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Software engineering — Life cycle processes — Software acquisition

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National foreword

This British Standard is the UK implementation of ISO/IEC/IEEE 41062:2024. It supersedes BS ISO/IEC/IEEE 41062:2019, which is withdrawn.

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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;

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— 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.

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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.

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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]

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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]

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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

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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

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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.

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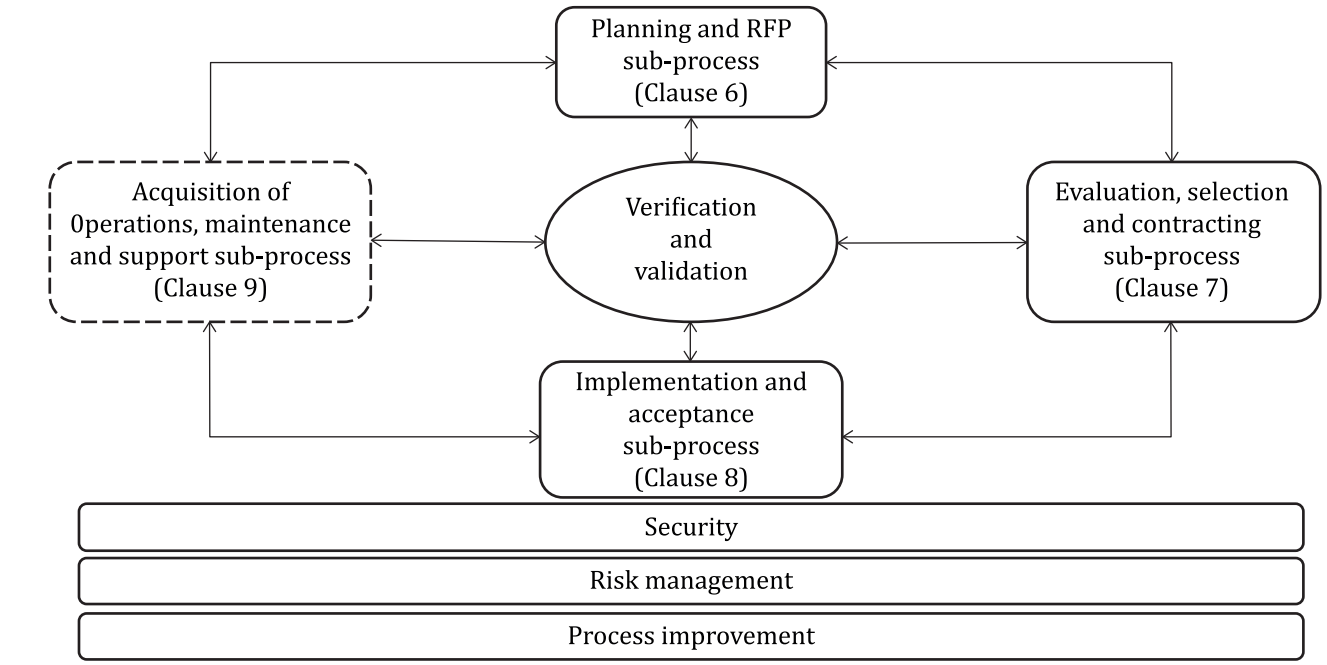

Figure 1 — Software acquisition sub-processes

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	
d) Monitor the agreement	Implementation and acceptance
e) Accept the product or service	
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

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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.

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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.

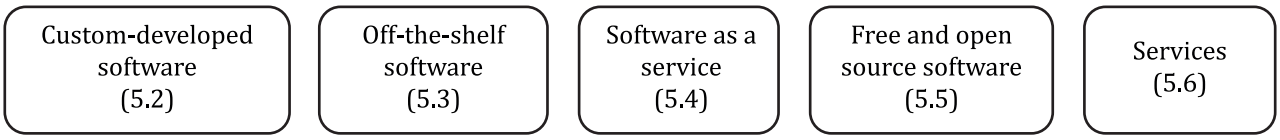

Figure 2 — Software acquisition alternatives

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.

