KRATOS®

PROCEDURE
Engineering, QA/CM

Title: Design and Development   Date: 04/06/23

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STATUS

Revision J updates the Author and BMS Manager of this document, corrects minor grammatical errors, and expands on the definition of a Product Specification. Added the definition of COTS.

OVERVIEW

The design of products or services is more likely to be successful and efficient if it is planned carefully. Clear definition of all functions involved is required so that appropriate review can take place throughout the design and development process. Since design input can come from many places, such as customers, government agencies, and contract review activities; an understanding of the various sources of design input is required. Once sources are clear, all input can then be reviewed and clarified as required. Completed designs must be documented in a way that they can be verified (tested to specifications) and validated (tested to performance requirements). In the design documentation, it must be made clear which characteristics can affect safety of performance. Finally, design changes need to have appropriate review and approval before implementation.

This procedure applies to designing new products and redesigning existing products developed by Kratos. Division Heads, Project Managers, and Project Teams follow this procedure to control, verify, and validate designs, ensuring that specified requirements are met. A brief summary of the authorities and responsibilities of the various parties involved in Design is presented in Table 1.

Table 1. Authorities and Responsibilities for Design

FUNCTION	AUTHORITY AND RESPONSIBILITY
Division Heads	Manage the organization of projects within their business unit Ensure that a qualified Project Manager and Project Team are assigned and adequately trained, and that this procedure is adhered to, modified, and improved as necessary Give authorization to proceed
Project Managers	Plan and oversee design activities
Project Team	Perform and coordinate required design activities according to the Project Manager's plans and directions

PROCESS

The design and development process used by Kratos is illustrated in Figure 1. If needed, a detailed document of this process may be developed from the Quality Assurance Plan template EN-005-T01 that describes the necessary input, output, and approvals of reviews in relation to baselines during the planning, development, and delivery of the product. Note that many projects do not specifically require a Quality Assurance Plan, but this template can be used to create one if appropriate.

Figure 1 below illustrates the choice that needs to be made between the two Engineering and Verification procedures, EN-008 for products and EN-003 for projects.

The Product Group develops Commercial Off-The-Shelf (COTS) products using EN-008. There are three types of software development that they perform.

1. COTS Product development that is for general enhancement.
2. COTS Product development that is program driven, but is considered COTS because it is useful for other customers.
3. Product development that is for a single project. This is most likely MUS (Mission Unique Software) development.

EN-008 will normally be used by the Product Group for all three. However, if they do use EN-003 it will only be for #3.
The Project Teams only develop MUS, so they will always use EN-003.
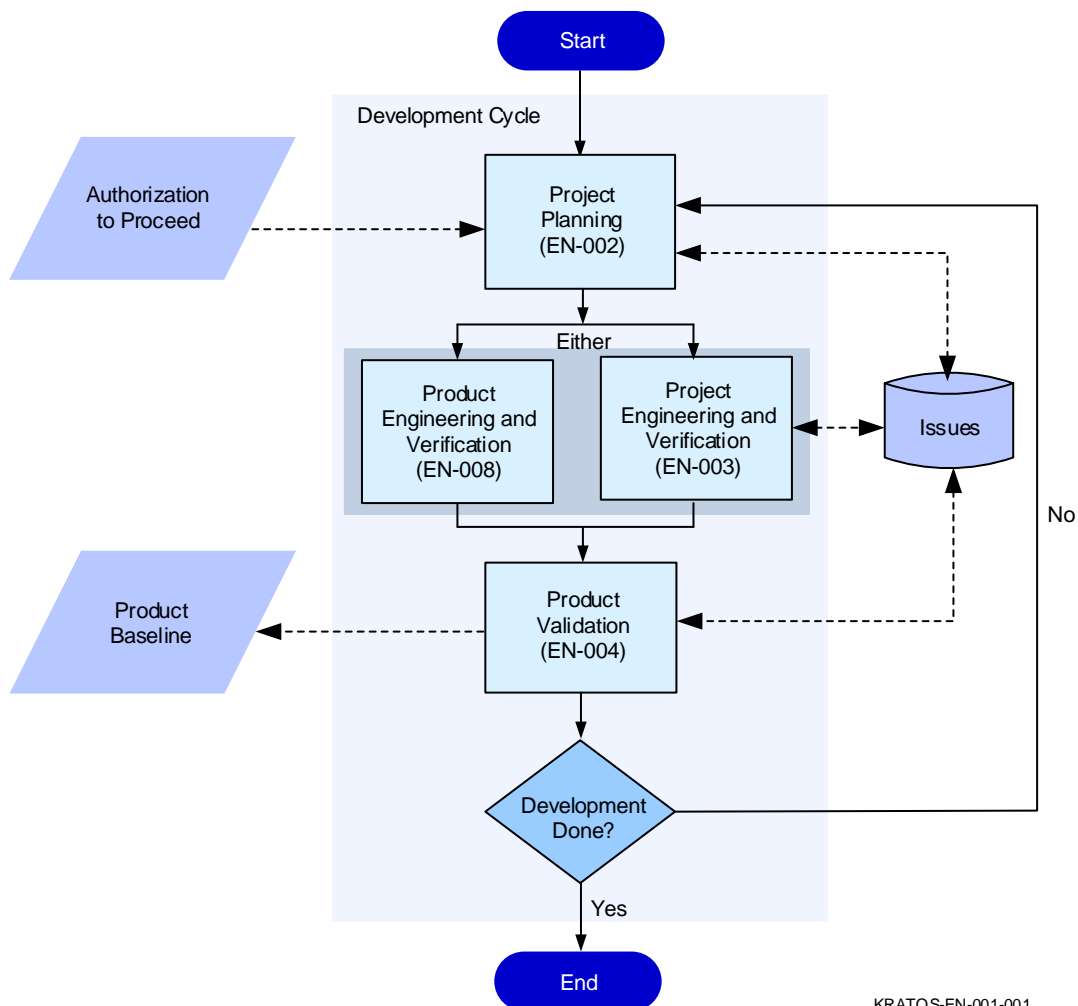
Figure 1. Design and Development Process

