

Defect Content Factors

D01 Developer Capability

- developers’ knowledge about the development processes
 - degree of experience with project’s platform/environment
 - experience and familiarity with development environment
 - degree of experience with tools and development language
 - developers’ knowledge about the tooling used to support the development activities
- the ability of the personnel to give accurate estimations for test activities

D02 Domain Knowledge

- the degree to which developers understand the architecture and resolves associated risks
- previous experiences with the development of a similar application
- developer’s knowledge about the business aspects of the product to be tested
- developers’ knowledge about the domain for which the product is intended
- knowledge about the product to be developed
- degree of developer’s experience in the user environment and operations
- knowledge of application environment
- experience with application
 - knowledge about how parts of the product have been implemented by other parties

D03 Team Composition

- programming experience
- skill level of developers
- skill level of designers
- experience of the team
- capability of the team
- quality and ability of development team
 - reliance on a few key personnel
- availability of right development personnel
- use of capable technical personnel
- use of specialists
 - size of project team
 - complexity of the software development team composition
 - the number of teams involved in development
 - the complexity of the overall project organization of which the development team is only a part

D04 Team Distribution

- degree to which development is distributed over geographical separated locations
- cultural differences between groups, sub-projects, and related parties

D05 Collaboration

- degree of developers’ mental stress
 - the degree to which the developers and the team show flexibility concerning project circumstances
- development team’s cohesion and relationships
- continuity and stability of the team
- attitude and commitment of developers
- the degree to which expertise of others is trusted
 - the degree to which (sub)contractors support the development work
- the degree to which clients support the development work
- the degree to which (end) users support the development work
 - reliance on a single development improvement

D06 Business Management Maturity

- experience of business in implementing change
- experience of business in a project of this nature
 - management’s experience and familiarity with application
 - stability of the (senior) management
 - management style of (senior) management
 - support from (senior) management

D07 Product Complexity

- the number of integration steps and their physical location
 - complexity of problem
 - number and complexity of external interfaces of the product to be developed
 - the degree of innovative features of the product to be developed
 - complexity of the product to be developed
 - size of the product to be developed
 - the degree of main storage constraint imposed on the software product
 - degree of constraint by size of main memory or storage availability
 - the degree to which the software must be designed to be reusable in other products or projects
 - the degree to which the software must perform its intended function under specified conditions over a specified period of time
 - the degree to which the software must provide appropriate responses, processing times and throughput rates

D08 Communication

- slow communication and distribution of changes
- information hiding by others/sub-projects
- degree to which communication is established between developers (of various disciplines)
- communications within development team and to parties outside the team
- communication errors between development teams
- degree to which personnel is skilled w.r.t communication
- competence of the contact person between a development team and related parties

D09 Project Management Maturity

- defined roles and responsibilities for development activities
- defined responsibilities and authorities for development activities
 - availability of adequate time for development activities
 - the degree of project progress reporting
 - degree of disciplined project planning
 - adherence to plans
 - accuracy of metrics used in project planning and management
 - availability of historical data to support project planning and management
 - the degree to which assumptions are made for project planning, design, and implementation
 - performance of development planning and coordination
 - the degree to which project management performs its task
- degree to which test and development processes have been aligned
- degree to which unplanned testing tasks are executed
- External Disturbance
- degree and impact of events that cause development to deviate from the plan

D10 Process Maturity

- degree to which knowledge is gained, stored, and maintained
 - maturity level of the development process
 - use of development processes
 - usage of disciplined QA procedures
 - usage of disciplined design methodology
 - usage of disciplined requirements analysis methodology
 - usage of disciplined procedures to record specification modifications, requirements questions and answers, and interface agreements
 - usage of disciplined procedures to identify and establish baselines of the product
 - usage of disciplined configuration management procedures
- the degree to which product requirements and derived tests are traceable
 - quality of third-party software and reused code
 - quality of input deliverables from sub-projects

D11 Change Control

- monitoring and control of changes in the product
- the degree to which requirements or specification changes are managed

D12 Quality of Documentation

- degree to which (supporting) documentation is created throughout the lifecycle
- quality and completeness of system documentation
- quality of documentation
- quantity (volume) of design documents

D13 Requirements

- the degree to which testability of the product has been included in the design
- stability of the requirements
- degree of changes in the specification during implementation
- the degree to which product requirements change or increase during design and thereafter
- extensiveness of the requirements to be applied for documenting the development work
- degree to which unnecessary features have been specified
- the degree to which requirements used as input for the implementation work, can be misunderstood
- quality of the requirements specifications
- the degree to which requirements are suitable as input for implementation
- the degree to which requirements allow multiple interpretations, multiple assumptions, existence of implicit requirements
- adequacy of the requirements to base implementation on

D14 Development Environment

- degree of access to development system
- availability of hardware resources for development
 - the degree to which the software and hardware platform needed by the software product is stable
 - stability of hardware and system support software used during development activities
- use of modern development practices and methods
- usage of software development tools
- effectiveness of software tools

