

Contractual Requirements Review and Management

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Abstract: *This article presents contractual requirements review as an element of a Quality Management System (SR EN 9100:2018 [1]), which requires the organization to conduct requirements reviews at various stages of the product realization lifecycle. Proper conduct of a review and management of requirements will enhance overall supply chain performance with regards to On-Time-On-Quality Delivery (OTOQD).*

Key Words: *On-Time-On-Quality Delivery (OTOQD, types of requirements, product-related-requirements*

1. INTRODUCTION

The supply chain for the procurement of the compliant materials needed by the aviation, space and defense industry has a complex role in carrying out specific activities.

The industry, through the EN 9100 Quality Management System (QMS) standard, imposes both “on time” and “on quality” delivery, leading to special demands on the supply chain for the procurement of compliant materials [1].

There are three possible outcomes, as a Supplier, receives requirements from a Customer:

- They are clearly applicable and are applied.
- They are applicable, but cannot be fully applied, which requires a **deviation** to be identified and accepted by the Customer.
- They are not applicable or may be considered only partially applicable, which requires an **exemption** to be accepted by the Customer.

Adherence to applicable Customer procedures for handling deviations/exceptions when agreed to by the Customer shall be documented, for example through the Quality Assurance Plan (QAP). The Customer's procedures are applied either directly or indirectly through the Supplier's procedures. The customer will always have the right to audit this equivalence at any time, with any non-conformity (except of course those already accepted by the customer as deviation/exception) subject to a mutually agreed action plan.

It is therefore imperative that agreed customer requirements are accurately communicated to all members of the supply chain and that all suppliers have methods to verify that requirements (including deviations and exemptions) are understood by all parties. This can only be achieved through active, effective two-way communication.

All suppliers in the supply chain should have a documented process with clearly defined roles and responsibilities for contract review and acceptance.

2. CONTENT

Figure 1 below describes the way in which the review of a contract is carried out, the cycle that starts with the customer's requirements [3], the acceptance of the contract and the transmission of the approved requirements as a result of the negotiations with the suppliers to the customer.

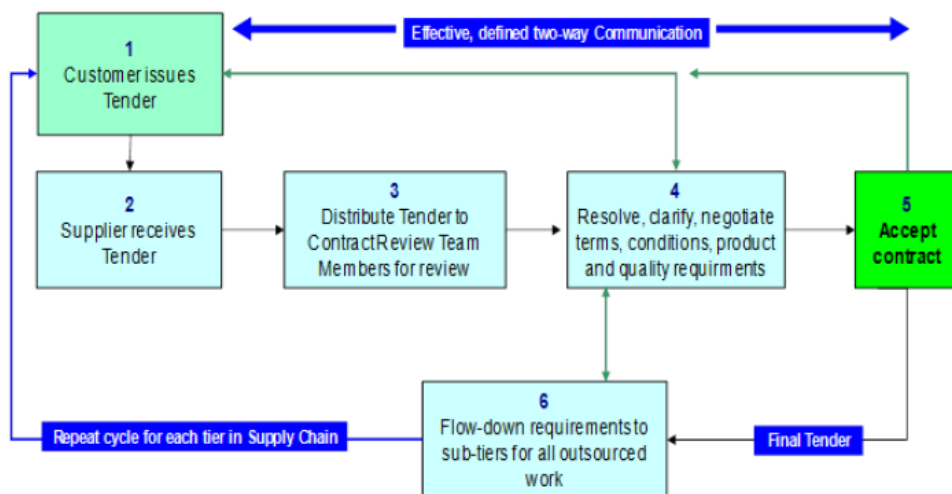


Fig. 1 Life cycle of a contract [2]

The revision of the contract represents a mutual negotiation between the supplier and the client with the aim of accurately defining the client's requirements in order to obtain a compliant product to be delivered by the supplier. Inadequate understanding of requirements causes delays, additional expenses, non-compliance. Each non-conformity leads to additional time for both the customer and the supplier. Identifying and understanding the requirements of the aviation, space and defense industry is a necessary and imperative requirement. The more complex or precise the item, the more requirements there may be. It is important that all requirements are known, established and communicated in order to obtain the compliant product. It is essential for the supplier to ensure that the customer really wants and/or needs the specified requirements. This is part of the necessary two-way communication between the parties.

2.1 Traceability

Traceability is one of the essential activities of a good requirements management process. It is important that the supplier has a two-way traceability mechanism. Forward traceability ensures that the product requirements transmitted to the supplier are in accordance with the customer's product specification.

Traceability back will trace the correspondence between the requirement sent to the supplier and the source requirement.

