

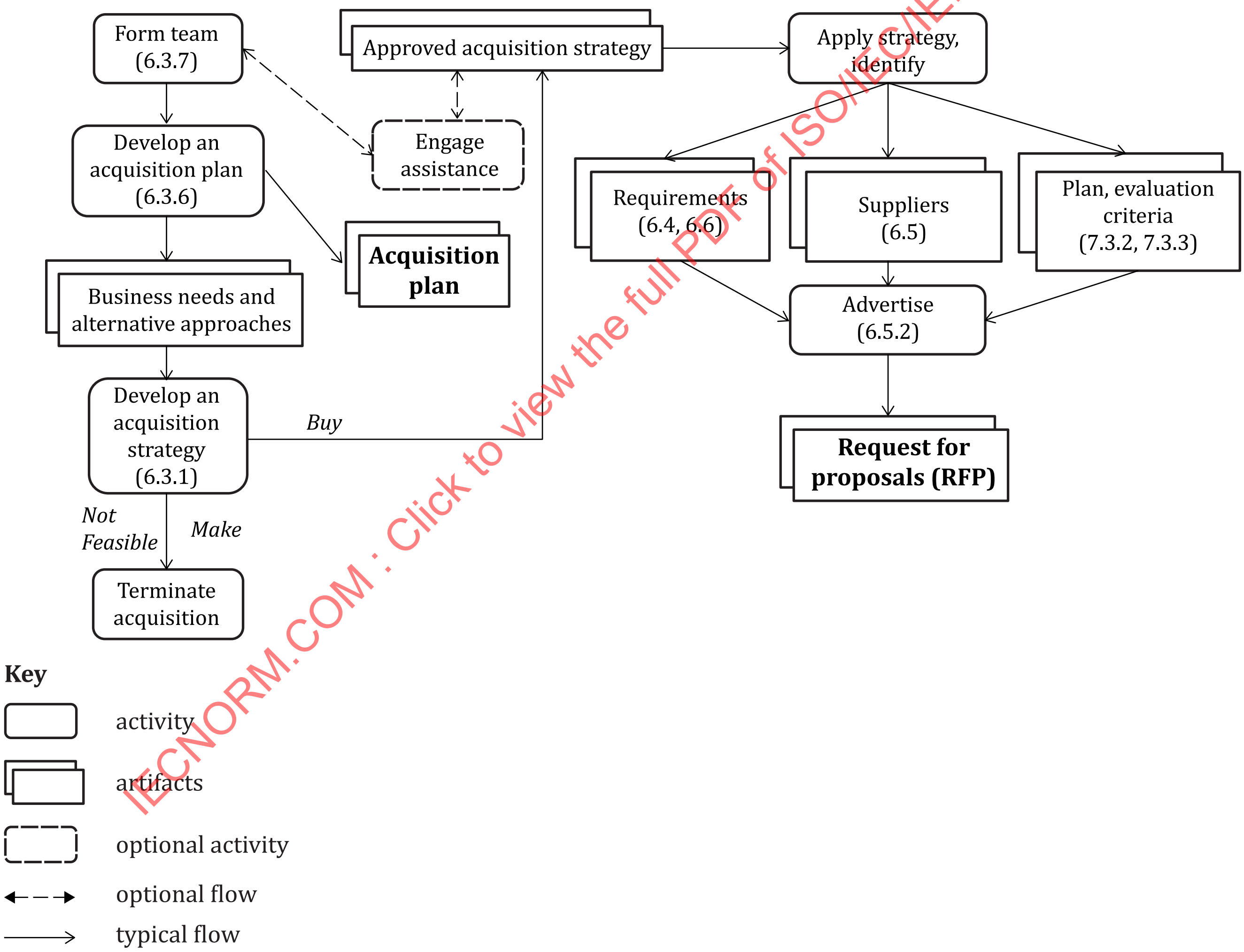

Figure 3 — Planning and RFP sub-process

Alternatively, when the feasibility analysis indicates that the acquirer is best served by acquiring (buying) a software solution from an external supplier, the team develops a strategy for guiding the acquisition. The main planning and RFP sub-process activity involves gathering, analysing, and organizing information regarding a set of topics which describe the acquisition and are included in a request for proposals (RFP) that is published and distributed to prospective suppliers.

6.2 Outcomes

Outcomes of the planning and RFP sub-process shall include:

a) business needs and alternative ways to meet the needs are analysed, with recommendations selected:

   1) develop (make or build) software internally;

   2) acquire (buy) software or services from an external supplier; or

   3) make no software change, continue business as usual (BAU) current practices, possibly including improving relevant non-software processes;

b) an acquisition strategy is developed, including identification and development of:

   1) relevant data for applying the strategy;

   2) a request for proposals (RFP) to supply software or services to the acquirer that meet the acquirer's requirements;

c) prospective suppliers have sufficient information to submit a proposal which the acquirer can evaluate effectively and efficiently;

d) the acquirer's proposed allocation of risk is made available to inform suppliers before pricing the solution or services;

e) foundations for contractual agreement are established, including:

   1) desired procedures for administering a contract with a selected supplier including remedies for non-performance;

   2) significant parts of a prospective contract for engaging a supplier, approved from both content and legal standpoints.

6.3 Planning the software acquisition strategy

6.3.1 Develop an acquisition strategy

a) Prepare for the acquisition
1) Define a strategy for how the acquisition will be conducted.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

An acquisition strategy establishes at a high level the process the acquirer wishes to follow for its procurement, subject to review and discussion with the supplier once a supplier has been selected. A strategy guides the acquisition activities but is not those activities. The acquisition strategy should include the following:

a) lists of capabilities (those of the acquiring organization and those of potential suppliers) that are helpful in identifying who can provide the needed software and services including implementation services;

b) lists of anticipated supplier and acquirer responsibilities; including whether to seek external assistance with the acquisition and the anticipated nature and extent of such assistance;

c) coordination with the organization's other strategies;

d) lists of potential options for acquisition and the risk, cost, and benefits for each; options typically include custom development, OTS with or without customization, SaaS, or services rather than executable products;

e) a description and analysis of implementation, maintenance, operations, and support options;

f) identification of intellectual property and data access and ownership issues;

g) identification of any regulatory and tax issues.

6.3.2 Perform feasibility study

Among the first key project milestones, typically is the completion of a feasibility study that can be used by management to determine whether to proceed with acquisition.

A feasibility study considers the organization's business needs, ways to satisfy those needs, and respective strengths, weaknesses, and estimated costs and benefits of the respective approaches including doing nothing (continuing with present practices). The study should also consider the key attributes of the software/services to be acquired. These attributes can include high-level descriptions of functionality and operations. Other issues to be addressed in the study should include business criticality, security, and safety-criticality, the degree of novelty and risk exposure, the required time frame, estimated financial benefits and cost, internal development and operational capabilities, experience with and attitudes toward external suppliers, and risk tolerance. Because constraints in the planned software/services environment can limit choices to software that is compatible with the environment and available infrastructure, such constraints should also be identified, described, and assessed.

6.3.3 Assess and manage risk

Software acquisition historically has had a high rate of full or partial failure, including acquiring software that fails to provide the acquirer expected benefits, acquiring software that costs much more than expected and sometimes more than the value of benefits the software provides, and acquisition processes that cost more or take longer than expected and sometimes also create other undesirable effects.

The continued prevalence of such difficulties is evidence that their real causes often are not identified adequately, which in turn prevents suitably addressing them so they do not occur in subsequent acquisitions. Common characteristics of acquisition inadequacies are that acquirers repeat (their own or others') practices without meaningful analysis or improvement of the acquisition process and that acquirers blame suppliers for all issues but seldom recognize, let alone acknowledge, their own role in causing inadequate acquisitions. This document provides analysis of and suggested improvements for practices which too often merely have been repeated from acquisition to acquisition.

Informed observers find that inadequate and inappropriate requirements are the biggest source of acquisition difficulties. Consequently, this document gives special attention to the distinctions among several qualitatively different types of requirements in the RFP and their effects on what the supplier can and cannot propose in response. Defining the appropriate type of requirement is necessary but not sufficient. That is, regardless of type, the requirements need to be defined accurately and clearly. Other standards address requirements definition, though mainly regarding product, system, or software requirements. Some verification and validation (V&V) techniques described below help identify requirements more accurately and clearly.

Ineffective evaluation, selection, and contracting together form the next highest acquisition risk. They affect not only the adequacy of the acquired software but also its cost and the cost of the acquisition process. While these activities are carried out in the following evaluation, selection, and contracting sub-process, their deficiencies originate when they are defined in the planning and RFP sub-process. This document gives far greater visibility and analytical attention to performing these activities in ways that reduce common risks, starting with their roles in an RFP.

6.3.4 Agile development considerations

6.3.4.1 Agile development considerations

Agile development is widely used and is frequently considered the favoured way to produce working software, presumably faster, more responsive to evolving stakeholder needs and at lower cost than traditional approaches which typically are considered to have longer development cycles. Agile includes a variety of methods, and with suitable planning, can be applied to projects of all sizes and to complex software. Self-organizing teams of business and technical members actively collaborate to create small pieces of working software, typically in one- to four-week sprint iterations. A team consists of a team lead responsible for work using the agile methods, a product owner responsible for identifying and prioritizing work items, and the rest of the team which typically includes developers and individuals with other relevant skills, such as user experience specialists, business analysts, and testers.

A basic tenet of agile development is that requirements can change from sprint to sprint. Typically for agile software development, the acquirer presents business requirements as scenarios (user stories, or at a high level, epics) which the supplier can determine how to structure into product features. A product owner represents the acquirer and is responsible for determining prior to the start of each sprint which of the items in the backlog of work items will be worked on during the sprint. Backlog items can be selected for development with input from the product owner. The development team in this case assumes some responsibility for detailed requirements elaboration, design, implementation, and verification, but all are driven or constrained by time and product owner concerns and needs. The acquirer and supplier roles and responsibilities should be negotiated and clearly delineated, so that mutual expectations are explicitly captured. Although this is a best practice for any acquisition effort, it is especially important for agile development since the acquirer will likely participate differently, and more actively, in the development effort than other approaches.

6.3.4.2 Acquisition implications of agile development

6.3.4.2.1 Using agile methods to perform the acquisition

Because of the prevalence and benefits of agile methods, some acquirers may want to apply agile methods to perform an acquisition of software products and services. For instance, there may be some opportunities to break the acquisition work into smaller pieces with less administrative overhead and more frequent feedback regarding the acquisition process.

Agile favours face-to-face oral communications over written documents and collaboration over contracts. In contrast, acquisition leads to formation of a contract; and although certain contracts need not be in writing to be enforced, the nature and complexity of software acquisition almost always warrants formal written contracts based upon written proposals to satisfy written requirements.

In addition, acquisition invites and responds readily to feedback with relevant adjustments; but it does so in accordance with defined plans. There would seem little occasion to regularly reprioritize acquisition activities in the way agile projects redetermine what to work on each sprint iteration.

6.3.4.2.2 Using agile methods to perform the acquisition

A major and perhaps most common use of software acquisition is to acquire working software products. Although several possible ways to acquire working software products developed using various methods are described below, agile development in general does not undertake development of working software products, especially ones requiring multiple sprint iterations to complete a full defined product. Rather than fixing the scope of work prior to project initiation, agile development fixes the duration (the sprint iteration) and recognizes that the scope of the working software delivered during that sprint iteration is not fixed. Prior to the sprint iteration, items in the product backlog can be added and modified before usually the product owner selects for the sprint backlog the set of prioritized backlog items to be worked on in descending priority sequence during the coming sprint iteration.

Consequently, because the outputs of agile development usually cannot be predicted reliably for more than the current sprint iteration. Additionally, difficulties can arise integrating agile working code developed in different sprints and especially by different agile teams, which further makes it difficult to acquire fully functioning working software products produced via agile development.

Some practitioners are of the view that this risk can be mitigated by various methods often characterized as hybrid approaches in one such hybrid approach, the supplier agrees to deliver software products in a series of iterations that together satisfy high-level business requirements agreed to prior to the commencement of the development. Related approaches to acquiring defined products with agile development may involve some form of overarching framework agreement (prime contract) governing key aspects of the arrangement, such as pricing and communication procedures, with a mechanism in the agreement to determine an agreed understanding of the work to be performed by the supplier for the upcoming specified time period (often called a “work order”) and related acquirer acceptance procedures and other obligations. Managing such arrangements can become complicated but allows flexibility as priorities change.

6.3.4.2.3 Acquiring agile development as a service

An often more workable approach is to treat acquisitions involving agile development as acquisitions of services, rather than of defined products. A supplier typically would be engaged to provide development personnel for one or more agile project teams, each of which also includes an acquirer employee product owner responsible for defining the prioritized work items to be worked on during each sprint iteration. It should be noted that an acquisition of services model brings its own risks, such as if the acquired services fail to product expected value.

In other situations, a supplier is engaged to provide services that assist the acquirer in implementing agile development methods or creating an environment supportive of agile development. The acquirer may request, and prospective suppliers may propose, such services in the same manner as other services acquisitions. When engaging agile development as a service, acquirers can benefit from asking suppliers to propose methods and practices, since that is part of the expertise the acquirer is acquiring.

See 5.6 for additional considerations for this approach.

6.3.5 Initiate a planning process

High-quality, detailed, project planning can have a significant impact on project success, and a well-structured acquisition planning process can have a significant impact on the plan. Effective planning further relies on monitoring actual events and flexibly adjusting the plan as needed. Key planning activities can include the following:

a) determining acquisition team jurisdiction and limits;

b) identifying skills for and forming a core team;

c) identifying and determining applicability of existing acquisition policies and procedures, including ITAM;

d) developing a scope for the planning process;

e) identifying corporate timing and other mandates including any required go-live dates for solution implementation;

f) in the absence of any corporate mandated go-live dates, determining target release or activation dates for acquisition and solution implementation;

g) identifying key tasks and milestones to achieve required or target release or activation dates;

h) identifying required acquisition activities and approximate level of effort;

i) determining extent to which key acquisition tasks are to be performed by acquirer personnel or third parties;

j) identifying key personnel to perform required activities;

k) identifying key stakeholders who are the source of relevant requirements and influence, are affected by, or are involved in using the acquired software products and services;

l) obtaining stakeholder support for the plan;

m) forming a planning group and reviewing the organization’s objectives;

n) identifying the objectives of, constraints on, and prior experiences with software acquisition;

o) supporting potential reprioritization and replanning when new information arises.

6.3.6 Develop an acquisition plan

The acquisition plan is a detailed description of the steps required to implement the acquisition strategy. The acquisition plan shall include the following:

a) the acquirer's business or mission objective;

b) key top-level business requirements to determine the scope of the system or service to be acquired, including how the software is expected to be used;

c) the acquirer's preferred solution type (e.g. custom development, OTS with or without customization, OSS, SaaS, or just particular services);

d) the expected respective responsibilities of acquirer and supplier;

e) additional factors affecting the acquisition, including the following:

   1) resources expected to be provided to the supplier by the acquirer, such as existing application software, tools, test environments, data, and acquirer's staff;

   2) facilities and access;

   3) required or preferred methodologies;

   4) a tentative budget and timeline for the implementation, including identifying key dates and events relevant to the implementation, especially where a series of periodic implementations is anticipated and any limitation or constraints regarding the acquisition's timeframe;

   5) a description of how the software is expected to be used, supported and maintained;

   6) a risk management plan including a list and assessment of key risks and potential mitigations

NOTE Detailed requirements for content of an acquisition plan are presented in ISO/IEC/IEEE 15289:2019, 10.4.

6.3.7 Form an acquisition team

The acquisition team consists of acquirer personnel or representatives responsible for planning, organizing, and carrying out the acquisition. The team's charter and authority should be defined and may be adjusted as the acquisition progresses. Initially the team may include a single member, or more. The team's capabilities are enhanced by members representing a variety of interests, and thus members may be added to or removed from the team over time. Ordinarily, the team should have members representing the business area with the need for software or services, technical areas related to the types of software likely to be acquired, management, project management, legal, and those familiar with software acquisition.

A key team role is designated acquirer contact – the individual to whom all supplier communications should be addressed. Not only does having such a role simplify communications and reduce administrative effort, but it also helps assure different team members have the same information and are shielded from attempts to separately influence individuals. The acquirer 's contact's authority to make decisions should be defined, may vary based on the point in the acquisition process, and may be modified as needed as the acquisition progresses.

NOTE This document does not specify how the acquirer or supplier organizes their work. Teams are described by their primary function and can relate to other acquisition teams in many ways.

6.3.8 Obtain assistance with acquisition

6.3.8.1 General

While the acquirer's own employees can perform a software acquisition, in many instances the acquirer may choose instead to engage an external supplier to assist with acquiring software or services. Thus, the situation consists of a pair of acquisitions. The first acquisition involves selecting the external supplier of the acquisition-assistance services. The second acquisition involves acquiring the software or services, but with the assistance of the third-party (different external supplier from those who will be considered for supplying the software and services). To prevent conflicts of interest, the acquirer may preclude the third-party assisting with the acquisition from bidding on the software and services. However, other considerations such as the availability of resources and the desire to work with known entities, sometimes make it very difficult to avoid such conflicts. Consultants and lawyers with a specialization in sourcing often perform these services. Acquiring a third-party's services involves much the same process as is described more thoroughly in subsequent sections with regard to acquiring software products or services.