D15 Innovation

- usage of new technology
- maturity of the technology used

Effectiveness Factors

E01 Testability

- test facilities integrated in the product
- the degree to which testability of the product has been included in the design

E02 Product Complexity

- quantity of the data generated (or needed) by the product to be tested
- usage of new technology
- the degree of innovative features of the product to be tested
- complexity of the product to be tested
- number and complexity of external interfaces of the product to be tested
- size of the product to be tested

E03 Quality of Documentation

- quality of the test specifications
- degree to which developers and testers are aware of the need for documentation, needed as input for testing
- the degree to which product requirements and derived tests are traceable
- quantity (volume) of documents needed as input for testing
- degree to which input documentation for testing is available throughout the lifecycle
- the degree to which requirements used as input for testing work can be misunderstood
- quality of documentation on which testers base their testing
- quality of the documents that are needed to support the test activities
- quality and completeness of system documentation
- quality of the requirements specifications used as input for testing work
- the degree to which requirements allow multiple interpretations, multiple assumptions, existence of implicit requirements
- quality of requirements specifications needed as input for testing
- extensiveness of the requirements to be applied for documenting the test work
- the degree to which requirements are suitable as input for testing work
- degree to which exceptional product behavior is addressed in requirements specifications
- adequacy of the requirements to serve as an input for testing

E04 Change Control

- monitoring and control of changes in the product
- experience of business in implementing change
 - the degree to which requirements or specification changes are managed
 - degree to which requirements change over time during test specification
 - the degree to which product requirements change or increase during test specification and thereafter

E05 Test Planning

- the degree of determination of what is tested, when, where, and by whom
- the degree of determination of what is reviewed, when, where, and by whom
 - the degree to which assumptions are made for test planning, test specification, and design
 - the degree of test progress reporting
 - availability of historical data to support test planning and management
 - capability of planning, monitoring, and controlling the test activities
 - accuracy of metrics used in test planning and management
 - performance of test project management
 - adherence to test plans
 - availability of test planning approach

- performance of test planning and coordination
- creation of and adherence to test plans
- degree of disciplined test planning

E06 Management Attitude

- let-go, release now, correct later attitude
- the complexity of the overall project organization of which the test team is only a part
- experience of business in a project of this nature
- support from (senior) management
- management style of (senior) management

E07 Adherence to Plan

- degree to which unplanned testing tasks are executed
- degree and impact of events that cause testing to deviate from the plan
- availability of adequate time for testing
- reduction in testing time resulting from delays in coding and design
- shortcuts in testing to gain time
- skipping of tests under time pressure
- Test Process Maturity
- degree to which test knowledge is gained, stored, and maintained
- the degree to which assumed solved defects are cross-verified
- degree to which test and development processes have been aligned
- usage of a test methodology
- maturity level of the test process
- organization of the test process
- usage of defect detection techniques
- usage of defect detection tools

E08 Development Process Maturity

- usage of disciplined requirements analysis methodology
- usage of disciplined configuration management procedures
- rigorousness of review process
- usage of disciplined QA procedures
- maturity level of the organization

E09 Test Environment

- suitable facilities for testing

E10 Support for Testing

- the degree to which (sub)contractors support the testing work
- degree of user involvement in testing activities
- the degree to which clients support the testing work
- the degree to which (end) users support the testing work

E11 Product Integration

- strategy for integration of product parts
- the number of integration steps and their physical location

E12 Test Capability

- the ability of the test personnel to give accurate estimations for test activities
- availability of right test personnel
- adequate staffing of test team
- experience with test tools
- use of test specialists
- test team's experience and familiarity with application
- testers' knowledge about the system to be tested
- testers' knowledge about the business aspects of the product to be tested
- degree of tester's experience in the user environment and operations
- tester's knowledge of application environment
- testers' knowledge about the domain for which the product is intended
- capabilities of test engineers
- skills and skills level of test personnel
- experience and expertise of the test team personnel
- testers' knowledge about the tooling used to support the test activities
- testers' knowledge about test techniques, methods, strategies, test design, test planning etc.
- testers' knowledge about the test process and development processes related to testing
- degree to which test personnel is skilled w.r.t communication
- competence of the contact person between a test team and related parties

E13 Test Team Cohesion

- degree of testers' mental stress
- attitude and commitment of testers
- test team's cohesion and relationships
- continuity and stability of test team

E14 Team Distribution

- degree to which testing is distributed over geographical separated locations
- the degree to which expertise of others is trusted
- cultural differences between groups, sub-projects, and related parties

E15 Test Team Organization

- defined responsibilities for testing
- defined organization for testing
- organization of the test team
- the number of test teams involved in testing
- size of the test team
- complexity of the test team composition
- reliance on a few key personnel

E16 Communication

- interpretation of test code received from other parties (outside the test team)
- knowledge about how parts of the product have been implemented by other parties
- slow communication and distribution of changes
- information hiding by others/sub-projects
- the degree to which test results are communicated to direct stakeholders
- communications within test team and to parties outside the team
- degree to which communication is established between developers and testers