2.2 Stakeholder

A Stakeholder is a person or organization who has a specific interest in a product, process, or system and who is affected by decisions and changes to them. Stakeholders include end users, business partners, customers, regulatory groups, suppliers, technology support, developers, producers, those who do testers and who perform maintenance. The stakeholder may be an internal or external party.

A key stakeholder is a person who participates in the decision to approve or disapprove requirements on the behalf of other stakeholders. If individual users disagree on requirements, the key stakeholders decide. The key stakeholders are expected to resolve requirements conflicts from those they represent and are authorized to do so.

In the aviation, space and defense industries the primary (key) stakeholder is the customer or purchasing organization identified in the contract. These are regulated products thus the regulatory and statutory entities are playing major roles as stakeholders, so special attention should be given to both their explicit as well as implicit requirements (table 1). Along with stakeholders external to the organization, there are stakeholders who are internal in the organization and have impact on the requirements definition and the management process.

Table 1. Example Listing of Stakeholders [2]

Stakeholders	Expected information Customers
Customers: 1. Owners/ sponsors/ managers 2. Subject Matter Experts 3. End users	1. Goals, objectives, and scope of the System 2. Business conformance requirements 3. Typical operational scenarios
Statutory and Regulatory: 1. AS&D civil, space and defense agencies 2. Local, national, international governments	1. AS&D civil, space and defense agency requirements 2. Export and Import Control compliance, licensing 3. Defense contracting regulations
Engineering staff: 1. Systems 2. Developers 3. Software/ hardware	1. Conformance requirements regarding Business 2. Technical feasibility of requirements. 3. Knowledge of recurring design problems, known solutions, and future changes/ needs. 4. Provides hardware, software, and communication requirements.
Standards experts:	Conformance requirements, design, and implementation constraints, future standards
External Partners:	Interoperability requirements with other systems; reports, safety requirements, legal requirements, etc.
Oversight staff:	Quality Assurance requirements, acceptance criteria, etc.
Supplier:	1. Features of existing and anticipated Commercial Off the Shelf (COTS) products 2. Knowledge of competing products

Trainers Facilities experts Contract specialists	1. Defines training or facilities needs. 2. Requirements may include Contracting requirements, which may require stakeholders with knowledge in this area to be part of the stakeholder group
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2.3 Product requirements

Product requirements are usually classified into these categories:

1. Architectural requirements that describe what needs to be done by identifying the system architecture.
2. Functional requirements describe what the system/product must do; the functionality that the system is to perform; for example, the dimensions of a structure or the modulation of the electronic signal. The supplier must provide information on the acceptance test(s) to demonstrate that the functional requirements are met. Sometimes these requirements are proven in “qualification” testing and are still accepted as part of project acceptance.
3. Non-functional requirements describe how the system/product works to fulfill general characteristics; features that the user cannot perceive.

The fulfillment of these requirements is achieved through “qualification” tests, either they are accepted on the basis of trial/ test or trials that determine the performance of the product.

2.4 Requirements in Systems Design and Development

In contracts involving supplier systems engineering activities (such as: complex systems design, software systems, etc.), a requirement can be a description of what a system must do, referred to as a functional requirement.

Such requirements are often called non-functional requirements, or “performance requirements” or “quality of service” requirements. Examples of such requirements include usability, availability, reliability, supportability, testability, maintainability, and ease-of-use.

2.5 Requirements Management Process

The requirements management process normally consists of the following activities:

- An inquiry/request for quotation is received from the customer.
- Customer/stakeholder requirements are reviewed for vendor understanding.
- The supplier determines how it will meet the requirements. The supplier submits a solution/offer to the customer.
- The customer reviews the offer and the negotiation with the supplier takes place.
- The negotiated offer is accepted by the supplier.
- The supplier monitors the status of compliance with the negotiated requirements.
- The supplier manages the changes to the negotiated requirements and defines the impact on the customer.

It is recommended that the supplier establish and maintain a documented CRR contract requirements review process to ensure that all requirements are understood, recorded and agreed with the customer at the outset of a contract.

The supplier must ensure a two-way traceability has been established and the appropriate authorizations have been obtained regarding the acceptance and fulfillment of the contract as the work is carried out.

Figure 2 below explains that the requirements management process begins when the customer specifies product requirements. Customer requirements are defined in “Request for Information (RFI)”, “Request for Proposal (RFP)”, “Request for Proposal (RFT)” or “Request

for Quotation (RFQ)” documents. An RFI is a procedure whose purpose is to gather information about options and products from different suppliers. Currently, the RFI does not establish solutions for the ongoing contract. An RFP is an invitation to suppliers to submit a proposal for a specific product and is intended to enable clear identification of risks and benefits in advance. An RFT is a formal, structured invitation to suppliers to supply products, particularly in the public sector. An RFQ is used when product specifications are known and suppliers are required to submit a specific bid.