The acquirer should first perform a feasibility analysis to:

a) determine whether and how to pursue an acquisition;

b) describe the subject and nature of the desired assistance in a request for proposals (RFP);

c) contract assistance based on evaluating prospective providers' written proposals describing their proposed approach to performing the software acquisition, their qualifications, pricing, and other relevant information.

Often the feasibility analysis is relatively brief and mainly focuses on whether to engage a third-party to assist with the acquisition; and a so-engaged third-party then performs a larger feasibility analysis regarding whether to acquire software or services ("make vs. buy") and developing an acquisition strategy. Alternatively, the acquirer performs such a larger feasibility analysis to determine whether to acquire software and a strategy for doing so, including whether to engage subsequent third-party assistance.

The selected assistance provider typically performs the bulk of the software acquisition activities and presents findings and recommendations to the acquirer, who has sole authority to decide whether and which software alternative to choose.

6.3.8.2 Coordinate with IT asset management (ITAM)

Where SaaS, COTS or OSS is being acquired by an organization which has an active ITAM program activity (see ISO/IEC 19770-1), the software acquisition team should leverage aspects of that program, including the following:

a) existing supplier relationships and agreements, especially relating to agreed service levels and support commitments;

b) change management processes;

c) license management processes;

d) security management processes;

e) risk management processes, especially with regards to the use of FOSS;

f) audit logs and traceability of the above processes.

6.3.8.3 Coordinate with legal counsel

Legal counsel should be involved during drafting of the RFP to give confidence provisions are defined suitably and can be incorporated directly in the formal contract. Legal counsel also should review prospective changes resulting from the selected supplier's proposal. Legal counsel especially should be involved with modifications affecting intellectual property or requiring additional legal documents, including separate agreements with additional suppliers occasioned by the main supplier's proposal, such as:

— 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; the acquirer should understand the consequences of these various contractual devices;

— custom-developed: in custom development systems, documents needing legal counsel review (i.e. SOW, data rights, purchase agreements, license agreements, IP) often are required;

— confirm compliance with applicable laws, regulations, and standards, which often are specific to the acquirer's business or organizational structure, such as involvement in particular regulated industries and being a governmental body;

— for acquired executable software other than SaaS, the acquirer may also acquire processing capabilities, either for internal operation by the acquirer or operated by an external supplier, which can be the same or different from the supplier of the acquired software product.

6.4 Defining the acquisition and content requirements

6.4.1 General

a) Prepare for the acquisition
2) Prepare a request for the supply of a product or service that includes the requirements
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

Acquisition requirements describe the procedures and formats suppliers should use when preparing and submitting their proposals. Such requirements are intended to produce proposals from one or more prospective suppliers that are structured in the same fashion and that address the same topics so that the acquirer can readily evaluate, and if necessary, compare them. Acquisition requirements also include timeframes and deadlines. For various reasons, including expediency and desire to work with known suppliers, acquirers often consider only a single ("sole") source to be the supplier. Acquisition requirements still need to be identified for sole source acquisitions but frequently are less extensive and less formal, which can incur additional risks.

Content requirements describe the capabilities the acquirer expects the software or service is to provide. The objective is to enable a supplier to propose and deliver software or services that meet the acquirer's needs. Adequacy of requirements definition is generally recognized as the single biggest determinant of a software acquisition's success.

The acquirer is responsible for defining its requirements and may engage assistance, especially if it lacks capabilities for requirements definition. Accordingly, the acquirer or third-party service providers working on behalf of the acquirer prepare the requirements included in the RFP. In sole-source acquisitions, it is especially common for the selected sole-source supplier also to define the requirements that the supplier will satisfy and frequently to define the requirements briefly and informally. When the same supplier defines and satisfies the acquirer's requirements, risk increases that the requirements will not be defined adequately. Such risk is exacerbated when the requirements are defined less thoroughly and less formally. Therefore, even in a sole-source acquisition, requirements need to be defined clearly and explicitly so they can be more reliably reviewed for accuracy. Considerable attention is usually addressed to carefully defining and drafting requirements in as unambiguous a fashion as is possible. Poorly drafted requirements increase the likelihood that the acquirer can fail to achieve its objectives and reduce the likelihood of the acquirer having legal recourse. However, ambiguity is only one factor affecting requirements adequacy. Requirements definitions often emphasize functionality (what the software does) while paying less attention to key non-functional areas which describe how well the functionality is performed. Such non-functional requirements include usability, performance, and security.

Requirements typically are refined in response to questions and comments raised during proposal preparation and evaluation. Supplier questions and comments can be prompted by such factors as the supplier's ability to satisfy certain requirements, the risks, or costs of providing functionality required to satisfy the requirements, and supplier insights regarding possibly advantageous alternatives. Acquirer questions in turn often are prompted by difficulties understanding what a supplier is proposing or how the supplier addresses the acquirer's requirements. Questions, clarifications, and amended requirements should be shared with all prospective proposers; and if necessary, additional time should be given to suppliers to modify their proposals in response.

The key process outcomes are well-defined requirements that suppliers can use to define and propose appropriate responsive solutions. The selected supplier then implements the proposed software products or services.

Contracting considerations identify topic areas the contract should address, such as ownership rights and negotiation ground rules, and required and desirable contract terms, including compliance with applicable laws, regulations, and standards.

Content requirements can include software requirements, which describe the implementable features of the executable software product. The type of content requirements defined in the RFP determines the type of software solution a supplier can propose and be held accountable for.

6.4.2 Types of requirements in an RFP

The acquirer sets the context of the acquisition by describing the types of software products or services it expects to acquire, such as:

a) executable code that aids the acquirer in performing specific business functions;

b) coding that implements a specified design;

c) testing specified executable code;

d) defining particular requirements;

e) designing specific software products and systems;

f) advising on management and methodology;

g) serving in the capacity of the acquirer's function, such as for:

   1) software development;

   2) testing;

   3) software maintenance;

   4) software operations;

   5) software support;

   6) cybersecurity;

   7) specialized services which require skills and knowledge that a typical software developer can lack, such as safety engineering.

The expected type of deliverables determines the type of requirements which the acquirer should define in the RFP. A supplier can propose to satisfy the acquirer's requirements by providing types of deliverables that differ from those the acquirer expects, though this approach can lead to the proposal being rejected as non-responsive.

6.4.3 Business requirements

The term "business requirements" frequently is used to mean only high-level requirements or desired goals, objectives, purposes, or desired benefits. More generally, business requirements are deliverable business capabilities that provide value by achieving goals, objectives, purposes, and desired benefits when satisfied by some product, system, software (hereafter shortened to "product") or related services.

NOTE The business or mission analysis and stakeholder requirements definition processes of ISO/IEC/IEEE 12207 can be consulted for further detail.

Business requirements can be defined at varying levels of detail and differ qualitatively from product requirements. Product requirements also can be defined at varying levels of detail and describe the implementable software products or services which are expected to achieve the business requirements. Unless the acquirer is absolutely sure it knows the product it requires, the acquirer should define business requirements and let the supplier propose the product or services that the supplier believes best meets the acquirer's business requirements, taking into account such factors as the acquirer's budget, timeline, risk tolerance and the like. This is expertise a supplier is expected to have.

When a supplier proposes to satisfy business requirements, the supplier is responsible for delivering a product whose design and implementation satisfy the business requirements and thereby provide the desired benefits. The design already exists within OTS software, and such design can have been created by someone other than the supplier proposing the OTS software to satisfy the acquirer's business requirements. When a supplier proposes to develop custom software, the proposal should include a high-level description of the product design the supplier intends to develop and implement. The supplier can be responsible for products or services that fail to provide intended benefits when such products or services are proposed in response to business requirements.

Some business requirements are technical in nature, for example, the required technical environment, computer programming languages, and operational preferences to which the supplier's solution conforms. Most acquisitions have business requirements related to usability, security, safety, and other capabilities often lumped together as "non-functional requirements" (or "quality factors" or "ilities"). In certain situations, such requirements can be pre-eminent and often can be defined adequately only by specialists.

Business requirements can include dependencies and other relationships with other systems, projects, and the business and physical environments.

6.4.4 Software/System requirements

Traditional software acquisition guidance often directs the acquirer to define its "software requirements," that is, the features and operational characteristics of the software system or services. In general, the terms product requirements, system requirements, and software system requirements can be used interchangeably. However, some organizations make distinctions among these terms. Depending on the system of interest (SOI), system requirements can include both hardware and software requirements; as well as environment and technology requirements, which also often are considered constraints on solutions.

Where an acquirer defines requirements in terms of the software or service, the supplier can be held accountable for providing a conforming product or service but not for whether that product or service provides desired benefits. Moreover, an acquirer who defines content requirements as product requirements fails to take advantage of the supplier's presumably greater product and design expertise.

Thus, while it often is advisable for an acquirer to define its requirements as business requirements, there are situations where an acquirer is better served by defining its requirements as product requirements. For example, it can be appropriate when the acquirer in fact has relevant product design skills and knowledge, especially technical knowledge of other systems with which the proposed system is required to be interfaced, or when the acquired software or services are required to operate in a specific environment or with specific technologies.

Sometimes alone, but often in conjunction with high-level product requirements, acquirers describe requirements in terms of lower-level product detail. For example, the description can include system flowcharts identifying modules and databases, module specifications, class diagrams, sample screen or report layouts, or use cases containing expected usage workflow scenarios.

Such detailed design information can be helpful for a supplier to propose and price software coding/development or testing of said product. It also is appropriate to describe low-level detailed product design of existing software with which the supplier's software is required to be integrated. Such information is necessary for the supplier to design its software. However, it can also preclude the supplier from refactoring the software and developing a more efficient product. In other situations, it generally is advisable for an acquirer not to define its requirements in terms of low-level technical design.

While most non-functional requirements are business requirements and should be defined as such, some are occasioned by design decisions embodied within product/system/software requirements.

6.4.5 Statement of work (SOW)

A SOW describes tasks to be performed. The SOW can be used in service contracts to define the work to be performed but should not include detailed procedures unless required by law or regulation. Similarly, in software projects, to take advantage of the supplier's expertise and hold the supplier responsible for outcomes, the supplier should define the tasks which they perform to supply the proposed software. Consequently, except where some independent authority prescribes use of a standardized life cycle process model, the SOW does not define software requirements or detailed work procedures.

Acquirers should identify constraints on how the supplier implements its software or services, such as specifying the software life cycle or programming environment and language the developer should use and requiring the developer to abide by certain industry standards. Similarly, the acquirer should identify the acquirer's rights to observe or participate in the supplier's testing.

6.4.6 Performing verification and validation of requirements

Review by parties with relevant subject area and process knowledge is the fundamental method to verify and validate all information and materials developed during software acquisition. Such reviews can be strengthened by following more formal review procedures and guiding the reviews with topic lists relevant to the artifacts and areas being reviewed.

NOTE IEEE Std 1012-2016, clause 7.2, acquisition support V&V process, discusses in greater detail verification and validation of requirements as well as other acquisition artifacts and processes.

Reviewing requirements presents an added difficulty compared to reviewing all subsequent deliverables. That is, a key method for reviewing other deliverables is to compare the deliverable to prior deliverables giving rise to it. For example, designs should be responsive to requirements and code should implement requirements and designs. However, requirements are essentially the starting point and thus have no prior deliverable to compare. A variety of techniques can help in providing bases for detecting requirements format and content issues. Preparation, verification, and validation of requirements are painstaking processes. They may use the combined efforts of subject matter experts, analysts, procurement experts and sometimes legal experts working as a team to identify the requirements and clearly articulate them in plain language to the extent possible. Third-party assistance can be valuable.

6.5 Identifying potential suppliers

6.5.1 General

To reduce the burden of proposal evaluation and the risk of selecting an unqualified supplier, acquirers can follow the widely used practice of limiting proposal submissions to a relatively small set of pre-qualified suppliers whose offers are likely to be acceptable. Such practices can take several forms and intend to serve one or more purposes described below. Analysis suggests the value of paying attention to these variations.

There is no single right answer or best practice that is likely to apply to all acquisitions. Rather, each acquirer should consider the advantages and disadvantages of each approach and determine which is best for it for the specific acquisition, considering its procurement procedures and policies.

6.5.2 Advertising the acquisition

b) Advertise the acquisition and select the supplier.
1) Communicate the request for the supply of a product or service to potential suppliers.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

Even a sole-source acquisition can benefit from organizing relevant information in an RFP, but there will be no need to publicize the RFP for a sole-source acquisition. Ordinarily, existence of the RFP should be publicized in a manner likely to gain the attention of prospective suppliers. Copies of the RFP should be distributed or made accessible to all prospective suppliers, except in limited situations requiring a supplier prequalification, such as for safety, security, or confidentiality. Procedures should be identified for a supplier to obtain such prequalification.

An electronic format for both the RFP and proposals is suggested to facilitate suppliers' incorporating the RFP content in their proposals and the acquirer's evaluation of proposals. Electronic distribution makes the costs, time, and effort of distributing RFP copies negligible.

Suppliers should be directed to communicate all questions and comments to the designated acquirer contact and refrain from sales activities contacts with acquirer personnel.

Suppliers should be notified that the acquirer may modify the RFP, typically with addenda reflecting clarifications and amendments, or even terminate the acquisition process.

6.5.3 Pre-qualification

Limiting the suppliers who are allowed to submit proposals can serve one or more of the following purposes:

— reduce the time, effort, and cost of evaluating proposals by limiting the number of proposals to evaluate and more specifically limiting proposals to suppliers who are considered likely to be able to satisfy the acquirer's requirements;

— avoid security or competitive concerns about revealing confidential acquirer information about the specifics and even existence of an acquisition to those whose trustworthiness has not been confirmed;

— acknowledge and reward prior successful experiences with suppliers, even to the extent of sole sourcing;

— engage suppliers more expediently by dealing directly with those who have already been qualified and are on a "preferred supplier" list;

— rely on internal resources' skill, knowledge, and familiarity with the acquirer's business and systems to determine a supplier's ability to satisfy the acquirer's requirements;

— comply with the acquirer's customary procurement procedures, practices, and policies.

Pre-qualification can involve a wide range of time, effort, and cost, from little effort if relying entirely on an existing list, to far greater time, effort, and cost to hunt for prospective suppliers and information about them and then analyse the information to determine whether the supplier qualifies. Whatever method is used, with pre-qualification a "short list" is identified of prequalified prospective suppliers who receive the RFP and have an opportunity to submit a proposal.

To reduce the effort gathering information about prospective suppliers, while at the same time increasing the information's reliability, the acquirer may prepare and distribute a request for information (RFI) which requests prospective suppliers to provide the information about them that the acquirer uses to pre-qualify them. This approach still can take considerable time, effort, and expense. Typical tasks may include the following.

a) Use internal and possibly external resources to perform research to identify prospective suppliers to receive the RFI. These resources can, among other things, talk to industry contacts, review industry publications, review websites, and review commercially available supplier rankings (e.g. Gartner) and other commercially available resources (e.g. D&B).

b) Prepare and distribute an RFI to such prospective suppliers. RFIs usually contain little or no confidential information about the acquirer and the proposed acquisition and request general company and domain specific information from the prospective supplier, including:

   1) the size of the potential supplier, the number of its employees, the locations of its facilities, a description of its financial status, and a description of its product roadmap;

   2) the potential supplier's qualifications including experience with similar acquisitions;

3) the potential supplier's references;

4) the potential supplier's level of interest.

c) Evaluate RFI responses.

d) Schedule and perform visits to their facilities to verify the RFI responses match the supplier's operational practices, observe product demonstrations, and review documents and quality systems. Meetings with the supplier can clarify critical points in the RFI response, establish familiarity and relationships between key personnel, and gain mutual understanding of further cooperation possibilities.

e) Check references.

f) Seek non-disclosure agreements (NDAs) for proprietary information from the potential suppliers.

6.5.4 Streamlined pre-qualification

Under this approach the acquirer performs some due diligence with respect to a large group of suppliers and pre-qualify a "short list" of prospective suppliers who are provided the RFP and given an opportunity to submit a proposal. However, this approach does not involve preparation and distribution of an RFI, review of prospective supplier responses to RFIs, site visits, or reference checks. In performing pre-qualification, acquirers may perform the following:

a) using internal and possibly external consulting resources, produce a list of prospective suppliers to be provided the RFP; these resources may be identified by talking to industry contacts and reviewing industry publications, websites, and commercially available supplier rankings and ratings;

b) requesting that a potential supplier on the list notify the acquirer of its level of interest and provide a non-disclosure agreement (NDA) if interested;

c) sending the RFP to suppliers submitting the NDA.

Proponents of this approach suggest that it has all the advantages of more rigorous pre-qualification without requiring as much acquirer effort.