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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

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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.

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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.

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— 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.

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— 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

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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.

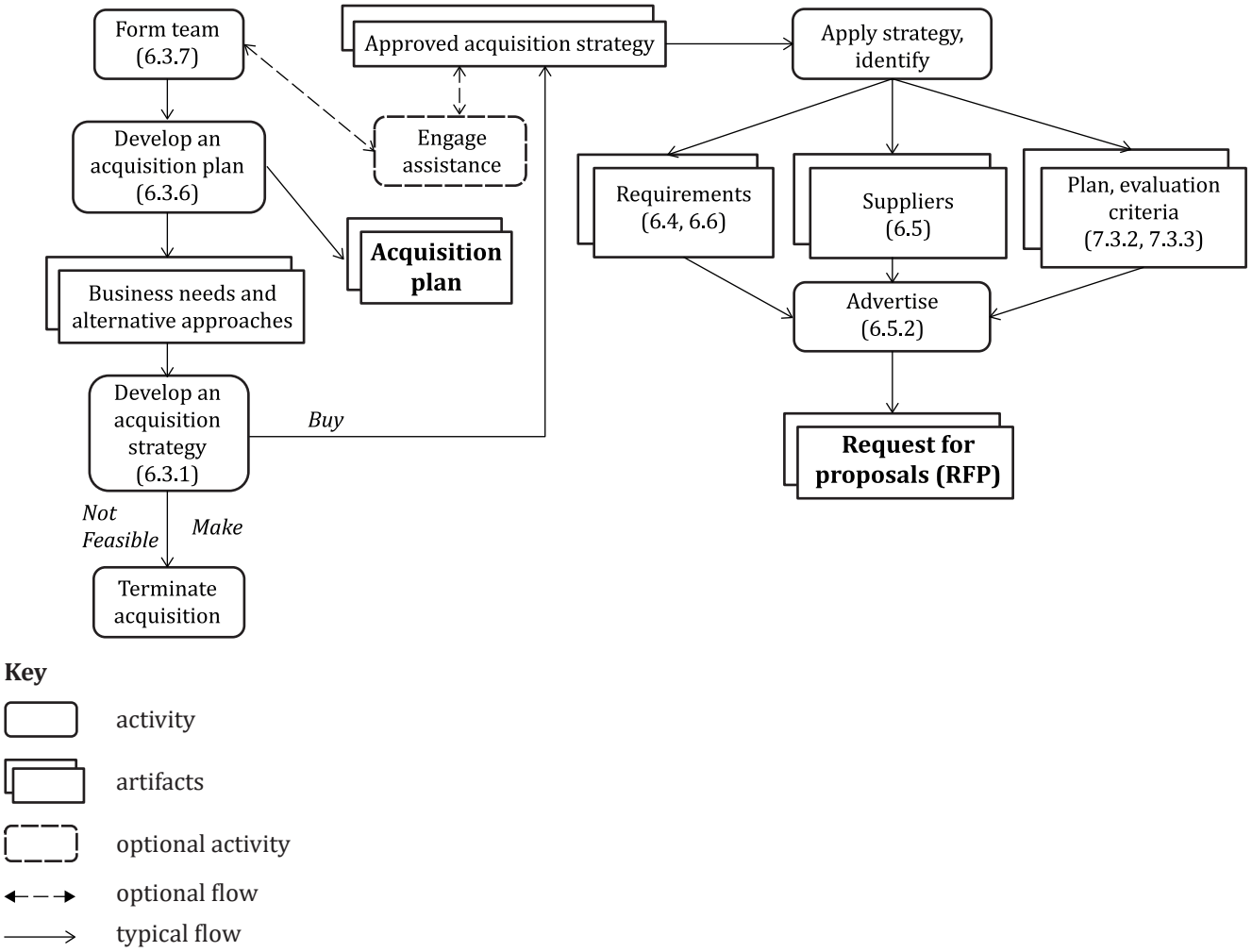

Figure 3 — Planning and RFP sub-process

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

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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;

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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

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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

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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;

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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

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