The RFI, RFP, RFT, or RFQ conveys appropriate information, contract deliverables, special requirements, critical items when not specified by the technical side, and key features in accordance with the type of product being purchased. The information is specified in the contract, the customer's quality system requirements, drawings or specifications.

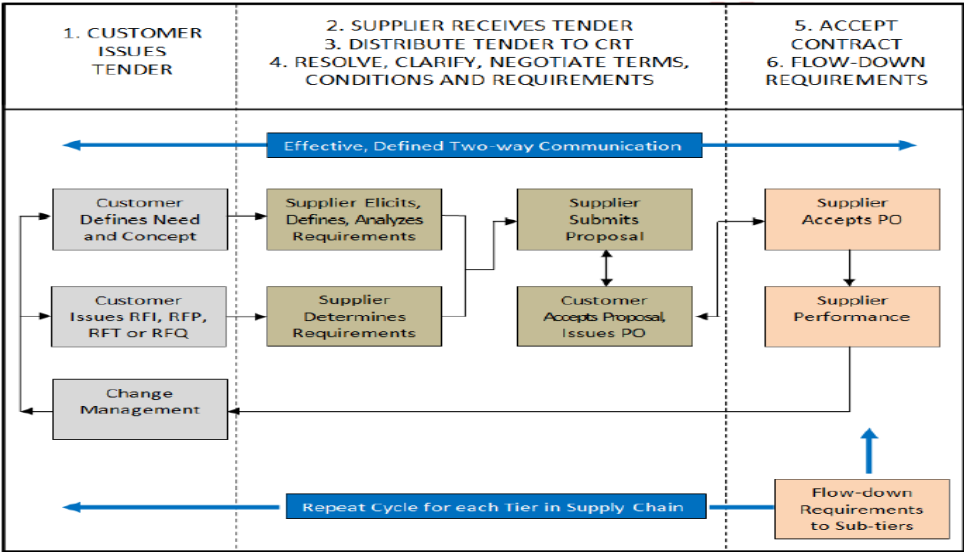


Fig. 2 Mechanism of bi-directional traceability [2]

2.6 Determination of Requirements

The process of drawing up contracts with the supplier begins with the determination of all the requirements related to the product.

These include requirements specified by the customer, requirements that are not stated by the customer but are common practice, statutory and regulatory requirements applicable to the product, special requirements and any additional requirements deemed necessary by the supplier (fig. 3). The supplier must establish and implement effective means of communicating with the customer about product requirements. The supplier should complete a clear understanding of all requirements and have the customer's requirements properly validated.

In contracts requiring vendor system engineering activities, requirements determination is initiated by gathering system requirements from users (interviews, questionnaires, user observation, workshops, brainstorming), customers, and other stakeholders.

2.7 Supplier Assessments

The supplier must evaluate all requirements related to the product before its commitment to supply a product to the customer. The supplier evaluation should ensure that all product requirements are defined, determined, and if the customer has not provided any documented statement of customer requirements confirmed prior to acceptance.

The supplier must assess whether it can ensure that the requirements are met and that all risks associated with making the product have been identified.

The supplier must keep records of the results of the assessment and of actions arising from risk mitigation actions (Reference IAQG 9100:2009 clause 8.2.2. and 4.2.4).

2.8 Supplier approval

Upon resolution of issues identified in the evaluation phase, the supplier will provide the customer with an offer detailing how the customer's requirements will be met, even if they deviate from the customer's original request. The written offer from the supplier to the customer, in response to an RFI, RFP, RFT or RFQ, informs the customer of the supplier's ability to meet the customer's requirements.

Based on the acceptance of the offer from the supplier, the customer will approve the supplier and issue the order/draft contract, establishing the terms and conditions applicable to the purchase of the product.

Upon receipt of the order, it is the supplier's responsibility to ensure that all items, including exceptions, have been resolved. Contract/ order acceptance records are kept in accordance with the customer's retention requirements.

The supplier is responsible for fulfilling all contract requirements, including subcontracted work. Subcontracted works will be mentioned in the contract.

The contract includes the relevant requirements to the sub-contacted suppliers:

- a. Succession of All Applicable Contractual Requirements
- b. Requirements for approval of outsourced work
- c. Quality management system requirements
- d. Legal or regulatory requirements, if applicable.