6.5.5 No pre-qualification

An alternative view is that in many instances pre-qualification is not necessary and can even be counterproductive. More efficient and effective alternatives to traditional proposal evaluation methods are described in 7.3.4 and 7.3.5 and can enable reliable evaluation of even numerous proposals in relatively little time. The potential benefits of receiving even one additional more responsive proposal can vastly outweigh the costs of evaluating it. Confidentiality concerns can still exist, but closer examination can reveal that in fact they do not extend to every acquisition and can be satisfied in more efficient ways. Prior supplier successes and relationships can and should be acknowledged, and certain acquisitions can be accomplished more expediently from trusted suppliers alone, even to the extent of sole sourcing, by consciously recognizing and balancing risks. The prevalence of acquisition inadequacies seriously draws into question individuals' common assessment that their own skill, knowledge, and capabilities enable them to pre-select appropriate suppliers. Efficient mechanisms should be present to enable identifying and qualifying additional prospective suppliers, especially ones with more current or innovative solutions who otherwise could be overlooked on a preferred supplier list.

Not only is pre-qualification costly and time-consuming, it means the acquirer performs a significant portion of the software acquisition evaluation without regard to the supplier's proposal, which should be the primary basis for evaluation. Moreover, judgments made in the abstract about the prospective supplier's capabilities can be insufficient to confirm that the prospective supplier can meet the acquirer's specific requirements if selected, let alone that the supplier is most advantageous, especially if the judgments are based on unreliable or misunderstood information, which can easily happen with pre-qualification.

Regardless of whether there is explicit pre-qualification, some acquirer personnel have been known to enter an acquisition having already decided which supplier to select and often then treating the acquisition process as an unnecessary formality to circumvent as much as possible. While such prejudgments sometimes turn out successfully, they often fail or preclude selection of a more advantageous solution, which can be hard to recognize at the time. The acquisition process is there to increase chances of success, including not relying on mistaken prejudged supplier selections.

Thus, the purpose of the no-pre-qualification approach is to identify potential suppliers of the required software and inform them of the acquisition. In some cases, this can necessitate special procedures that comply with confidentiality concerns. The acquirer may utilize existing lists of approved or known suppliers and supplement as needed with various forms of research, such as, searching the Internet, asking colleagues, identifying relevant speakers and authors, and issuing advertisements. A brief request for information (RFI) may be used to solicit suppliers' willingness to be included and obtain relevant contact information. In some cases, it can be appropriate to require a supplier to pay a deposit or submit an NDA to receive a copy of the RFP.

Methods for identifying prospective suppliers are not appropriate for evaluating the presumed suitability of such suppliers, let alone selecting one. For many acquisitions where pre-qualification is not necessary, time and effort need not be spent trying to predetermine a shortlist of "finalist" suppliers to receive the RFP; and visiting prospective proposers' sites is especially unnecessary. Potential suppliers should self-select and agree to be subject to security and confidentiality constraints before receiving a copy of the RFP. The RFP shall identify mandatory deliverables and relevant constraints, such as an NDA or security procedures. If a supplier chooses to invest their time and money submitting a proposal, the acquirer can then evaluate and exercise its judgement about the credibility of the proposal with regard to the suitability of the potential suppliers.

6.6 Preparing contract requirements

6.6.1 General

Acquirers and suppliers should work during the acquisition process to establish a cooperative and collaborative relationship. Such a relationship almost always makes it easier for them to address issues and differences that can arise. However, such a relationship alone is no substitute for a well-documented, negotiated contract that sets forth the supplier's promised way to satisfy the acquirer's requirements and the acquirer's commitments to the supplier.

During acquisition planning and execution, it is common and helpful to draft and issue several types of requests that can be issued for different purposes: RFI, RFQ, and RFP.

6.6.2 Request for information (RFI)

An RFI solicits information to aid the acquirer in planning the acquisition. Such information often is used in evaluating the feasibility of the acquisition and may include indications of typical software capabilities, costs, and other considerations. Responses to an RFI are not intended to be a proposal which is legally binding on the responding supplier and are not a suitable basis for evaluating or contracting with suppliers.

When an RFI is used to solicit interest of suppliers in being included among the group of prospective suppliers being asked to propose software and or services, the RFI should include sufficient information about the acquirer and the acquisition to enable a prospective supplier to determine their suitability for proposing; but the acquirer should not decide based on an RFI response whether or not a prospective supplier is qualified, let alone that the prospective supplier should be selected to provide the software.

6.6.3 Request for quote (RFQ)

An RFQ solicits a legally binding offer from a supplier to supply a specified product for a specific price. Thus, an RFQ is appropriate only for acquiring software which truly has attained commodity status, which most software has not attained. Except for ordering additional copies of a software product that the acquirer has acquired previously or seeking more advantageous pricing such as for a volume purchase, RFQs should be avoided for software. An RFQ for a specific brand, model, and version places the entire burden of responsibility on the acquirer for specifying a suitable product.

An acquirer may reduce its risk by issuing an RFQ for a commodity product which the supplier identifies based on some basic characteristic variables. For example, the RFQ may request a quote for a particular type of software product that runs under a particular operating system; but the acquirer is still responsible for selecting an appropriate product.

6.6.4 Request for proposals (RFP)

Perhaps the most-distinctive characteristic of software acquisition addressed in this document is that the transaction is between unrelated parties and thus can be a legal agreement. A contract can be formed when an offer is accepted in conjunction with consideration (usually an agreement to pay for receiving what has been offered). In general, a contract need not be a single document or even in writing and need not include a specific level of detail or any verbiage, such as designation as a contract or "legalese."

As used in this document, an RFP solicits a proposal (offer) from a supplier to supply software products or services that satisfy requirements stated in the RFP for a given price (consideration). When the acquirer accepts a supplier's proposal and agrees to pay for its implementation and delivery, a contract is formed. Consequently, a supplier should be very careful to propose only what the supplier is willing to become responsible to provide.

An RFP contains the information identified during the planning and RFP sub-process about the acquirer and the acquirer's content, contract, and procedural acquisition requirements, and requests prospective suppliers to propose software or services to satisfy the requirements. Unlike an RFI, an RFP solicits information which can become legally binding on the supplier and thus is the basis for evaluating and contracting with suppliers.

An RFP invites proposals where each prospective supplier is proposing to provide software products or services which are to some degree unique. That is, the capabilities of the proposed software product or services are what differentiates one proposal from another; and pricing can be compared meaningfully only with regard to the various proposals' respective capabilities. The objective of an RFP is to provide sufficient information to enable suppliers to propose responsive software products or services that suitably meet the acquirer's needs. The acquirer's challenge is defining its requirements adequately, so that satisfying the stated requirements in fact meets the acquirer's needs and so that the supplier can understand the requirements sufficiently to propose suitable software or services to satisfy the requirements.

Some acquisitions request suppliers to submit a working prototype of their software instead of a written proposal identifying what they propose to deliver and how it satisfies the acquirer's requirements. While a prototype can be a suitable part of a proposal, primarily for custom development, a prototype should not substitute for a written proposal. It can be exceedingly difficult and unreliable to comparatively evaluate working software prototypes. Moreover, a prototype includes limited capabilities and may not accurately reflect the operation and control functions of the final software product. Furthermore, the information that typically goes into a proposal has to be produced eventually for inclusion in a formal written contract, so skipping the proposal does not really save any time or effort.

Requirements commonly are less accurate and less understandable than the situation calls for. Therefore, prospective suppliers often request the acquirer to clarify particular requirements and sometimes also suggest additional or alternative requirements that the acquirer may consider. Suppliers also can qualify certain aspects of their proposal and can choose to respond less than fully to some requirements. When reviewing a supplier's proposal, the acquirer may similarly request the supplier to clarify aspects of their proposal; and sometimes such a request reveals a need for the acquirer to clarify or modify some requirements. To promote fairness and the ability of all prospective suppliers to make more suitable proposals, questions and comments about the RFP along with related responses, clarifications, and amended requirements should be shared with all prospective proposers.

In general, the RFP should specify a structure for the supplier's proposal which facilitates the acquirer's review and evaluation of the proposal. A common technique is to include turnaround forms, questionnaires, or responses to a set of requirements or SOW, that all proposals are required to include, completed to provide specific requested information in the same format in all proposals. Because anticipating evaluation provides context which can otherwise not be understandable for various requirements topics and formats, several are addressed in 7.3 and 7.4.

Ultimately, a contract is formed when the acquirer accepts a supplier's proposal, which can have been modified in whole or in part by responses to questions or RFP amendments and can incorporate by reference product demonstrations and other additional information from the supplier. In addition to acquirer responses that affect and therefore should be shared with all prospective suppliers, there often are final negotiations affecting only the selected supplier and not changing the basis of the selection. To help avoid misunderstandings and unintended consequences, the RFP should state that the parties agree a contract is not formed until it is in writing and formally executed.

The RFP shall include or refer to descriptions of:

a) the acquirer’s business;

b) the acquirer’s objectives, nature of what is being acquired, and overall acquisition strategy;

c) any legacy systems that are expected to interoperate with the new software and services;

d) any legacy systems or services that are expected to be replaced;

e) sufficient information about the acquirer’s requirements for what is being acquired to enable prospective suppliers to make sufficiently responsive proposals regarding the software and/or services to be acquired, addressing relevant terms and conditions;

f) mechanisms for monitoring and evaluating ongoing progress and quality, including relevant types of software metrics such as those described in ISO/IEC/IEEE 15939;

g) criteria for ascertaining acceptability of delivered software and services;

h) a specified structure and delivery media for the supplier’s proposal which facilitates the acquirer’s review and evaluation of the proposal; this should include direction to submit pricing information separately from the proposal's technical content;

i) the acquirer’s commercial and legal requirements, including desired contract terms and conditions;

j) schedule of procurement activities, e.g. submission deadlines, product demonstrations, or bidders' conference;

k) designated acquirer's contact information and procedures for supplier communications with the acquirer regarding the acquisition, generally including limitations on supplier sales activities and contacts with other acquirer personnel;

l) procedures for suppliers to raise questions regarding the RFP, usually in writing with the understanding that such questions and the acquirer's responses will be shared with other prospective suppliers to maintain fairness and increase all prospective suppliers’ ability to propose software or services that are maximally advantageous to the acquirer; face-to-face discussions can be an economical way to communicate but should not be relied upon by themselves without commitment to writing;

m) procedures for requesting suppliers to provide additional information, including demonstrations to explain and answer the questions;

n) procedures for issuing clarifications and amendments to the RFP, including methods for determining when amendments warrant changing the deadline for supplier proposals;

o) deadlines for proposal submission and delivery of proposed software products and services; interim milestones may also be defined.

NOTE Detailed requirements for content of an RFP are presented in ISO/IEC/IEEE 15289:2019, 10.48.

6.6.5 Contractual requirements

6.6.5.1 General

The RFP should include the acquirer's proposed contract terms and conditions and require that prospective suppliers should include them in their proposal, so they become part of a formally executed contract. The acquirer's legal department or outside counsel typically participates in identifying contract requirements.

NOTE The common approach of making contract preparation a separate activity after a supplier's proposal has been selected can result in unnecessary additional acquisition effort, cost, and disagreements while at the same time risking producing a contract document which does not accurately reflect the acquirer's basis for selecting the supplier.

In preparing their proposals, prospective suppliers can raise questions and concerns about content and contract requirements in the RFP and can suggest alternatives. Based on such supplier feedback and other information, the acquirer may distribute to all prospective bidders addenda to the RFP, clarifying or amending the RFP. Considering possible extra effort needed to address such addenda, it can be appropriate to extend the deadline for submitting proposals.

Amendments to the RFP should be issued sufficiently prior to the proposal due date that prospective suppliers can address all amendments in their proposals. However, occasionally the need for some amendment is not identified until later. sometimes even after suppliers have submitted their proposals. In such a case, addenda with the amendments should be distributed to all suppliers who have submitted proposals or would have submitted proposals given the RFP amendments, and those suppliers should be provided sufficient time to submit responsive amendments to their proposals.

Contract provisions should be developed and included according to the acquirer's needs and identified in the RFP so they can be incorporated directly in the supplier's proposal and formal contract. The form and substance of these contract provisions may differ depending on whether OTS, custom developed software or SaaS is being acquired the following topics should be addressed in a formally executed contract or agreement:

a) a description of the software or services to be supplied;

b) ongoing operations, maintenance, and support services for the supplied software product;

c) a description of the tasks the acquirer is obligated to perform;

d) the term of the arrangement;

e) payment terms including linking payments to deliverables and holding back a portion of each payment until acceptance of the software and/or service;

f) the software lifecycle the supplier uses and a commitment to employ it in accordance with industry standards unless otherwise specifically agreed by the acquirer:

g) for services, standards for supplier personnel (e.g. with respect to training and experience), any limitations on the use of subcontractors and any limitations on the location from which the services are to be performed;

h) methods to monitor ongoing progress, software performance, and quality;

i) acceptance criteria;

j) the supplier's obligation to comply with applicable law and to provide services and software that meet any applicable legal and regulatory requirements;

k) the supplier's confidentiality and data privacy obligations;

l) the consequences of applicable law changing during the term;

m) the parties' respective rights to the software or services and intellectual property used to provide or resulting from the use of the software or services (also see Annex C);

n) remedies for intellectual property (IP) infringement including the supplier's obligation to replace the infringing IP if possible;

o) ownership of and rights to data processed by or resulting from the use of the software or service;

p) a process for invoking and escalating urgent, critical events (e.g. delivery schedule slipped, critical quality issues, payment delay, and response time) to the supplier or acquirer management for prioritization and resolution;

q) the parties' respective termination rights;

r) mechanisms for modifying supplier or acquirer obligations and constraints and resolving disputes; this provision should include an informal process utilizing executives of each party not directly involved in the transaction, and a formal process such as alternatives to litigation including mediation and arbitration.

Typically, the most efficient way to address these issues is to incorporate them in the RFP and supplier's proposal.

6.6.5.2 Specifying the required quality of the work

c) Establish and maintain an agreement.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

The purpose is to make the supplier's understanding of the quality level of the finished work it is to provide and the acquirer's understanding of what it is getting the same.

The supplier should identify in their proposal how they will carry out the work to implement the software or services they propose. The supplier is being engaged because they presumably have relevant skills and knowledge to define and deliver suitable software or services. Moreover, in order to hold the supplier accountable for performing appropriate work, the supplier shall be the one defining said work and indicating its conformance with the policies and procedures of the acquirer for the type of work. When evaluating a proposal, the acquirer judges whether the supplier's proposed work plan seems reasonable to implement proposed software or services. Often the acquirer has questions which result in the supplier modifying its proposal; often through providing demonstrations or additional information. Sometimes information surfaces which necessitates the acquirer's amending the RFP requirements, which then in turn may necessitate revisions to supplier proposals and added time for making revisions.

Methods for identifying required quality of work may include the following.

a) In general, the main method for evaluating a supplier's work is the acceptability of the software or services the supplier delivers with regard to both functional and non-functional requirements. However, especially for acquisitions where implementation takes an extended period of time, the acquirer should identify in the RFP the methods and criteria it intends to apply to evaluate the supplier's ongoing work. The supplier can question these and propose alternatives which the acquirer in turn can question. Identify how such ongoing evaluations measure progress and are coupled with progress payments to the supplier. A common way to do this is to define a series of deliveries, each of which represents a milestone for assessing progress and providing partial or tentative acceptances. In some instances, deliveries may be defined in terms of agile sprints. The less defined the software is, the closer the evaluation points should be. In some cases, the acquirer's approval should be required for each sprint or increment before the development is allowed to continue to the next.

b) Evaluation of ongoing work should address the reasonableness of the work activities for the situation and the proficiency with which activities are performed and produce required results.

c) Describe procedures for the supplier or acquirer to request information or changes, identify who for the supplier and for the acquirer are authorized to provide requested information or approve changes, and what types of changes warrant a change in price or a formal amendment to the contract.

d) Describe methods the supplier uses to assure the quality of its work, and how the acquirer is informed of such actions and their results.

e) Describe respective supplier and acquirer obligations, such as for reporting and providing needed access and resources, methods for evaluating their adequacy, and procedures for resolving disputes. Describe procedures for delivering and installing supplied software, including the acquirer's performing acceptance testing at the time of installation, and methods to back out installed software as needed. Delivery can consist of a series of deliveries, each with relevant acceptance testing.

6.6.5.3 Determine how payment is to be made

Different approaches to payment are used depending on whether OTS, custom software, SaaS, or ancillary services such as implementation services are being acquired. Where OTS is being acquired software is typically paid for on delivery and acceptance. Where SaaS or "in the capacity" services are being acquired, the services are typically paid for in periodic (e.g. monthly) payments over the life of the contract. Where custom software is being acquired, tie supplier payments to deliverables, typically with some reasonable time after delivery to confirm suitability of the deliverable. Consequently, the agreement should include a schedule for series of deliveries with corresponding progress payments and a hold-back amount payable only upon final acceptance within a reasonable amount of time from the supplier's final delivery.

One of the most common acquisition questions concerns whether price should be a fixed or variable amount. The price of an existing OTS software product or standard SaaS product/service ordinarily is a fixed amount, which often is publicly advertised, though can be adjusted for competitive advantage in the proposal. In contrast, suppliers generally prefer to charge for custom development based on the supplier's expenditure of time and for materials (T&M).

