



Identify need
 Refine the need for a system
Inputs: Company strategy - crew, market & technology forecasts - replacement request - experience gained from existing systems - legislative requirements
Outputs: Business requirement - context(s) of use - system strategy - concept and scope description

Design
 Draw on established state-of-the-art practice, experience and knowledge of the supplier and other stakeholders and on the results of the context of use analysis, to design the system to meet specified requirements; design the operation, maintenance, training, support and other procedures that ensure that it performs as required in use; develop integration testing approach and products
Inputs: Requirements specification - context of use - rules & regulations - standards & codes of practice - legislation - evaluation report
Outputs: Design documentation - integration & test specification - training needs of crew - support plans

Planning and Management
 Specify how the required technical, quality, safety and human-centred activities integrate and fit into the whole system lifecycle
Inputs: Concept and scope description - terms and conditions of contract - requirements specification - context of use
Outputs: Project Plans - installation plan - validation plan

Validation
 Validate that the system meets its requirements specification; ensure that it meets the requirements of the users, the tasks and the environment
Inputs: Validation plan - requirements specification - project plan - context of use - standards & legislation - user feedback
Outputs: Validated system - validation report - validation log

In-service support
 Operate and maintain the system to keep the required dependability
Inputs: Installed system - operation & maintenance procedures - system manuals - support plans
Outputs: Operation & maintenance log - monitoring log

Define concept
 Identify hazards and associated risks relating to the system; identify, clarify and record characteristics of stakeholders, tasks and organisational and physical environment in which it will operate; develop understanding of its users, boundaries, environment and applicable requirements sufficient to enable satisfactory performance of lifecycle activities
Inputs: System strategy - project scope - legislation - competitor systems
Outputs: Concept & scope description - hazard & risk management description - context of use - invitation to tender

Installation and Commissioning
 Install and commission the validated system; establish human-system aspects of its support and implementation
Inputs: Validated system - context of use - requirements specification - installation plan - stakeholder representatives - training materials - support plans
Outputs: Installed system - Trained users

Define requirements
 Define complete, correct and unambiguous set of functional and non-functional requirements for the system; establish requirements of the organisation and other stakeholders acquiring or utilising it, taking full account of needs, competencies and working environment of each relevant stakeholder
Inputs: Concept & scope description - hazard & risk management description - project scope - user representatives - industry/national/international standards
Outputs: Requirements specification - revised context of use

In order for the marine industry to gain full benefit from computer-based systems, such as ship automation, it is necessary for crews to place appropriate trust in the system and that the system is sufficiently dependable for the task. The International Standards Organization (ISO) has developed a total system, human-centred, risk-based, through-life approach to the specification, design, introduction and use of operationally effective and commercially efficient software intensive marine systems. This is presented in ISO 17894:2005 *General principles for the development and use of programmable electronic systems in marine applications*, which defines twenty principles and associated criteria for dependable marine systems. This new standard:

- Promotes a systems-oriented view of software intensive systems development;
- Gives user and usability requirements equal emphasis with technical requirements;
- Takes account of operation and maintenance;
- Supports the assessment of innovative designs;

And

- Provides a set of dependability requirements that owners can request for all systems.

Here we present the guidance in ISO 17894 on the lifecycle stages and processes for the definition, development and operation of a dependable and usable computer-based system - from a human element perspective.