A. Change Control

A product baseline (i.e., a version of the product that has been approved for delivery), is established at the end of each development cycle. A "development cycle" is a defined period during which a set of components is planned, developed, and reviewed. Changes to baselines are controlled. Each proposed change is documented and tracked in the Project's Issues Database or CM tool. An "issue" contains documentation and status for a change made to a product baseline. Reviews that initiate change to baselines will require approval and relevant parties will be informed of changes.

B. Project Planning

The Project Planning phase clearly defines the work to be performed. The Project Planning phase starts when:

    a.   The Division Head responsible for the Project assigns a qualified Project Manager and authorizes the Manager to begin work on the Project.

    b.   The product validation phase indicates whether another development cycle is needed. The issues generated by the product validation are the input to the Project Planning phase.

In the Project Planning phase, the Project Manager develops or updates the Project Plan, a document that defines a project's components (components are considered a subset of the product features planned and developed together) and development cycles. The Project Plan lets managers identify, understand, review, and clarify important issues such as resources; deliverables/documentation/records; organization/roles/responsibilities/interfaces; schedule and project stages/milestones; reviews/testing required at each project stage, and the Quality Assurance (QA)/Configuration Management (CM) process to be used.

In addition, the method or procedure for handling, preserving, and protecting customer-furnished property shall be described in the Project Plan. Consideration for the selection of the method or procedure should be based on contractual requirements first and then Kratos' Business Management System (BMS) procedures. It also defines the work to a sufficient level of detail to carry out at least the next development cycle. In addition, the project's design, development, product verification, and validation stages are defined clearly within a schedule supporting the Project Plan. Every Project should have a Product Specification (technical documentation that shows the scope of the Project as seen by the customer) and a Product Test Plan. These components are developed in early development cycles and updated as necessary for the life of the Project.

The Product Specification details design input requirements, resolving ambiguous and conflicting requirements when completed. This specification also addresses characteristics of the design crucial to safe and proper Product operation.

The Product Test Plan describes how the Project Team ensures that each product component conforms to the Product Specification, and that the final product meets the defined needs of the customer. The customers or organization taking delivery of the product may be internal to Kratos.

The Project Planning phase ends when the Project Manager responsible for the Project has completed the initial version of the Project Plan. The Project Planning Procedure describes this process in more detail.

C. Product Engineering and Verification

The Product Engineering and Verification phase creates and/or evolves product components as necessary to complete the next development cycle as defined in the Project Plan. The Product Engineering and Verification phase begins after the Project Planning phase has been completed. Primary input to this phase consists of the current Project Plan and the components already produced.

In the Product Engineering and Verification phase, the Project Team creates, reviews, and/or evolves the specified product components as described in the Project Plan. The Product Engineering and Verification phase ends when the Project Manager and Project Team have verified that the product or component is at the planned state for completion and that requirements for the current development cycle are met. The Product Engineering and Verification procedure describes this process in more detail.

D. Product Validation

Product Validation occurs upon completion of each product development cycle. The purpose of product validation is to ensure that the product meets the customer's defined needs. The Product Validation phase begins at the end of the Product Engineering and Verification phase. Primary input to this phase consists of the current Project Plan, Project Issues, and the current product components. In the Product Validation phase, the customer validates the product as described in the Project Plan, Test Plan, or other project document. The Product Validation phase ends when the product has been validated and, if accepted, a product baseline has been established. The Product Validation Procedure describes this process in more detail.

RECORDS

Table 2 lists the records that are associated with this procedure.

Table 2. Records

NAME	LOCATION	RESPONSIBILITY	MINIMUM BACKUP FREQ.	MINIMUM RETENTION PERIOD
Project Issues	Project CM Tool	Project Manager/Engineers	Weekly	3 Years after project completion
Project Plan	Responsible Project/Electronic Records Area	Project Manager	Weekly	3 Years after project completion
Test Plan	Responsible Project/Electronic Records folder	Project Manager/Engineers	Weekly	3 Years after project completion

Table 3: Revision History Table

REVISION LETTER	DATE	DESCRIPTION
Rev I	06/10/21	Updates the Owning Manager, updates reference from Razor to CM tool. Add Revision History Table.
Rev J	10/28/22	Updates the Author, BMS Manager. Changes references from QMS to BMS. Expands on Product Specification and its relevance to Projects.
Rev K	04/06/23	Added the definition of COTS.

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