T&M reduces the supplier's risk that the supplier's costs exceed revenue but increases the acquirer's risk that total charges exceed the maximum amount the acquirer intended to spend, in which case hindsight often suggests a preferable but now no-longer-available payment method. A common technique for reducing the acquirer's risk is to limit the total T&M charges to a "not to exceed" amount, which essentially makes the price fixed at that amount. In any type of fixed price contract, the acquirer should identify objectively ascertainable conditions that warrant price adjustments and procedures for calculating and making such adjustments.

While the acquirer may suggest in the RFP an expected or preferred payment procedure. the supplier can offer alternate payment methods in their proposal.

6.6.5.4 Acquirer's retained responsibilities

The acquirer and supplier should agree on the acquirer's specific responsibilities. Failure to do so can lead to problems that threaten the acquisition and implementation. For example:

— the supplier assumes the acquirer is performing a task that the acquirer does not intend to perform or lacks the capability to perform; or in other words, there is no meeting of the minds regarding the acquirer's retained responsibilities;

— the supplier blames the acquirer for a supplier failure by stating that the underlying task was the acquirer's responsibility.

7 Evaluation, selection, and contracting sub-process

7.1 Purpose

b) Advertise the acquisition and select the supplier.
2) Select one or more suppliers.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]
c) Establish and maintain an agreement.
2) Identify necessary changes to the agreement.
3) Evaluate impact of changes on the agreement.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

The purpose of the evaluation, selection, and contracting sub-process is to help ensure the selection of a responsive proposal which can reasonably and most advantageously meet the acquirer's requirements, and to contract with the selected supplier(s) to deliver the agreed software and services. The acquirer shall perform the key activities in this sub-process, including:

a) evaluate supplier proposals;

b) eliminate any proposals that are unlikely to meet acquirer's needs;

c) rank supplier proposals;

d) identify and address any common critical commercial and legal issues;

e) select the most advantageous proposal overall;

f) negotiate final details and execute a formal contract with the supplier whose proposal is most advantageous overall; or if a formal contract cannot be executed, repeat with the next most advantageous, or terminate the acquisition.

The extent and formality of each activity can vary based upon the risks involved. The acquirer should obtain additional information as needed from qualified suppliers to confirm understanding of their proposals, such as by formal requests for clarification of the proposal or for demonstrations of their software and services.

Figure 4 shows an overview of the major activities and outputs of the evaluation, selection, and contracting sub-process. The sub-process technically begins after an acquirer issues a request for proposals (RFP); but most of the sub-process' observable activity occurs after the acquirer receives a proposal in response to the RFP from a prospective supplier.

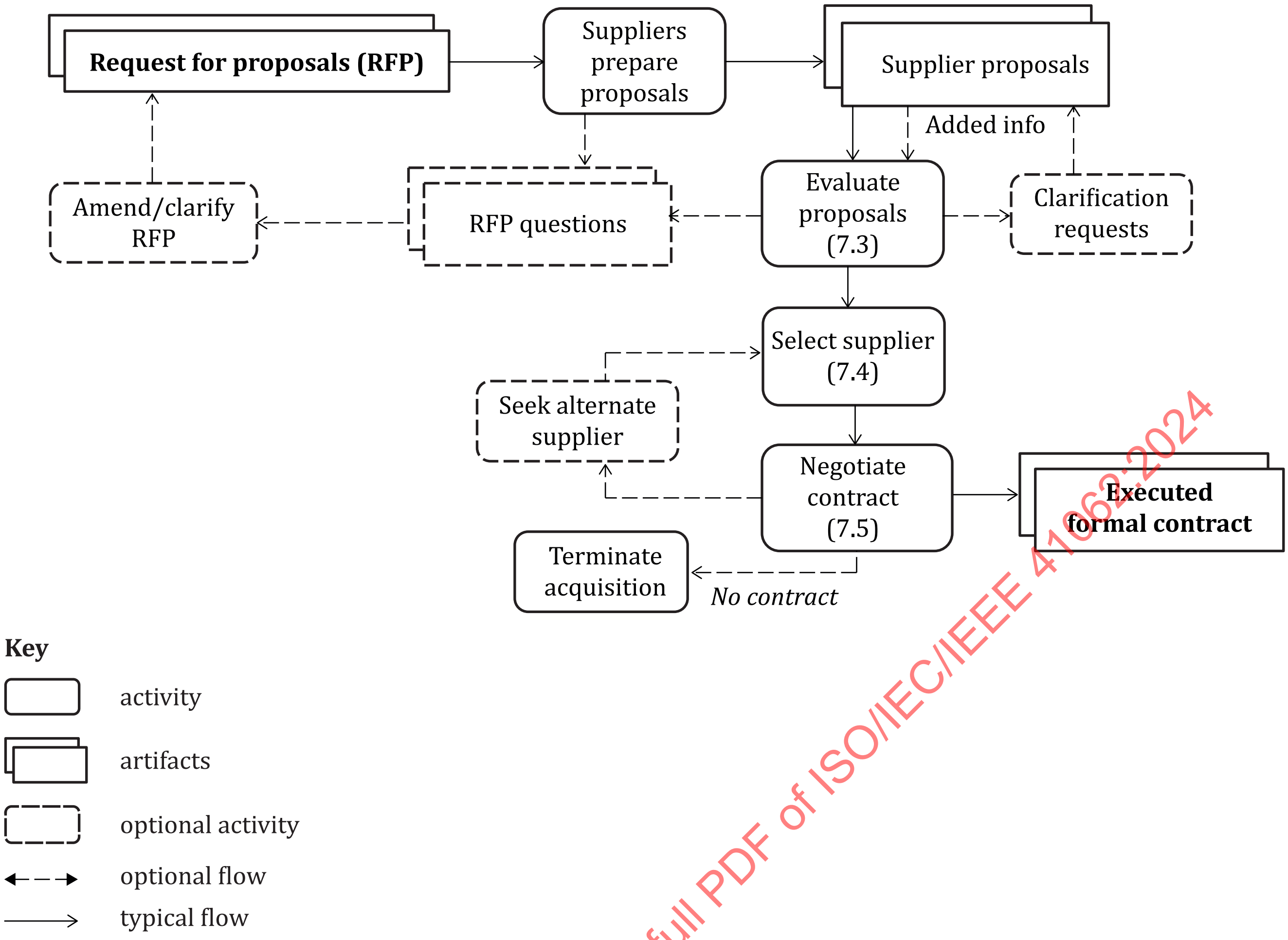

Figure 4 — Evaluation, selection, and contracting sub-process

Before submitting a proposal, suppliers can ask the acquirer to clarify certain RFP contents and suggest alternatives for the acquirer to consider. To maintain fairness and provide all prospective suppliers the opportunity to make proposals that more fully meet the acquirer's needs, the acquirer should share in writing with all prospective suppliers all questions and answers along with any amendments to the RFP.

The acquirer evaluates each supplier proposal, preferably applying structured evaluation procedures and criteria described in the RFP. During evaluation, the acquirer may request a supplier to clarify or provide additional information regarding some aspect of the supplier's proposal. Although the intent is to make all RFP amendments prior to proposal submission, it also is common, often in response to supplier proposals which indicate misunderstanding of some aspect of the RFP, for an acquirer to amend its RFP and for one or more suppliers in turn to submit additional information or modify their proposals accordingly. Generally, the supplier is responsible for the suitability and feasibility of its proposal. However, the acquirer should question aspects of a proposal which seem significantly out of line with other proposals, since such differences can reflect the supplier's superior capability or can signal a misunderstanding of the acquirer's requirements.

After evaluating all proposals, the acquirer should rank those which are deemed acceptable and may gather additional information to confirm the acquirer's understanding of acceptable suppliers' proposals. The acquirer then begins negotiations of final details with the supplier whose proposal is highest ranked (or a few suppliers in a competitive range) with the objective of reaching agreement in an efficient manner. When the acquirer and supplier have reached agreement, the acquirer accepts the supplier's proposal as modified by negotiations as a formal written contract, whereupon the supplier begins carrying out its contractual obligations.

In the event the acquirer cannot reach a satisfactory agreement in a reasonable time with the supplier of the currently highest-ranked proposal, negotiations shift to the supplier with the next highest-ranked proposal and so forth until a formal contract is executed or the acquirer terminates the acquisition.

Although evaluation apparently begins when all proposals have been submitted, in fact, many activities between issuing an RFP and receiving proposals are likely to provoke evaluations of suppliers. Thus, this sub-process begins upon issuance of an RFP.

7.2 Outcomes

The outcomes are as follows:

a) proposals are evaluated;

b) a qualified and preferred supplier is selected;

c) a formal contract between acquirer and supplier is negotiated and executed; or the acquisition is terminated.

7.3 Evaluating proposals

7.3.1 Planning for proposal evaluation

The acquirer's strategy should include identifying anticipated methods and procedures for evaluating submitted proposals. General anticipated proposal evaluation procedures should be described in the RFP to better enable prospective suppliers to submit responsive proposals. More specific information about evaluation methods may be private to the acquirer and not described in the RFP. However, the RFP shall specify a required proposal format structured to facilitate such evaluation.

7.3.2 Evaluation criteria

The primary evaluation criterion should be the extent to which the supplier's proposal satisfies the acquirer's requirements and thus provides the desired value. Typically, the acquirer's requirements include a set of mandatory requirements which a supplier is required to propose to satisfy for the supplier to be considered further. The acquirer can also identify a set of additional non-mandatory requirements and their respective weightings (degrees of importance) which become the basis for comparative proposal evaluation. The objective is to establish clear and open supplier evaluation criteria that give confidence the supplier selected to do the work can satisfy the acquirer's requirements and, in a competitive situation, on balance is best suited to provide the software or services. Even when considering only a single source, a prospective supplier's proposal should be evaluated to confirm it reasonably will satisfy the acquirer's requirements sufficiently to provide needed value before engaging the supplier.

7.3.3 Establishing proposal evaluation procedures

7.3.3.1 Defining explicit structured evaluation techniques

Evaluation procedures should be developed to use in applying evaluation criteria when reviewing supplier proposals, identifying non-responsive suppliers, and selecting a qualified supplier. Additional considerations relate to assessing the acquirer's degree of confidence in the supplier's ability to deliver as promised and should include the supplier's management qualifications, technical approach, financial position, technical capability, experience, quality practices, and perceived ability to work harmoniously with the acquirer. Visits to supplier facilities and interviews with supplier clients may be conducted.

Many evaluations are performed in a relatively unstructured manner, typically directing evaluators to review and comment on supplier proposals without specific guidance. Such an unstructured approach relies on the evaluators to know what to look for and how to evaluate it–and frequently produces review results which are incomplete, inconsistent, and unreliable.

Many acquisitions employ a more structured evaluation approach developing a scoresheet, which typically breaks out specific evaluation topics and assigns relative weights to each based on their importance to the acquisition. In addition, evaluators prepare checklists such as ones which ask yes-no questions or other guides for evaluating various aspects of a proposal and ordinarily also identify a mechanism for scoring evaluation results. Less formal guides rely on evaluators' judgments to score each question yes-no, high-medium-low, 1 to 5, or other similar techniques. More formal guides list specific criteria warranting each score.

One or more evaluators follow guides to evaluate and score each proposal with respect to each of the evaluation scoresheet questions. Evaluators also can record comments regarding their specific evaluations. For each proposal, the score for each topic is sub-totalled and extended (multiplied times the topic's weight). Extended scores are totalled for each proposal and then coupled with the proposal's price to enable quantified performance-price comparisons of competing proposals.

7.3.3.2 Guiding submission proposals that address capability gaps

Weightings and scoring should be explained in the RFP so the supplier understands priorities and can produce a responsive proposal. Required, higher risk, and very important capabilities are weighted higher than low risk, optional, and less important capabilities. Often a supplier who cannot satisfy a key set of required capabilities is removed from further consideration. Making such critical criteria explicit enables prospective suppliers to determine whether to propose.

Since the objective is for the acquirer to receive appropriate software and services, and to enable fair and meaningful comparative evaluation of suppliers proposing different software solutions, suppliers should be directed to submit proposals which address all the acquirer's key requirements. Thus, a supplier whose own product or service does not satisfy a key acquirer requirement is directed to identify a way the requirement can be satisfied.

For example, services or an additional piece of software, hardware, or custom development from a separate supplier can be needed to fill the gap. The main supplier can arrange with a supplemental supplier to provide the additional items as a vendor or subcontractor to the main supplier or as a co-contractor with whom the acquirer is required to contract separately.

While this document primarily anticipates evaluation of competitive proposals for supplying products and services to meet the acquirer's needs, acquisitions for a variety of reasons often are "sole source" wherein a single supplier is considered. Chances of a sole source acquisition succeeding are enhanced by following procedures similar to a competitive selection. That is, the acquirer defines its requirements, the supplier proposes to satisfy them, and the acquirer evaluates the adequacy of the supplier's proposal and engages the supplier only when the supplier's proposal is found adequate to meet the acquirer's requirements.

7.3.3.3 Reference to external supplier/product evaluations

Periodicals, books, and websites frequently publish reviews of various suppliers and their software products. Such reviews can be helpful for suggesting areas to evaluate more closely; but such reviews should not be the primary basis for the acquirer's evaluation of a supplier's proposal. The review has no accountability, nor is there any reliable way to assure its applicability to the acquirer's situation or supplier's actual proposal.

Acquirers may request prospective suppliers to provide references, who predictably tell only about the supplier's favourable side. A more informative technique is to request a list of all the supplier's recent clients for products and services like those being proposed, who have agreed to be contacted, and then have the acquirer choose which clients from the list to contact for references. Information from references can be helpful in judging the extent to which the supplier's depiction of some situation matches the acquirer's perception of it. Reference information can be especially relevant in making judgments about the responsiveness, attention to quality, and ease of working with a supplier. However, the fact that a reference found the supplier's product satisfactory for the reference's purposes is not sufficient for assuming the supplier's product is satisfactory for the acquirer's purposes. Often information from a reference describes more about the reference than the supplier. In addition, acquirers should not read meaning into a client's refusal to provide a reference, since many organizations have policies against giving references or other business reasons for declining.

Many acquirers spend considerable amounts of time and money visiting supplier facilities. Such visits often fail to provide any information which is relevant for evaluating the supplier's proposal, particularly when the supplier's developers work virtually; and judgments based upon visits concerning the supplier's suitability are often unreliable or inconclusive. On the other hand, visits to the supplier's existing customers can be more instructive. However, clients the supplier identifies for site visits can be unrepresentative of the supplier's full client base.

7.3.3.4 Uses of bidder's conferences

After releasing an RFP to prospective suppliers, an acquirer may invite all the prospective suppliers to a supplier (bidder's) conference where the acquirer explains the RFP and answers prospective suppliers' questions. While such multi-person conferences can facilitate communications and expedite identification of needed clarifications, bidder's conferences also can have several drawbacks. Acquirers may take less care preparing an RFP on the assumption that verbal communications at the conference will make up for the RFP's shortcomings. However, taking sufficient care preparing the RFP is more reliable, since verbal communications are often unreliable and need to be captured in writing anyhow, so all prospective suppliers receive the same information even if they are not present at the bidder's conference.

In-person bidder's conferences especially can incur significant expense which the supplier passes along to the acquirer. Prospective suppliers can feel obligated to attend lest their absence be used against them in evaluations of their proposal. Suppliers have been known to veil sales presentations in the form of questions; and acquirers often make subjective judgments about suppliers based on their bidder's conference behaviours. Such impacts can be reduced by encouraging submission of written questions prior to the conference and holding it electronically.

7.3.3.5 Trial use of proposed software products

Often prospective suppliers offer the acquirer the opportunity to install the supplier's product for a trial period. Once the acquirer has expended the effort installing and learning the proposed software, and as it becomes familiar, it can seem like the preferred way such software should act. Consequently, it can be hard to evaluate other competing proposed software objectively unless the acquirer is able to engage in trial use or demonstrations of each competing supplier in the competitive range. Even then, the first product trial often gains an advantage, so it can be instructive to conduct a second trial of the first product after completing trials of competing products.

7.3.3.6 Avoiding overemphasis on certain aspects

An acceptable supplier's proposal should meet the acquirer's business and technical requirements, including the supplier's credibility, before the proposed price is considered. To help avoid the common tendency to look first at price, a suggested practice is to direct suppliers to submit the pricing of their proposal separately from the proposal content and keep evaluators unaware of such price information. The acquirer should first evaluate all proposals without regard to price, and then compare the price-performance ratios of all proposals. Moreover, when comparing prices, the evaluators should normalize the various suppliers' proposals. For example, if a proposal lacks one or more items of functionality of value to the acquirer, for purposes of the evaluation the acquirer may add the estimated cost of obtaining such items of functionality from an alternative source to the supplier's price. An alternative is to require suppliers to identify ways and prices to fill gaps in their own product or service.

Many proposal evaluators base their evaluations on supplier reputation or their judgments about the supplier's proposed methods and plan of work. Evaluators can need training to make such judgments reliably. Such judgments can be biased when based upon information from other sources which are not part of the supplier's proposal and which the supplier was not even aware of.

When proposing services, suppliers commonly identify the backgrounds of personnel who are likely, and sometimes promised, to perform specific roles. Proposal evaluators make judgments about how well they expect the proposed personnel to perform; and concerns thereof can be communicated to the prospective supplier. Except where the participation of particular supplier personnel is a key element in the supplier's selection, or where there are valid reasons for excluding particular supplier personnel from participating, the supplier alone should determine its staffing and direction of its staff. Giving feedback about suitability of particular proposed supplier staff is not a license to dictate the supplier's staffing and methods. The supplier has control over how it staffs and manages its work, consistent with applicable laws and regulations.