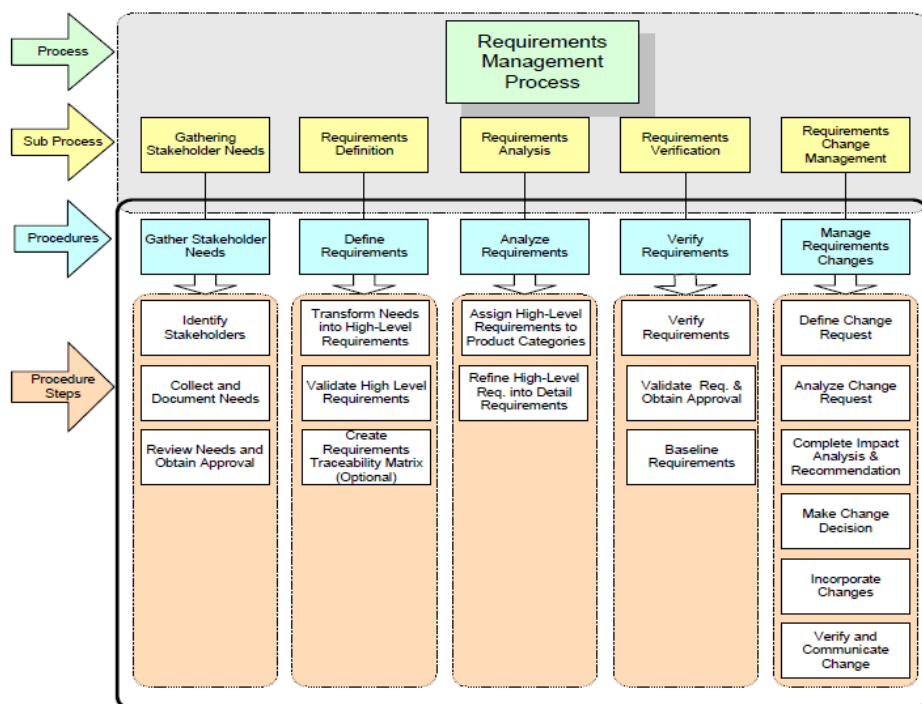


Fig. 3 Complex Systems Requirements Management Tools [2]

2.9 Supplier Performance

In the product development stage, the supplier must determine the product requirements and keep their records. The product features must conform to the entry requirements.

The supplier must carry out systematic evaluations of the results at different work stages, to ensure that the results obtained lead to the fulfillment of the product requirements and to identify any problems that would lead to the modification of the product requirements. Supplier performance management is more than simply obtaining information about suppliers; it involves performance evaluations and is oriented towards improving supply chain performance.

The supplier will periodically evaluate the supplier's performance; the results of these evaluations will be the basis for establishing the level of controls that must be implemented.

2.10 Change Management

Business requirements may change throughout the product life cycle. Change in requirements can come from internal as well as external causes. Changing external factors can make change difficult to avoid.

Internal reasons for change consist of:

- a. Business development,
- b. Organizational restructuring of either the client or the supplier,
- c. Significant revisions to the business objectives strategy of either the customer or the supplier.

The external reasons consist of:

- a. Developments in technology (elements that were not possible become possible, therefore requiring change in requirements),
- b. Economic trends affecting profitability,
- c. Changes in legislation or legal interpretation.

3. CONCLUSIONS

The review of contractual requirements is an element of a quality management system, which requires the organization to perform requirements assessments at various stages of the product realization life cycle. Properly performing requirements review and management will improve overall supply chain performance in terms of on-time and quality delivery (OTOQD).

A thorough review of contract requirements during the initial phases of contract agreement and implementation and subsequent management will improve overall supply chain performance and product compliance.

The contract review is a mutual negotiation between the supplier and the customer that defines exactly what is required of the supplier to deliver a compliant product.

At a minimum, the provider must verify that:

The necessary technical information is available:

1. Technical data and descriptions,
2. Specifications and standards,
3. Drawings.

Customer requirements are understood and can be met:

1. For product acceptance (i.e. quality, inspections and tests, verification and validation, any special monitoring),
2. For delivery expectations,

3. For post-delivery expectations,

4. For payments to be granted.

The related standards have been reviewed and can be met:

1. Statutory and regulatory,

2. International quality (i.e. ISO 9001:2016, AS9100),

3. Other necessary and applicable standards (EN 31000).

Unclear or ambiguous requirements must be resolved.

Feasibility was determined by:

1. The supplier has the ability to fulfill the requirements of the order,

2. The supplier has the necessary equipment to manufacture the product,

3. The supplier has the appropriate space,

4. The provider has adequate financial resources to achieve the success of the program,

5. The supplier has qualified personnel available to support the manufacturing and programming of the product management.

Any discrepancies between the final bid and contract award must be resolved.

The methods of communication with the client are defined related to:

a. Product Information and Program Performance,

b. Questions, feedback and status,

c. Concerns and complaint handling,

d. Requirements not stated, properly defined or subsequently added by the customer.

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