7.3.3.7 Maintaining supplier's burden of responsibility

Acquirers can evaluate supplier proposals in a way that unwittingly undercuts the supplier's responsibility for the suitability of their proposed software. This occurs in the typical acquisition sequence of events: the acquirer states its requirements, the supplier describes its software product and service solution, and the acquirer determines whether the proposed solution can satisfy the acquirer's requirements and provide desired business benefits/value. This makes the acquirer, not the supplier, responsible if the supplier supplies the proposed solution but it fails to satisfy the acquirer's requirements. To avoid such an undesired outcome, the acquirer shall define its business requirements; and the supplier shall state explicitly that its proposed solution does satisfy the acquirer's specific business requirements.

7.3.4 Alternative evaluation techniques

The traditional scoresheet evaluation approach can be time-consuming and expensive, especially if evaluators misunderstand and thus mis-score aspects of the supplier's proposal. Less easily recognized is that the traditional scoresheet evaluation can remove a supplier's responsibility for its software – exactly opposite the effect acquisitions and such evaluations are presumed to provide. If a supplier says they provide a given result but fails to do so, the supplier generally can be held responsible. On the other hand, if someone else infers the supplier will provide a given result; but the supplier is not able to, the supplier's responsibility can be contested.

In the typical traditional scoresheet evaluation, the acquirer describes its requirements in the RFP, the supplier describes the product or services it proposes to provide, and the acquirer's evaluators make judgments as to whether or not they think what the supplier proposes is likely to produce the acquirer's desired results. In such a situation, the supplier can be held responsible only for providing the promised products or services, but not whether they in turn provide the benefits and value the acquirer expects.

An alternative approach which helps keep the supplier responsible has the supplier's proposal describe the proposed overall approach to satisfying the acquirer's requirements and then indicates for each requirement whether the supplier satisfies the requirement and the relative degree of risk thereto by stating whether:

a) a proposed existing software product satisfies the requirement;

b) a proposed existing software product is customized at no additional cost to satisfy the requirement;

c) an enhancement at additional charge satisfies the requirement; separately describing the product or service enhancement in the proposal and listing its additional price in the separate pricing part of the proposal;

d) an alternative is proposed; separately describing it and explaining why it should be acceptable in the proposal and listing any additional price for it in the separate pricing part of the proposal;

e) the requirement is not satisfied.

By stating each individual requirement as a deliverable capability that the supplier commits to delivering, there are no longer issues due to misunderstanding what the supplier is proposing, and the supplier can be held responsible for their promised provision of needed capabilities. The same approach applies to "non-functional requirements" (or "ilities"), such as performance, security, usability, reliability, and maintainability; and typically, RFPs additionally may request information about the supplier's procedures for satisfying such capabilities.

Suppliers whose own products or services cannot satisfy a particular acquirer requirement are encouraged to find and propose work from other suppliers who can satisfy the requirement. Such arrangements can take the form of subcontracting or other agreements with additional suppliers.

This technique provides three advantages. First, the burden of responsibility stays with the supplier since the supplier is promising to satisfy the acquirer's respective requirements, which can make it easier for the acquirer to establish supplier responsibility for failures of the software or service to meet the acquirer's need. Second, relative risk is reflected in each response, wherein an existing product that satisfies a requirement is the lowest risk because it is currently observable. No-charge customizing reflects a slightly higher risk, whereas enhancement for an additional charge incurs greater risk. Suggested alternatives can represent a range of risks which the acquirer assesses based on the alternative's specifics. A requirement that a supplier does not propose to satisfy is not a risk but rather a certainty that the acquirer does not receive desired capabilities. By making specific risks more apparent, there can also be opportunities to negotiate actions that reduce the risks or language in the contract that additionally allocates such risk to the supplier. Third, by not having to figure out what the supplier is proposing or judging it, the acquirer can more reliably evaluate the proposal's responsiveness in very little time.

7.3.5 Information to aid proposal evaluation

With the scoresheet approach, evaluators sometimes include additional scoresheet items which they use to make judgments about a supplier's response to some related question in the RFP. Often these questions can be reworded and included in the RFP for the supplier to respond to explicitly. This can greatly reduce evaluation effort and evaluation errors due to the evaluator's misunderstandings.

Where the supplier performs customization development or other services, the supplier should provide a detailed work plan briefly describing tasks, expected start and end dates, relevant dependencies, delivery schedule, and other pertinent information (such as things to be provided by the acquirer) that together produce software or services that satisfy the acquirer's requirements. The supplier can also describe particular methods, such as their approach and experience in agile methods or familiarity with the acquirer's software development policies and procedures.

Where the supplier is proposing ongoing operations, maintenance, or support services in conjunction with or separate from the supplier's proposing to provide related software products, the acquirer should request a description of measurable results and service levels and to propose methods for the acquirer to monitor, evaluate, and address the adequacy of such services.

The acquirer should not prescribe specific tasks but can look for expected tasks in the supplier's description of their work plans. For instance, much can be learned from the supplier's own intentions regarding project management activities, quality assurance, testing, planning, design, execution, reporting, corrective activities, and retesting.

Regardless of whether the supplier proposes subsequent maintenance of its software product, the supplier should identify types of warranty issues to be corrected without additional charge to the acquirer. Similarly, suppliers of OTS and SaaS products should describe and commit to regularly released product updates that typically go to all users of a proposed software product.

The evaluator evaluates the reasonableness of the supplier's proposed approach for meeting the acquirer's requirements, not whether it is the way the evaluator would do it.

The supplier usually is requested to identify and provide biographical information about key personnel to be assigned to work on the project. Generally, the supplier has full control over determining who staff will be and what they work on. The acquirer's main concern should be that the supplier has sufficient suitable resources to carry out the supplier's proposed work plan. In limited circumstances, an acquirer may indicate that a particular individual, or type of individual (such as to avoid conflicts of interest or security concerns) should not be involved, but usually cannot specify who should be involved. An exception occurs when a particular individual has recognized unique skills and expertise; and that individual's involvement is a key basis for selecting a specific supplier. The RFP should specify if identified key personnel are required to be committed to the project or are included in the proposal as typical, and whether the key personnel are currently employed by the supplier or will be engaged upon contract award.

Financial information can be requested from the supplier, such as their latest audited financial statement. The acquirer should have evaluators who can interpret financial reports and predict the viability of the supplier over the initial term of the contract. Recognizing the questionable accuracy of such predictions, another approach is to include in the RFP questions requiring the proposer to identify financial, legal, market, or other situations that constitute a risk affecting the supplier's ability to deliver the proposed software or services. Suppliers' inability or unwillingness to disclose such risks can be an added basis for evaluation. Where questions arise, the acquirer's evaluators may seek further information and clarification from a prospective supplier. Where such questions and related answers are also relevant to other prospective proposers, an amendment to the RFP pertaining to the identified topics may be issued, with an extension to give suppliers additional time to respond with modifications to their proposals.

The acquirer's evaluators prepare preliminary evaluation scores for each proposal based entirely on the written proposal as adjusted to address supplier answers to questions and clarifications. Suppliers whose proposals do not appear capable of satisfying the acquirer's requirements may be excluded from further consideration, and so notified at this point. However, the acquirer should keep potentially suitable proposals in consideration until a formal contract has been executed with a selected supplier.

7.4 Selecting the supplier

7.4.1 General

The acquirer should carefully and critically review each proposal for the following:

a) the magnitude of the effort required to fill any gaps between such proposed software or services and the acquirer's requirements as stated in the RFP;

b) the risks associated with the proposal (strategic, technical, commercial and environmental, social, and governance–ESG, among others) including with respect to the effort to fill any such gap;

c) the extent to which implementation will require business process change other than any that is part of a desired transformation;

d) the risk allocation reflected in the prospective supplier's concerns about and suggested changes to the acquirer's proposed contract terms and conditions, including representations, warranties and indemnities;

e) the price and the risk that the price will increase over time, including cautions when a supplier's proposed prices are much higher or lower than the average of all proposed prices, noting that both higher- and lower-than-typical prices may reflect superior solutions.

Members of the acquirer's procurement team responsible for the selection of the supplier, or for recommending a supplier or suppliers to a senior executive, should work to achieve a consensus view of the supplier or suppliers that are most advantageous to the acquirer. Once such a view is achieved this group should prepare a summary of its analysis for presentation to executives and to create a record regarding the decision.

7.4.2 Evaluation of information not in the proposal

Traditionally, much of an evaluation is based upon factors other than the supplier's proposal. Starting with pre-qualification to receive an RFP, considerable attention often is paid to the supplier's reputation and presumed capabilities ascertained from sources other than the supplier's written proposal. Annex A presents numerous topics often used for consideration in evaluating suppliers and software.

For example, prospective suppliers can be invited to demonstrate the software they are proposing and allow site visits to supplier or client facilities. In addition to the acquirer's own expenses for these activities, the winning supplier's costs end up being passed along to the acquirer. The alternatives described below can reduce these impacts.

Visits to supplier or supplier client facilities add time and cost to an evaluation. Too often such visits provide little additional reliable information that aids the evaluation; and frequently information that visits provide can be obtained in other less costly yet often more reliable ways. The increasing prevalence of supplier personnel's remote working makes it easier to recognize why and when acquirer site visits can be unlikely to provide added value offsetting their added cost.

Many evaluations rely extensively on supplier demonstrations of proposed products to understand what the supplier is proposing. Not only are demonstrations expensive and time-consuming, they often create an unreliable understanding of the proposed software. A demonstration provides a very limited view of the software yet can include too much information for an observer to comprehend. Moreover, demonstrations almost always avoid revealing areas of concern. Consider limiting demonstrations to suppliers whose proposals already have been evaluated as suitable for acceptance; and use demonstrations to confirm understandings rather than create them.

7.4.3 Additional requested information

To reduce both the acquirer's and suppliers' time and effort, the following activities should be restricted to a small number of "finalists" advantageous proposals which evaluation indicates are capable of sufficiently satisfying the acquirer's requirements. The purpose of these activities is to confirm the evaluators' understanding of the respective proposals and determine a level of confidence in the supplier's claims that their proposal satisfies the acquirer's requirements. In the light of such additional information, evaluation scores based on written proposals can be discounted, even to the point of determining that a proposal in fact is unlikely to satisfy the acquirer's requirements. That proposal may be excluded, or its author may be requested to revise their proposal accordingly and submit it to re-evaluation.

The RFP usually requests each proposer to provide references. Specific comments can be instructive about aspects or features of the software that the reference found especially easy or hard to use, error-prone, ineffective, poor performing, or useful. Some of the most valuable reference comments describe experiences working with the supplier and supplier personnel, such as speed, perseverance, and adequacy of response to problems and questions.

Supplier demonstrations of proposed software can be limited to proposals which have been evaluated as likely advantageous to the acquirer. The demonstration is to confirm the proposed software works as the acquirer's evaluators expected it to work, both with respect to subjective judgments of factors such as the software's usability and in accordance with the capabilities claimed in the proposal. Third-party reviews of products by authors not involved with the current acquisition and references' comments about the supplier's products often indicate aspects of the software to be sure to have demonstrated. Expected users of the software should observe the demonstration along with proposal evaluators; and where possible the expected users should try out the proposed software to evaluate its usability and general suitability for their work.

Ordinarily proposers demonstrate their proposed software at the acquirer's site. Alternatively, the acquirer's evaluators, including some expected users of the acquired software, can visit the supplier's or a supplier's client's facilities to observe the proposed software in actual operation. Since such visits incur significant time and expense, they should be undertaken only when they provide sufficient additional needed information that cannot be obtained more economically in other ways.

For existing products, access to a complete or representative set of user and operations documentation (information for use) should accompany the supplier's proposal. This is the simplest and most informative way to confirm such documentation exists and evaluate its suitability. These materials should accurately reflect the way the demonstrated software works. For software the supplier is developing, it can be helpful to request samples of documentation the supplier has produced for other custom development.

For large, complex, and unique custom software acquisitions, and for maintenance services, it can be appropriate to request proposers to provide samples of their work to demonstrate their technical capabilities. Work samples should be protected with NDA and restrictions on reuse. However, samples of work the supplier has done for other clients can be less relevant to the current acquisition. Then it can be instructive to request a proposer to develop a small piece of software to perform some challenging function of the software being acquired.

After discounting for supplier claims in the written proposal which are not supported by additional evidence and adjusting (and re-evaluating) for supplier proposal additions and corrections, proposal technical scores can be combined with proposed and adjusted prices to produce a performance/price ratio for each "finalist" proposal. The proposal with the most favourable performance/price ratio should be tentatively selected, and final contract negotiations should be initiated with its proposer. If a formal contract cannot be executed with the selected supplier within a reasonable time, the supplier with the next highest performance/price ratio can be engaged and so forth, so that a formal contract can be executed with a supplier whose proposal satisfies the acquirer's requirements. If a satisfactory formal contract cannot be executed with any suitable supplier, the acquisition can be terminated.

7.5 Negotiating the contract

7.5.1 General

c) Establish and maintain an agreement.
4) Negotiate the agreement with the supplier.
5) Update the agreement with the supplier, as necessary.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

Negotiations occur between acquirer and supplier representatives who have final negotiating authority, often with assistance of legal counsel, procurement specialists, subject matter and technical experts, or other advisors. 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.

The negotiating process is intended to identify any problems and misunderstandings, examine potential uncertainties, allocate the risks, and protect both parties. Review comments from business, finance, legal, procurement, and technical stakeholders should be consolidated for negotiation reference. The following aspects shall be agreed and documented when negotiating the contract:

a) a means of resolving disputes;

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

c) a maximum total price, payment amounts, or total value of the contract, adjusting the contract consideration in accordance with the custom-developed, OTS, or SaaS acquisition model;

d) the right to use intellectual property of acquired software and the remedy process if intellectual property infringement occurs on the acquired software to protect the acquirer's product delivery;

e) consistency with the acquirer's acquisition policy or strategy and related or previous contracts;

f) means of transitioning to supplementary contracts for operations, maintenance, or support services that a supplier is to provide for acquired software;

g) defining the process of invoking and escalating urgent or critical events such as delivery schedule slipped, critical quality issue, payment delay, or excessive response time, to the supplier management for prioritization and resolution.

If negotiations with the selected supplier fail to produce a contract that assures delivery of a quality product on time and properly supported, the acquirer should open negotiations with an alternate supplier.

If the acquirer cannot within a reasonable amount of time execute an acceptable formal contract with a supplier, the acquirer can terminate the acquisition. Furthermore, the parties should approach the negotiation as a process pursuant to which they can work together to find mutually acceptable solutions to common problems. By being empathetic and attempting to understand the other party's needs and positions, each should think about the extent to which they can meet the other's needs without materially compromising their own. Once an issue is identified, the acquirer and supplier should attempt to narrow or reduce its scope and impact by quickly identifying any parts that can be agreed and then working together to resolve remaining differences.

NOTE Detailed requirements for content of a contract are presented in ISO/IEC/IEEE 15289:2019, 10.12.

7.5.2 Additional negotiation considerations

The purpose of negotiation is to identify issues and risks that can arise during the term of the contract and resolve them or agree to the processes to be used to resolve them. The traditional approach typically treats contract negotiation and execution as an additional activity creating a contract document separate from the supplier's proposal. Although the supplier was ostensibly selected based on their proposal, such negotiation can result in an executed contract between supplier and acquirer that does not reflect what the supplier proposed or the basis for the supplier's selection. While the supplier's proposal ordinarily is incorporated by reference in the final contract, it often is more for historical contextual purposes than for defining the supplier's resulting contractual commitments. An alternative approach described below offers the opportunity to reduce negotiation time and effort while also keeping the formally executed contract faithful to the supplier's proposal.

Since a contract is formed when the acquirer accepts the supplier's proposal (offer), contract negotiations can be viewed as a process mainly of modifying the supplier's proposal until it is accepted. Thus, most negotiations should take place prior to supplier selection, and be reflected in proposal modifications such as clarifications, demonstrations, or provision of additional information. An added benefit is that the acquirer is likely to have greater leverage before rather than after selecting a supplier. Since some suppliers can be reluctant to invest time and resources negotiating until they have been selected, characterizing such activities as clarification or providing additional information can help overcome such resistance. Moreover, the acquirer should make clear that ease of working with a supplier is a critical factor in selecting a supplier.

The time, effort, and impact of such negotiations can be reduced often considerably by anticipating and addressing such issues in the RFP. By incorporating requirements in the RFP concerning topics that usually are the subject of negotiation so that the supplier addresses them in their proposal, much of the final contract can be achieved without extra negotiation effort. Since some questions and need for changes invariably still arise, the RFP should state explicitly that the agreement between the acquirer and the selected supplier is not formed until a formal written contract has been executed. However, the bulk of the formal contract should be the selected supplier's proposal, as modified by clarifications and additional information provided prior to tentative selection. Negotiations following tentative proposal selection should deal with minor details, rather than content that goes to the heart of and can even conflict with the basis of the supplier's selection.

The acquirer may also negotiate and execute contracts with additional suppliers arranged by the main supplier to provide capabilities the main supplier indicated it cannot provide.

If the supplier proposes to provide both a software product and ongoing services relating to the product, it can be advisable to split the contract into:

a) a section dealing only with the software product which is satisfied by the acquirer's acceptance of the delivered software product;

b) a section dealing with subsequent related services which continue in force for a length of time and are subject to definition of services, required performance levels, and remedies specified in that contract section.

7.5.3 Informal letter of understanding (LOU)

Some acquirers and suppliers prefer to rely on a brief and somewhat general letter of understanding (LOU) memo of understanding (MOU), agreement in principle, or similar document, rather than typically more-descriptive formally executed contracts. An LOU usually can be drafted and agreed upon in less time than a more detailed and formally executed contract; and the parties agree that an LOU increases their flexibility. Often an LOU is meant to indicate that a more thorough formal agreement is forthcoming, but frequently the parties intend the LOU to be their agreement. When everything in the acquisition proceeds as expected, an LOU can turn out to be adequate. However, many if not most acquisitions encounter difficulties, frequently regarding areas the LOU fails to address or address adequately, in which case relying on an LOU can contribute to difficulties.

A related type of issue can occur when time is of the essence and the parties rely on an LOU for the supplier to begin work before the acquirer has engaged the supplier to do the work. Such an LOU usually states that the acquirer anticipates the supplier will be engaged to do the work. If the supplier later in fact is so engaged, the technique has served its purpose to speed delivery. However, if the supplier is not engaged later or is engaged differently from the way the LOU anticipated, disputes and extra costs often can arise.

7.6 Assessing and managing risk

Most evaluation and contracting risks originate in the RFP or relate to basing evaluations on unreliable information. Such risks can be reduced by confirming relevant topics for evaluation are identified in the RFP and included in supplier proposals in formats that avoid misunderstandings while facilitating evaluation.

7.7 Performing verification and validation (V&V)

Comparing the findings of multiple evaluators is an often-effective method for detecting and resolving evaluation anomalies. Demonstrations of proposed products and information from those familiar with proposed products and services help identify the degree of confidence in the supplier’s claims in their written proposal. The measure of evaluation effectiveness is the extent to which delivered software products and services in fact provide promised business results for promised prices and in promised time frames.

8 Implementation and acceptance sub-process

8.1 Purpose

The purpose of the implementation and acceptance sub-process is to obtain acceptable performance of services and delivery of work products, by maintaining oversight on supplier performance throughout the term of the contract and evaluating whether the supplier has met the agreed acceptance criteria.

In this sub-process, “implementation” refers to the selected supplier’s activities producing and culminating in delivery and installation of the proposed software products or services, which upon acceptance by the acquirer satisfy the supplier’s contractual obligations for them and entitle the supplier to receive any outstanding payment due. Such delivery can take place as a single complete delivery or a series of partial deliveries and acceptances over time.

While the supplier is responsible for managing its implementation work, the acquirer also monitors and manages the process to help ensure the supplier completes milestones that contribute to the acquirer’s receiving software products and services that satisfy the acquirer’s requirements.

Figure 5 shows the major activities and outputs of the implementation and acceptance sub-process. The bulk of the activity during this sub-process consists of the supplier’s developing or implementing executable software products or services the supplier is to provide pursuant to the supplier’s executed formal contract with the acquirer.

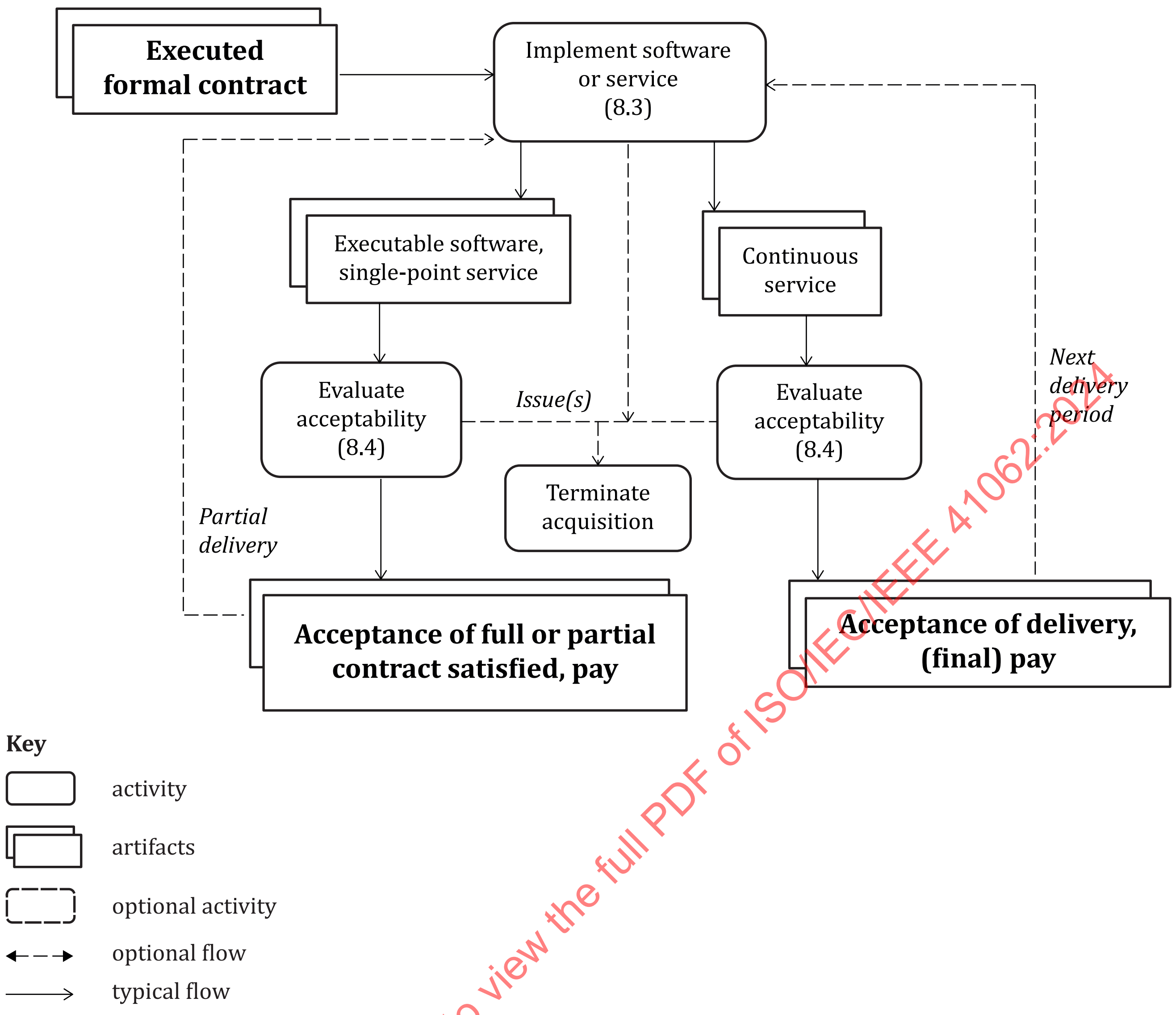

Figure 5 — Implementation and acceptance sub-process

Somewhat different processes are followed depending on whether the supplier is engaged to provide software products or services that can be considered complete upon delivery or ongoing continuous services that are not fully completed until expiration of a covered period of time. Delivery can be accomplished by a series of partial deliveries until the full delivery is completed.

The acquirer shall evaluate the acceptability of the supplier's delivery and report to the supplier issues for the supplier to address, which remain subject to acquirer acceptance. Upon the acquirer's full or partial acceptance of the supplier's delivery, the supplier is entitled to payment, possibly adjusted to reflect issues and other forms of partial delivery or incentives for superior performance. The contract can allow the acquirer to hold back some portion of total payment until final completion of the supplier's contractual obligations.

For services which are intended to be delivered over some period of time, methods and procedures can be defined for ascertaining acceptability of such services on an ongoing basis as they are delivered, thereby entitling the supplier to pertinent payment; but the supplier's full contractual obligations are not satisfied until the end of the specified period of time for which the supplier is engaged to provide the software services.

For operations, maintenance, or support services relating to acquired executable software, the implementation and acceptance of the executable software do not also include acceptance of services the supplier is engaged to provide after acceptance of the executable software. Typically, such services are considered the subject of a separate contract which takes effect upon acceptance of the applicable implemented executable software products.

8.2 Outcomes

8.2.1 Outcomes of evaluating supplier performance

The outcomes of evaluating supplier performance are as follows.

a) Required software or services are provided in an acceptable state and time frame.

b) Objective performance measures are collected, available for review, and used to evaluate adequacy of the supplier's performance and of the delivered software or services.

c) Issues affecting implementation success are identified and addressed appropriately.

d) Acquirer objectives are achieved.

e) The adequacy of the acquisition process is evaluated to identify improvements to be made during the current implementation or in future acquisitions.

8.2.2 Outcomes of software acceptance

The outcomes of software acceptance are as follows:

a) A detailed acceptance process is defined;

b) Detailed definitions of tests or evaluations are available to demonstrate satisfaction of acceptance criteria;

c) Acceptance tests or evaluations are performed:

d) Defects and deficiencies to be resolved prior to acceptance are identified;

e) Identified defects and deficiencies are resolved or a plan to resolve them is agreed upon;

f) Supplied software or services are accepted;

g) Upon final acceptance, any remaining amounts due to the supplier are paid and the contract is closed.

8.3 Implementing software or services

d) Monitor the agreement. 1) Assess the execution of the agreement. 2) Provide data needed by the supplier and resolve issues in a timely manner. [ISO/IEC/IEEE 12207:2017, 6.1.1.3]

The main activity of this sub-process involves the supplier doing what the contract requires to implement its proposed software and services. Thus, the supplier is primarily responsible for identifying, performing, and managing the supplier's activities.

In addition to performing its own retained responsibilities, such as providing required resources to the supplier, the acquirer shall determine that the supplier's overall performance under the contract fulfils the acquirer's requirements. In general, the acquirer does not have authority to manage or supervise the supplier's work practices but is well-advised to monitor the supplier's work output and take relevant actions to assure that the supplier is delivering acceptable work products in accordance with the schedule and contractual agreement. Agreed-upon measures and metrics can aid in such monitoring. For instance, if the supplier is obligated to use a standard method or life cycle model, mechanisms should be included to track the supplier's performance against such obligations and identify cases of non-performance (or superior performance where incentives are involved).

If non-performance is identified, the acquirer shall discuss with the supplier the reasons for and potential consequences of it, as well as corrective and preventive actions the parties can take so that it does not occur again. This approach is designed to increase acquisition success and limit the prospect that the acquirer has to apply the remedies available to it under the contract.

The RFP, the supplier's proposal and the resulting formal contract should provide for several techniques to assist in mitigating non-performance issues, including:

a) identifying a single, senior supplier executive who is responsible for the relationship with the acquirer; this project executive should have authority within the supplier to address acquirer concerns including supplier performance issues and be readily available to the acquirer;

b) preparing a detailed project plan listing the key tasks the supplier is required to perform, the prerequisites for each such task and the dates by which such tasks are to be performed;

c) reviewing periodic, detailed supplier reports showing objective measures of progress to date along with identification of impediments to progress and steps taken to address such impediments and their outcomes;

d) identifying a single acquirer point of contact to deal with the supplier on all matters related to the agreement; the acquirer contact should have decision authority or ready access to critical decision makers that represent the acquirer;

e) meeting regularly to review such reports and any problems, issues, and concerns not reflected in such reports;

f) recording and tracking the resolution of problems, issues and concerns;

g) rapidly escalating to more senior executives of both parties any problems, concerns, or issues not resolved to both parties' satisfaction at such meetings so that all problems, concerns and issues are identified, analysed, managed and controlled to resolution;

h) supplier monitoring of the acquirer's performance of any acquirer retained responsibilities and promptly notifying the acquirer of any acquirer non-performance; some contracts even permit the supplier to, or even require that the supplier, step in and perform any necessary acquirer responsibilities that the acquirer fails to perform on a timely basis and charge the acquirer for such performance;

i) determining incentives for superior supplier performance and reduced payments to the supplier in the event a supplier fails to achieve certain key milestones identified in the contract by the dates set forth in the contract. Such payment adjustments are intended to maximize supplier management's focus on avoiding or remedying performance failures and are not intended to be punitive. Accordingly, such adjustments are typically capped at a relatively low percentage of the service charge (e.g., 10 % to 15 %). On the other hand, more extensive adjustments can be prescribed for more serious performance breaches, up to and including termination of the contract and liquidated damages.

The RFP should identify activities to counter non-performance to be addressed and may suggest applicable terms for them. The supplier's proposal should address each of these topics, along with others the supplier can find relevant. The supplier can choose to accept the acquirer's suggested terms or suggest alternatives. Negotiations should address and resolve differences so that the final version of the supplier's proposal or the contract commits the supplier to addressing these topics in a manner agreed upon by both parties.

8.4 Evaluating and accepting software and services

8.4.1 Developing plans to evaluate and accept software and services

e) Accept the product or service.
1) Confirm that the delivered product or service complies with the agreement.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

The acquirer shall identify conditions for determining acceptability of the delivered solution software or services prior to accepting, paying for, or using them. Effective acquisitions encourage the supplier to perform suitable quality assurance and testing prior to delivery and frequently also provide for the acquirer's participation or auditing the supplier's testing prior to installation. The acceptance criteria and anticipated methods of evaluating the delivered solution prior to acceptance should be described in the RFP to help the supplier deliver a solution that in fact is acceptable.

Requirements should be identified in the RFP and the contract for handing over, installing, and assuming operational, maintenance, or support responsibilities for delivered solutions. Responsibilities for operation, support, and maintenance of acquired software should be identified explicitly. Supplier obligations for ongoing maintenance and support should be identified and typically include what is covered by warranties, help resources, and periodic maintenance releases. In turn, such supplier obligations generally do not extend to software modifications made by or on behalf of the acquirer by other suppliers.

Where the selected supplier is to provide ongoing operational, maintenance, or support services for the delivered software, the nature and procedures for such services should be described additionally in the selected supplier's proposal and become a separate part of the contract when agreed upon. Such services are addressed more fully in the operations, maintenance, and support sub-process (Clause 9).

8.4.2 Defining acceptance criteria and procedures

8.4.2.1 General

Based on the type of requirements, the acquirer should identify the criteria and methods by which the acquirer intends to determine the acceptability of the products and services the supplier delivers. Typical methods for demonstrating the achievement of acceptance criteria include user acceptance testing and quality evaluations of delivered products and services.

Procedures for accepting a software product that is delivered in a single delivery or series of individual deliveries can differ from acceptance of software services that are delivered continually over some specified period of time. For the former, satisfying acceptance criteria completes the supplier's obligations with respect to pertinent deliverables. However, for the latter the supplier's satisfaction of contractual obligations is only partial until the full term of commitment has been completed.

8.4.2.2 Distinguishing between supplier testing and acquirer testing

Throughout the supplier's software or service implementation, the supplier should be performing testing which, depending on the contract and product, can include unit testing, component testing, system testing, performance testing and the like. The supplier should make the evidence and results of such tests available to the acquirer for regular review. So long as it does not interfere unreasonably with the supplier's activities, the acquirer should be permitted to observe the supplier tests.

NOTE The ISO/IEC/IEEE 29119 series provides details of testing processes and procedures.

Deliverables including software or software services (including SaaS) are subject to acceptance testing by or under the direction of the acquirer. Acceptance tests demonstrate the software or services satisfy acceptance criteria, which in turn reflect the acquirer's requirements including for performance, capacity, safety, security, usability, and other quality factors as well as functionality. The supplier should support acceptance testing and provide the acquirer with reasonable assistance.

8.4.2.3 Conducting acceptance review and test of the software

The objective is to demonstrate and confirm that the software and/ or services meet contract specifications. Describing the full range of testing is beyond the scope of this document.

NOTE ISO/IEC/IEEE 29119-1, ISO/IEC/IEEE 29119-2, ISO/IEC/IEEE 29119-3, and ISO/IEC/IEEE 29119-4, and IEEE Std 1012 provide more complete information and guidance on software testing, verification, and validation.

Consideration should be given to the following when acceptance reviewing and testing the software or service.

a) Acceptance criteria should be meaningful, current, and readily translated into executable test cases demonstrating the acceptance criteria have been met.

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

c) Acceptance tests generally should be executed in a production-like environment by representative real users to give confidence that the software or services will work adequately in production.

d) Acceptance tests generally exercise the entire system end-to-end and can also demonstrate interfaces with other systems.

8.4.2.4 Managing the testing process

The acquirer should monitor that test skill, knowledge, and effort are applied to acceptance tests, which provide adequate confidence in the suitability of supplied software and services. When evaluating a software product or service, topic lists in Annex A can be helpful in suggesting factors to be considered along with those specific to the acquirer and acquisition.

The acquirer should capture the acceptance tests and test results in an observable and reviewable form. The acquirer should compare actual to expected results, note exceptions (defects), and determine appropriate corrective actions with the supplier. The supplier should fix detected defects; and the acquirer should confirm that the defects have been addressed adequately and without creating additional issues. In some situations, it can be appropriate for the acquirer to accept software with noted defects and agreed-upon dispositions.

8.4.3 Accepting the software and services

e) Accept the product or service.
2) Provide payment or other agreed consideration.
3) Accept the product or service from the supplier, or other party, as directed by the agreement.
4) Close the agreement.
[ISO/IEC/IEEE 12207:2017, 6.1.1.3]

The contract shall provide for acceptance of the software or services. The purpose of acceptance is:

a) to provide the acquirer one last opportunity to assess the quality of the software or service and any implementation thereof against standards set forth in the contract or agreed by the parties after execution of the contract;

b) if the acquirer determines that the software or services meet the standards therefore set forth in the contract, elevate the software or services to production.

Acceptance typically cuts off the acquirer's remedies for defects and deficiencies discovered after acceptance except to the extent such defects and deficiencies are covered by a warranty set forth or referenced in the contract.

Acceptability can be evaluated by analytical means or executable acceptance tests. Such evaluations and tests are facilitated by identifying in the RFP acceptance criteria that such evaluations or tests demonstrate. The supplier can question and suggest alternatives which can lead the acquirer to amend its description of acceptance criteria in the RFP. Similarly, the supplier's proposal can be modified to reflect negotiations concerning the carrying out of acceptance testing or evaluation.

Ordinarily, a supplier is given a reasonable amount of time to address and correct acceptability issues. In some instances, the acquirer may agree to accept the software or services conditionally despite identified acceptability issues. Typically, the supplier is given additional time to address and resolve issues while the software or services are being used in production by the acquirer. Impacts on the acquirer may be reflected in adjusting timing or amounts of payments due the supplier.

When the software or services sufficiently satisfy acceptance review and testing, the acquirer should accept the software or services. The acquirer's acceptance of all supplied software usually constitutes completion of the supplier's contractual responsibilities and entitles the supplier to receive any remaining amounts due for the software. However, a contract may require the supplier to correct latent defects in its software which are detected post-acceptance. Such responsibility may be in the form of engaging the supplier to maintain its software for a specified additional price, or it may pertain only to defects which are considered breaches of the supplier's warranty for the software and which the supplier agrees to fix without additional charge.

Implementation of SaaS is also subject to acceptance. Upon acceptance the SaaS supplier's implementation obligations are complete, and then the supplier's obligation to provide ongoing software services commence. Typically, payment for implementation becomes due and payable, and subsequent periodic charges for the ongoing SaaS software services commence.

8.4.4 Evaluating the process and identifying improvement opportunities

The purpose of the evaluation is to identify issues or concerns with the acquisition so that the acquirer can improve its acquisition process in the future. The evaluation should include:

a) an evaluation of the contract documents' adequacy;

b) an assessment of how well the delivered software or services meet the acquirer's stated requirements, especially issues that led to warranty fixes by the supplier or maintenance changes that the acquirer requests of whomever is responsible for subsequent maintenance;

c) a determination regarding whether there is a gap between the acquirer's stated requirements and its needs, especially as indicated by experience using the acquired software or services, emphasizing quality in use and user satisfaction;

d) the actual amount of software maintenance work that is needed after the software or services are put into use and analysis of their main causes;

e) identification of supplier performance leading to deficiencies in the outcome of the acquisition;

f) an evaluation of the efficiency and effectiveness of the acquirer's acquisition practices, including candidly assessing from the supplier's perspective the effects of the acquirer's performance on the supplier's performance.

The outcomes of collecting and analysing such data include identifying ways to improve:

— acquisition and contracting processes;

— requirements identification and analysis;

— the specific acquired software or services;

— supplier communication and management;

8.4.5 Applying non-performance remedies

The acquirer and supplier should have a shared objective to deliver software products and services which satisfy the acquirer's requirements on-time and in-budget. In furtherance thereto, effective acquisitions; include incentives for superior supplier performance as well as remedies for inadequate supplier performance.

In general, non-performance is indicated by failure of the supplier's deliverables to satisfy acceptance criteria. Ordinarily, the supplier is given some time to correct deficiencies. Where full delivery cannot be made acceptable, the acquirer may choose to accept and pay for parts of the promised software or services which are acceptable. If the acquirer has to obtain corrective software or services, some or all of their costs can be assessed against the supplier, sometimes in addition to or instead of penalties or liquidated damages. The conditions giving rise to such remedies and how to determine relevant amounts should be identified in the RFP and are subject to questions and negotiation with an agreed-upon definition included in the supplier's final proposal and formal contract if the supplier's proposal is accepted.

For operations, maintenance, and support services, the typical measures of supplier performance are service levels and the typical remedy for failure to achieve service levels is service credits; that is, reductions in the amount the acquirer is required to pay for the product or service. Other remedies include rights to terminate the arrangement and, in some cases, seek a refund of amounts paid to date.

In some limited circumstances performance incentives can facilitate achievement of the shared objective of providing quality goods and services on-time and on-budget. However, such incentives should only be used when supplier performance exceeds contractually required performance and the performance in excess of that required under the contract actually generates meaningful value for the acquirer. In other words, the acquirer agrees to pay the contract price for performance as required under the contract and to make an incentive payment for even better performance if that better performance was of value to the acquirer.

As provided in the terms of the contract, the acquirer and the supplier should have the right to terminate for material breach and a right to terminate for convenience with due notice. Some causes for termination include failure to satisfy payment obligations, failure to provide necessary information or access, material misrepresentation of facts. breach of the obligation not to use intellectual property except as permitted in the agreement, and breach of the confidentiality obligations. The negotiated agreement should have contractual restrictions, such as liquidated damages and due notice, regarding termination. The acquirer should be prepared with alternate sources of supply when the contract performance is unsatisfactory. Mitigation techniques can be appropriate, such as cross-training acquirer staff and termination transition procedures to enable a replacement to assume the work.

Where the acquirer does not receive access to acquired software source code and related documentation, the contract 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. Such escrowed materials become the acquirer's property in the event of the supplier's failure to deliver promised software. However, it can be difficult to structure, and obtain supplier agreement, to a useful escrow for SaaS.

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.

Where the supplier has an ongoing relationship with the acquirer, such as for maintaining or operating the acquired software, the supplier should propose and include in the contract when acceptable a transition procedure to protect the acquirer in the event at some point in the future the acquirer's relationship with the supplier changes.

9 Acquisition of operations, maintenance and support sub-process

9.1 Purpose

The purpose of the acquisition of operations, maintenance, and support sub-process is to obtain services and delivery of work products, relating to operations, maintenance, and other support services in conjunction with acquiring software products to which such services pertain. Often, in connection with an acquisition of executable software products, the acquirer also optionally engages the selected supplier to provide operations, maintenance, or support services for the acquired software. This sub-process identifies common considerations related to acquiring such services. While many of these considerations also pertain to acquiring operations, maintenance, or support services for software which is not part of a recent software acquisition, that is considered an acquisition of services as covered in 5.6.

NOTE The ISO/IEC 20000 series provides requirements and guidance for a service management system.

Figure 6 summarizes the key activities and outputs of the acquisition of operations, maintenance, and support sub-process. Although the specific services provided vary depending on whether they are for operations, maintenance, or support, the processes for acquiring them are essentially the same.

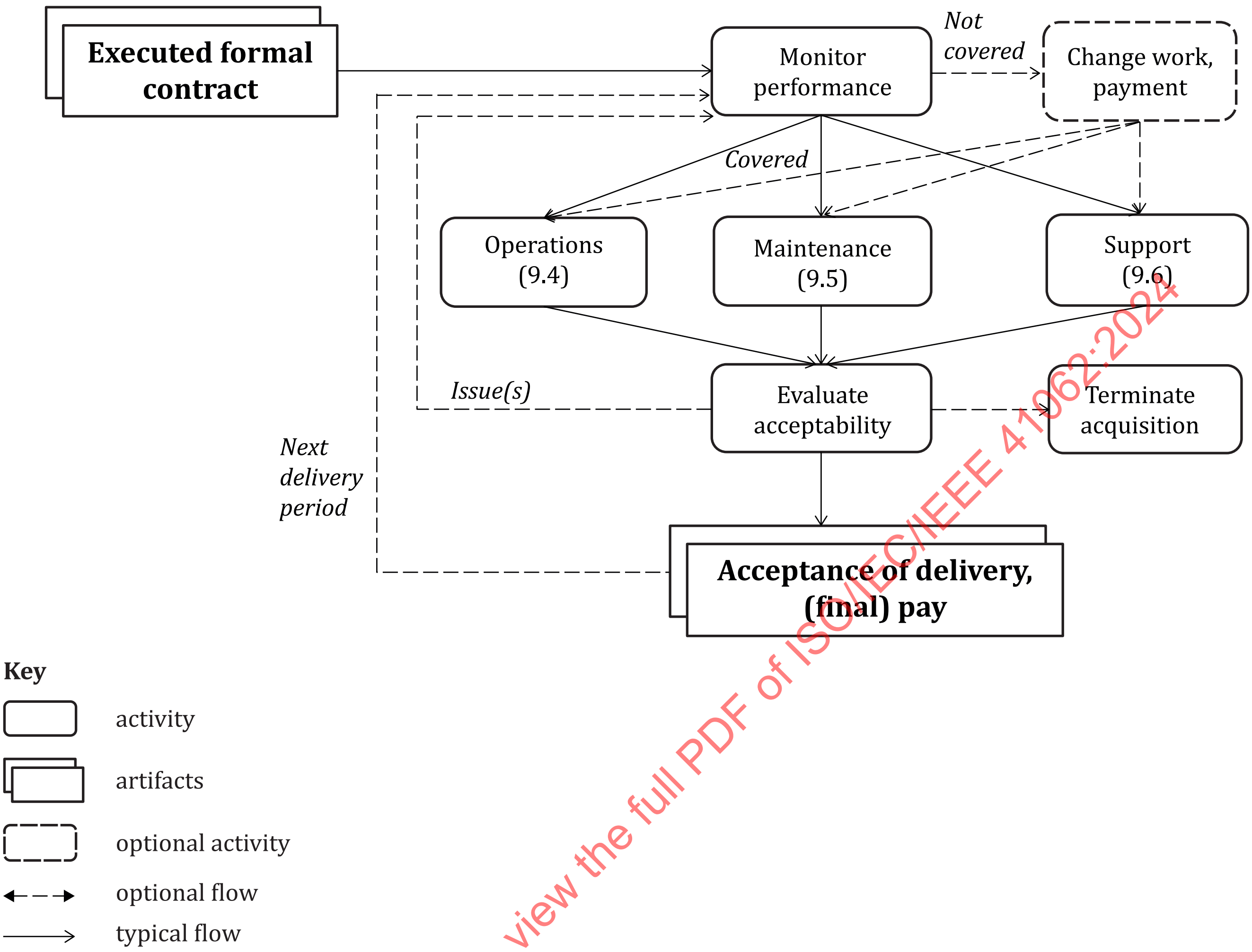

Figure 6 — Acquisition of the operations, maintenance, and support sub-process

Unlike the other major sub-processes, the execution of services covered in this sub-process does not take place until after the software products to which they pertain have been implemented and accepted. Such subsequent operations, maintenance, and support services normally continue for a specified term, which can be in multiple increments or can cover the life of the products or services. These services usually are proposed in conjunction with the supplier's proposal to provide the software products, pertain to and follow upon acceptance of the software products, and are subject to a related but separately executed formal contract between the acquirer and supplier. Service level agreements (SLAs) are typically a major part of service contracts. SLAs should reflect the needs of the acquirer.

Certain aspects are common to the acquisition of the operations, maintenance, and support services and should be identified in the formal contact, including:

a) covered services and service levels;

b) procedures for requesting additional or different services;

c) services for which an additional agreement, and typically also additional payment, are required, and procedures related thereto;

d) roles and responsibilities of the acquirer in enabling the supplier to provide the services;

e) interactions with other parties providing related services;

f) interactions with recipients of the services;

g) compliance with applicable laws, regulations, and standards;

h) providing and limiting secured access needed for the services;

i) reporting problems and issues with the services;

j) evaluating adequacy of the services;

k) disputes regarding a provided service and methods for resolving them;

l) ownership rights in products developed by the service;

m) ownership or licensing rights for products acquired pursuant to the service;

n) ownership rights to data involved in the service;

o) service renewal procedures;

p) procedures for transitioning from the supplier upon termination of its services.

The executed formal contract specifies a relevant mechanism for identifying on an ongoing basis the applicable services the supplier is to provide. The contract also identifies criteria for identifying and responding to requests for services that are outside the scope of services covered by the contract. The supplier should perform and be paid for such additional services only upon a contract addition or modification addressing them.

The executed formal contract and additions or modifications also identify criteria for the acquirer to determine acceptability of delivered services and procedures and methods for dealing with detected issues with said delivered services or with the terms of the contract itself. During the term of the service contract, the supplier is entitled to payment which can be based upon time periods or services delivered.

The acquirer continually evaluates the supplier's ongoing performance, reports issues to the supplier, and works with the supplier to resolve the issues. If issues cannot be resolved or circumstances change in manners addressed by the contract, the contract can be terminated.

9.2 Outcomes

The outcomes of the acquisition of operations, maintenance, and support sub-process are the same as those in 8.2 with the following addition: the need for and execution of suitable contract revisions are identified.

9.3 Service transitions

Service transitions deal with shifting operations from their current provider, environment, and methods to a different provider and its environment and methods. This can be from the acquirer's environment to the contracted supplier or from an existing supplier to a new supplier. Data can be converted to different formats. Computer programs can be modified to operate in a different hardware/software environment. Additional equipment or software can support the transition or revised operation. Specialized staff can be hired or trained. The supplier's proposal should identify a service transition plan and required resources. Transitions can incur related tax, legal, regulatory, finance, and other changes that the supplier's proposal should identify and address.

Service transitions can have varying levels of complexity with each having different potential issues that should be addressed in a supplier proposal. Typical issues to be addressed include the following:

a) employees of the acquirer or a previous supplier to be engaged to continue to perform the operational services that the supplier is taking over;

b) gaining information and knowledge from those currently performing the operations, to become familiar with existing operations, needs, and procedures to be retained, adapted, replaced or discontinued;

c) for a new operations environment, integration with and impact upon other existing operations;

d) ascertaining priorities for access to shared resources;

e) acquisition and ownership of related equipment or software;

f) third parties with whom new or modified contracts and procedures can be needed, such as for related services;

g) definition of responsibility for acquiring additional. equipment or related services, licenses, maintenance, and ownership.

9.4 Operations

9.4.1 General

Operations services involve physical operation of software and can include creating and maintaining the computer and communication facilities, equipment, supplies, scheduling and running computer programs, system software, backup, and security, along with sufficient suitably skilled staffing to conduct such services capably. Identity and access management and equipment provisioning are typically part of operations services, although in some organizations can be considered part of support services.

9.4.2 Service validation and testing

Validation involves confirming the transition's success before the acquirer or supplier assumes ongoing operations responsibilities. Special areas of consideration include trial cutovers, final cutovers, and data conversions. In addition, procedures should be included to continually monitor and assess the accuracy and adequacy of ongoing operations. Clear roles and responsibilities should be defined to cover each of these and should be addressed in the supplier proposal and subsequent contract.

9.4.3 Change evaluation and management

Bug fixes and change requests produced during the maintenance and support activities can create the need to deploy new and modified software. Procedures should be established for introducing changes into production operations, including determining that such changes are authorized appropriately and include rollback mechanisms when needed.

Different supplier proposals give rise to different transition issues, and the time, cost and risk associated with such issues should be factored into the acquirer's proposal evaluation. Moreover, in developing strategy, it can be important, but difficult, to candidly assess the organization's capability to utilize a new product or service and determine what changes are required for success. The need to undertake significant operational changes can reduce the number of potential solutions for evaluation, impact weightings in selection, and alter contracting options. The Implementation and acceptance sub-process shall anticipate and address the critical success factors for each area of service transitions.

Special attention should be given to situations where existing infrastructure can be "destroyed" or otherwise changed in ways that affect other systems.

9.4.4 Service asset and configuration management

Asset and configuration management involves changes to the hosting infrastructure, licensing and configuration of the operating environment or to the software itself during the operation of the acquired product. In the case of SaaS most of this is the responsibility of the supplier. But in other forms of software this may be the responsibility of the supplier or the acquirer, depending upon the situation. In some cases, making these adjustments can result in a change to the licensing requirements.

In any case these types of changes should be planned for and the supplier proposal and resulting contract should address the ability to adjust the product or operating environment as necessary to meet the business needs the software is designed to address.

9.4.5 Continuous evaluation and improvement

This evaluation pertains to the effectiveness and efficiency of operations performed by the supplier and should integrate with existing processes for addressing incidents and leveraging opportunities. Relevant metrics can need to be added to or modified in existing processes and included in operations reviews.

This is intended to be an ongoing, continual process that spans the duration of the operational life of the acquired product. These elements should be defined as part of the Planning and RFP sub-process, verified to be addressed in the evaluation, selection and contracting sub-process and the implementation and acceptance sub-process and then measured and applied in the operations, maintenance and support sub-process.

9.4.6 Capacity management

Mechanisms shall be provided to anticipate and enable the operational environment to meet changing capacity demands. Capacity requirements should be related to relevant business measures and should address dealing with new, changed, or discontinued business activities. Respective responsibilities and procedures should be defined for acquiring, installing, and paying for equipment upgrades and additions. Similarly, respective responsibilities and procedures should be defined for removing or retiring existing equipment. Objective mechanisms should be provided to identify the appropriateness and amount of changes to supplier payments attributable to operations volumes not under the supplier's control.

Similarly, software typically includes inherent limits in the architecture, design or configuration which can impact the ability to meet future needs. For example, can the software itself support the number of users anticipated for the future, or does it support running in various hosting environments, which can be required for future use.

9.4.7 Monitoring and security management

During operation of the software the system and services shall provide mechanisms to allow for sufficient logging, monitoring, alerting and auditing to support continued operation without negatively impacting the business. Monitoring should cover operational health, security events, and policy compliance. Preferably, security management requirements should allow for preventive action. Security requirements shall allow for forensic investigation to determine the cause of issues so they can be prevented in the future.

If the acquirer has existing monitoring and security policies and tools, these should be identified as a necessary part of what the supplier is required to comply with. Examples are compliance with specific security standards (e.g. OWASP, NIST) or compatibility with operations or security.

9.5 Maintenance

9.5.1 General

Maintenance services involve modifying acquired software to keep it performing adequately and often to enhance its capabilities. Much of maintenance involves fixing defects in the software. But this can also include addressing changing business requirements and improving the software's performance and maintainability. Key objectives are to correct and avoid processing mistakes, especially to avoid business disruption.

These maintenance services can include installing patches and maintenance release product modifications made by a product's supplier for all product users or be for issues specific to the acquirer. The supplier proposal and contract should address what is covered or requires additional funding or contracts. The process for how defects and feature requests flow back to the supplier and how updates are to be provided to the acquirer should also be addressed.

The supplier proposal and resulting contract should address details for how all of this works and who is responsible for which pieces are maintained.

9.5.2 Covered maintenance

A major challenge in acquiring maintenance services for an acquired software product is adequately anticipating and characterizing the nature and quantity of covered maintenance requests. Procedures should be defined for identifying or requesting maintenance services, ascertaining whether they are covered by the maintenance service contract, and if not, how they should be addressed. Ordinarily, defects which are subject to the software product's warranty or attributable to changes distributed to all the software product's users are not covered by the acquirer's specific product maintenance contract. In some cases, the product warranty does not apply to certain customer types or product usage, unless they are specifically included in the contract.

Typically, the maintenance service includes fixing identified and prioritized defects in the software product. Defects usually are defined as failure to function as specified, required, or reasonably expected–which can lead to disputes when specifications, requirements, and expectations are not defined adequately. Such maintenance involves analysing the failure to determine its cause, designing and implementing a correction, testing that the correction works properly and has not created other problems, and moving the corrected software into production in a controlled manner. Such a correction may include fixing or recovering lost or incorrect data, including adjusting erroneous calculations, breaches of confidentiality, and other impacts.

Other maintenance is necessitated by normal business changes. While the supplier is likely to accept most as keeping current processing going and thus within the contract coverage, questions about coverage tend to arise when the change provides some new or different processing, especially when the change is estimated to require a lot of supplier effort or risk.

9.5.3 Maintenance quality

The poorer the quality of the acquired software product, the more defect-fixing maintenance the supplier is engaged to perform; and the more difficult and time-consuming it can be to make other maintenance changes. To avoid inadvertently rewarding poor product quality, the contract should apply quality measures consistent with maintaining high-quality software such that the supplier bears the costs of maintaining their poorer quality products.

Maintenance quality has at least three dimensions to consider in the supplier's proposal and contract:

— responsiveness, how long in elapsed time it takes to implement corrected software, which typically is conditioned upon the urgency and magnitude of addressing the request; that is, urgent issues should be worked on right away, whereas less urgent issues can be deferred; similarly, multi-cause problems with large and complex corrections can take longer to correct than smaller and simpler ones;

— correctness of the maintenance correction, primarily whether it in fact fixed the basis for the request and did so without causing additional problems;

— customer interaction related to the ease of working with the supplier's maintenance staff and their ability to understand and address issues presented to them.

9.6 Support

9.6.1 General

Support services most often pertain to "help desk" activities, primarily receiving and responding to software users' questions and problems. Often the response is a defect report or enhancement request which goes to the software maintenance function or possibly to the operations function. Other support services include training, documentation (information development), identity and access management, and equipment provisioning.

NOTE ISO/IEC/IEEE 26512 provides guidance for the acquisition of documentation and documentation services.

9.6.2 Customer support

Customer support can cover all aspects of all recipient's customer care, such as employees of the acquirer of the software, or customers of the acquirer, whomever needs to be familiar with the use and operation of the software being acquired and report incidents and problems. For example, the supplier can take over the acquirer's internal help desk or provide support services in addition to it. When selecting software, an acquirer should identify its support requirements.

Preparation for operation of a new or updated software product can require training users, operations or support personnel on their function.

During operation of the software, user requests, defect reports, and enhancement requests usually are fielded by support personnel; and operations and support personnel can discover issues as part of the operation and support of the software. Most defects and enhancement requests are referred to the maintenance function; but some can be submitted to the original supplier to be addressed with patches and product enhancements. The supplier proposal and resulting contract should define a support model addressing details of included support activities, how they are carried out, who is responsible for any services the supplier is not providing, determination of covered workload and procedures for modifying it, escalation, and dispute resolution procedures, and measuring, evaluating, reporting, and addressing quality and levels of services. Since needed support tends to increase as product quality decreases, mechanisms should be identified which adequately support the acquirer without rewarding the supplier of poor-quality software with additional business.

10 Quality assurance for software acquisition

10.1 Objectives of quality assurance in software acquisition

The acquisition of software or services should achieve the acquirer's goals and objectives. Quality assurance (QA) facilitates this by:

a) reducing risk in the software acquisition processes and activities;

b) increasing the likelihood that the acquired software solution conforms to requirements and is acceptable to the acquirer and end user;

c) enabling acquirer selection teams to identify suppliers whose methodologies and processes in architecting and delivering software solutions are compliant with known standards and are most likely to produce the desired results.

10.2 Implementing quality assurance in software acquisition

QA activities should be performed in every sub-process and activity of the software acquisition process. The quality assurance approach depends on the software acquisition option that is chosen or implemented. The supplier should provide a detailed quality assurance plan reflective of the software acquisition option. These activities help ensure the acquisition processes and methods are monitored and evaluated to avoid mistakes or defects. Such activities can simply involve checking activities, processes, or results against requirements and relevant standards.

Table 2 includes recommended quality assurance activities for the software acquisition process.

Table 2 — Recommended quality assurance activities

Sub-process	Software acquisition activities	Recommended quality assurance activities	Related standards/ guidelines
Planning and RFP	Planning the software acquisition strategy (6.3)	Check completeness and compliance of the defined strategy/ approach Compile quality assurance plan.	ISO/IEC/IEEE 12207 ISO/IEC/IEEE 16326 ISO/IEC 25041
	Defining the acquisition and content requirements. (6.4)	Check that requirements specifications are unambiguous and comply with standards.	ISO/IEC/IEEE 29148
	Identifying potential suppliers (6.5)	Check compliance of potential supplier's processes against known standards to determine level of likelihood to succeed. Evaluate capability of potential supplier in terms of software development service delivery record.	The ISO/IEC 29110 series IEEE Std 1012
	Preparing contract requirements (6.6)	Check completeness of contract specification and seek legal advice.	ISO/IEC/IEEE 12207
Evaluation, selection and contracting	Evaluating proposals (7.3) and Selecting the supplier (7.4)	Check solutions against requirements.	ISO/IEC/IEEE 26512
Implementation and acceptance **Operations, maintenance and support**	Evaluating and accepting software and services (8.4)	Evaluate software/solution design and trace to requirements. Evaluate database design and trace to requirements. Establish a relationship with the supplier's QA personnel and work collaboratively where possible to achieve program quality goals.	ISO/IEC/IEEE 12207 IEEE Std 1012 ISO/IEC 25010 ISO/IEC 25030 ISO/IEC 25040
	Accepting the software and services (8.4.3)	Assemble user acceptance test cases to support verification of requirements. Evaluate results of acceptance tests conducted using the acceptance test cases. Check completeness of user manuals.	ISO/IEC 25051 The ISO/IEC/IEEE 29119 series IEEE Std 1012 IEEE Std 730
	Evaluating the process and identifying improvement opportunities (8.4.4)	Monitor performance against requirements. Monitor and observe quality in use	ISO/IEC/IEEE 12207 ISO/IEC 25010

Annex A
(informative)

Software acquisition considerations

A.1 General

This annex includes lists of questions and topics that are important in software acquisition. These topics are intended to help organizations identify issues and risks relevant to specific sub-processes and activities in software acquisition. Not all topics are applicable to every acquisition and the lists should be tailored to a specific software acquisition.

Table A.1 presents the applicability of topics to the sub-processes in software acquisition.

Table A.1 — Activities supporting by the acquisition sub-processes

Topics	Planning/ RFP	Evaluation, selection, con-tracting	Implementation and acceptance	Operations, maintenance, support
A.2 Maintenance and support strategy	x			
A.3 Software definition	x			
A.4 Supplier evaluation	x	x		
A.5 Supplier and acquirer obligations	x	x		
A.6 Quality and maintenance plans	x	x	x	X
A.7 User survey	x	x	x	X
A.8 Supplier performance standards	x	x	x	X
A.9 Contract payments	x	x	x	X
A.10 Monitor supplier progress			x	X
A.11 Software evaluation			x	X
A.12 Software test			x	X
A.13 Software acceptance			x	

A.2 Maintenance and support strategy

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

b) Is maintenance documentation necessary?

c) Should user training be provided by the supplier?

d) Will acquirer's personnel need training?

e) When software conversion or modification is planned:

   1) Will supplier manuals sufficiently describe the supplier's software?

   2) Will specifications be necessary to describe the conversion or modification requirements and the implementation details of the conversion or modification?

   3) Who will provide these specifications?

    4) Who should approve these specifications?

f) Should source code be provided by the supplier so that modifications can be made?

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

h) Are supplier publications suitable for end users?

    1) Will unique publications be necessary?

    2) Will unique publications require formal acceptance?

    3) Are there copyright or royalty issues?

i) Will the software be evaluated and certified?

    1) Is a survey of the supplier's existing customers sufficient?

    2) Are reviews and audits desirable?

    3) Is a testing period preferable to demonstrate that the software and its associated documentation are usable in the intended environment?

    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?

k) Will subsequent releases of the software be made?

    1) If so, how many?

    2) Will there be compatibility with each other?

    3) Will the acquired software require rework whenever operating system changes occur?

    4) If so, how will the rework be accomplished?

A.3 Software definition

a) When is the software required?

b) What is the budget for the software?

c) What are the key functions the software is required to 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.

    2) Capability specification including performance, physical characteristics, and environmental conditions under which the software is to perform.

3) Interfaces external to the system and software.

4) Qualification requirements.

5) Safety specifications including those related to methods of operation and maintenance, environmental influences, and personnel injury.

6) Security specifications including those related to compromise of sensitive information.

7) Human-factors engineering (ergonomics) specifications 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.

9) Installation and acceptance requirements of the delivered software.

10) Product at the operation and maintenance site(s).

11) User documentation requirements.

12) User operation and execution requirements.

13) User maintenance requirements.

14) Any known constraints or parameters

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.

2) Software design documentation (including database design, if relevant).

3) Software description.

4) Source code listings.

5) User documentation (information for users).

NOTE Refer to IEC/IEEE 82079-1 for information for users.

6) Support documentation.

7) Sales and promotional material.

8) List of current users (existing software product).

9) Off-the-shelf product documentation.

10) Software release documentation.

11) Software test documentation.

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

1) User training.

2) Internal training.

3) Installation support.

4) Post-installation support.

5) Correction of errors.

6) Modifications, when requested.

7) Software warranty.

8) Documentation warranty.

9) New releases of the software.

10) Open source products used.

A.4 Supplier evaluation

A.4.1 Financial soundness

a) Can a current financial statement be obtained for examination?

b) Is an independent financial rating available?

c) Has the company or any of its principals ever been involved in bankruptcy or computer-related litigation?

d) How long has the company been in business?

e) What is the company's history?

A.4.2 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?

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

e) Is a list of users available?

A.4.3 Development and control processes

a) Are software development practices and standards used?

b) Are software development practices and standards adequate?

c) Are the currently used practices written down?

d) Are documentation guidelines available?

e) How is testing accomplished?

f) Are the security procedures adequate?

g) Does the supplier have any software related certification or maturity/capability level ratings?

h) List the certifications and reference models and ratings achieved.

A.4.4 Technical assistance

a) What assistance is provided at the installation time?

b) Can staff training be conducted on site?

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?

f) Are any enhancements (software and documentation) planned or in process?

g) Will future enhancements be made available?

A.4.5 Quality practices

a) Are the development and control processes followed?

b) Are requirements, design, and code reviews used?

c) If requirements, design, and code reviews are used, are they effective?

d) Is a total quality program in place?

e) If a total quality program is in place, is it documented?

f) Does the quality program assure the product meets specifications?

g) Is a corrective action process established to handle error corrections and technical questions?

h) Is a configuration management process established?

A.4.6 Maintenance service

a) Is there a guarantee in writing about the level and quality of maintenance services provided?

b) Will ongoing updates and error conditions with appropriate documentation be supplied?

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?

A.4.7 Product usage

a) Can a demonstration of the software be made at a user site?

b) Are there restrictions on the purposes for which the product may be used?

c) What is the delay between order placement and delivery of the product?

d) Can documentation be obtained for the examination now?

e) How many versions or releases of the software are there?

A.4.8 Product warranty

a) Is there a warranty period?

b) What are the warranty conditions?

c) Does successful execution of an agreed-upon acceptance test initiate the warranty period?

d) Does a warranty period provide for a specified level of software product performance for a given period at the premises?

e) How long is the warranty period?

A.4.9 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 additional cost?

A.4.10 Contracts

a) Is a standard contract used?

b) Can a contract be obtained now for examination?

c) Are contract terms negotiable?

d) Are there royalty issues?

e) What objections, if any, are there to attaching a copy of these checklist questions with responses to a contract?

A.4.11 Other legal and regulatory issues

a) Who owns the intellectual property of the software designs?

b) Is the software under any form of export control?

A.5 Supplier and acquirer obligations

a) Definition of software development framework.

   1) Are development steps to be accomplished by the supplier identified?

   2) Is 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 and acceptance test results?

   3) Are milestones that are required to be satisfied before the development is allowed to continue to the next step identified?

   4) Are the acquirer obligations included in the same milestone chart as the supplier obligations?

b) Definition of the relationships between the supplier and acquirer.

   1) Are the relationships between the supplier and acquirer identified?

   2) Are responsibilities for each task identified?

c) Identification of responsibilities for the following?

   1) Publication and expense of user documentation.

2) Publicity releases.
3) Software distribution to end users.
4) Notices and reports, if specified.
5) New software that replaces old software.
6) Appointment of supplier and acquirer representatives for interactions with other suppliers.

A.6 Quality and maintenance plans

A.6.1 Identify the contents of a quality plan

a) What are the quality objectives?
   1) Documentation is usable.
   2) Warranty is adequate.
   3) Software possesses functional capabilities that are required.
   4) Software is verified to properly perform its functional capabilities.
b) What are the evaluations and tests planned to satisfy the quality objectives?
   1) Demonstration.
   2) User survey.
   3) Inspection.
   4) Test.
   5) Documentation review.
c) Who is responsible for conducting the evaluations and tests?
   1) Supplier.
   2) Acquirer.
   3) Third party.
d) For which of the following items is test documentation required?
   1) Test plans.
   2) Test procedure.
   3) Test data.
   4) Test results.

A.6.2 Identify what a maintenance plan should contain

a) What are the maintenance objectives?
   1) Support documentation is usable.

   2) Technical support is available.

b) What is included in the technical support?

   1) Error corrections.

   2) Modifications.

   3) New releases of software.

   4) Updating of user documentation.

   5) Installation assistance.

   6) Training.

c) The responsibility of providing technical support on a timely basis.

   1) Who provides technical support during the warranty period?

   2) Who provides technical support after the warranty period?

   3) Who pays for the cost of the technical support?

d) What acquirer responsibilities are obtained or satisfied by other organizations?

   1) Internal organization(s).

   2) Third party.

A.7 User survey

A.7.1 Operation

a) Is the system easy to use?

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

c) Have there been any serious operator complaints?

d) Was adequate operator and support training given?

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

A.7.2 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?

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?

i) How long does it take for recovery?

j) Is a diagnostic package available on site to verify that the system functions properly?

k) Are supplier backup facilities available?

A.7.3 Maintenance service

a) How reliable and accessible is the supplier?

b) Are supplier personnel competent in solving problems?

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

d) Are backup procedures adequate?

e) How long does backup take?

A.7.4 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?

g) Are there any terminal lockouts when the printer is running?

h) What is the envisioned response time?

A.7.5 Flexibility

a) What software product modifications have been done?

b) Who did the modifications?

c) Are changes done on site?

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?

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?