SER415 Final Exam materials(cumulative)

8 quality
measures for requirements

1. Correct
2. Unambiguous
3. Complete
4. Consistent
5. Prioritized
6. Verifiable
7. Modifiable
8. Traceable

Correctness

An SRS is correct if, and only if, every requirement
stated therein is one that the software shall meet

Unambiguous:

A requirement is unambiguous "if and only if it
has only one interpretation"

Completeness

A set of requirements is complete "if and only if it
describes all significant requirements of concern to the user,
including requirements associated with functionality,
performance, design constraints, attributes, or external
interfaces"

Consistency

A requirement set is consistent "if and only if
no subset of individual requirements described within it
are in conflict with one another"

Prioritized

Requirements ranked by importance
and stability

Verifiability

A requirement is verifiable "if and only if there exists
a finite, cost-effective process with which a person or machine
can determine that the developed software system does
indeed meet the requirement

Modifiable

SRS modifiable "if and only if its structure and
style are such that any changes to the requirements can be
made easily, completely, and consistently, while retaining the
existing structure and style of the set

Traceable

A requirement is traceable "if and only if the origin
of each of its component requirements is clear, and there is a
mechanism that makes it feasible to refer to that requirement
in future development efforts".

Other Quality Measures

1) Clear
2) Concise
3)Cohesive
4)Feasible
5) Managed

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Requirements

DEFINITION

Descriptions of the system SERVICES and CONSTRAINTS that are generated during the requirements engineering process

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Phases of Requirements Engineering

DEFINITION

Elicitation

Analysis

Validation

Change Management

TERM

Requirements Elicitation is sometimes called _____ or _____

DEFINITION

discovery or gathering

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Stakeholders

DEFINITION

End-users, managers, engineers involved in maintainance, domain experts, trade unions, etc

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Requirements Analysis

DEFINITION

Translating requirements expressed as needs into software products.

Provide a model to bridge the chasm between business stakeholders and implementers (e.g. design docs)

Architecture

Higher level design

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Requirements Validation

DEFINITION

Demonstrating that the requirements defined the system the customer really wants

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Objectives with Inception

DEFINITION

1. Understand what to build

2. Identify key requirements

3. Determine at least one potential solution

4. Understand costs, schedule, and risk

5. Understand what process to follow and tools to use

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Objectives with Elaboration

DEFINITION

1. Get a more detailed understanding or requirements

2. Design, Implement, validate and baseline the architecture

3. Mitigate risks, produce more accurate schedule & cost estimates

4. Deployment and Development Environments

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Needs

DEFINITION

Problem or opportunity that must be addressed

TERM

Features

DEFINITION

A service the system provides

Identifiable but not implementable

WHAT not HOW

TERM

5 Heuristics in Problem Analysis

DEFINITION

1. Gain agreement on the problem definition

2. Understand the Root Causes

3. Identify Stakeholders and End Users

4. Define the Solution System Boundary

5. Identify Constraints

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Functional Requirements

DEFINITION

What the system does

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Non-functional Requirements

DEFINITION

How well the system does its thing

Stipulations or constraints on the system

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Types of non-functional requirements

DEFINITION

Product

Organizational

External

TERM

Product requirement

DEFINITION

The reqs we often think of.

Reqs which specify that the delivered product must behave in a particular way e.g. execution speed, reliability, usability, etc.

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Organizational requirement

DEFINITION

Internal Stipulations

Reqs which are a consequence of org policies and procedures.

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External requirement

DEFINITION

External Stipulations

Reqs which arise from factors external to the system and its development process

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User Requirements

DEFINITION

Written for (and often with) customers

Natural language

Should describe functional and non-functional requirements so that they are understandable by system users who don't have detailed technical knowledge

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System Requirements

DEFINITION

More detailed specifications

A structured doc setting out detailed descriptions of the system services

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Requirements Elicitation Techniques

DEFINITION

-Individual Interviews

-Group Meetings

-Prototyping

-Questionnaires

-Observation

-Research

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Individual Interviews

DEFINITION

2-way communication process

Time sensitive

Could be user, buyer, or expert

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Group Interviews

DEFINITION

N-way communication

Groups of customers, cross-functional teams, buyers, experts, focus groups etc.

Semi-structured

Cons: Group think

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Prototyping

DEFINITION

A structure for individual or group exploration

Participants are end users

Cons: Could push yourself into a corner early on

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Questionnaires

DEFINITION

1-way communication

Possibly anonymous

Cons: False answers, Answer options that are too limiting, answer options that are too broad

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Observation

DEFINITION

Watch real people in the domain

Ethnography

Cons: Observing can cause behavior to change

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Research

DEFINITION

0-way communication

Finding and reading written info and artifacts

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Use Case

DEFINITION

Describes sequences of events between an actor and a system that yield a result of value to the actor

A template for a collection of related scenarios

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Use Case Specification (Parts)

DEFINITION

Objective

Primary Actor

Trigger

Secondary Actor(s)

Pre/Post Conditions

Scenarios (Success/Failure)

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Actor

DEFINITION

Defines a coherent set of roles that users of an entity can play when interacting with the entity

Stick figure

TERM

A use case should focus on the users _____

DEFINITION

GOAL

(you should avoid functional decomposition)

TERM

Steps to create a use case

DEFINITION

1. Identify and Describe the Actors

2. Identify the Use Cases and write a brief description

3. Identify Actor to Use Case relationships

4. Outline the Individual Use Cases

5. Refine the Use Cases

6. Verify & Validate the Use Cases

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<<include>>

DEFINITION

A stereotype of a dependency

A -> B

The behavior of B is ALWAYS included into A

TERM

<<extend>>

DEFINITION

A stereotype of a dependency

A <- B

A possible extension, behavior of B may be incorporated into A

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Generalization

DEFINITION

B inherits the behavior and communication relationships of A and is allowed to override and extend

B is generally a standalone basic use case

Actors may apply Generalization as well

A <- B

e.g. Student <- Graduate Student

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Analysis Modeling Techniques

DEFINITION

Data/object Models

Behavioral Models

Flow Models

TERM

Data/object Models

DEFINITION

* Entity-Relationship (ER)

OOA&D

Data Dictionaries

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Behavioral Models

DEFINITION

Use Case Models

State Machines

TERM

Flow Models

DEFINITION

Process/workflow Models

* Dataflow Diagrams (DFD)

* Sequence Diagrams

* Activity Diagrams

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Other Requirements Quality Measures

DEFINITION

Clear

Concise

Cohesive

Feasible

Managed

TERM

IEEE 29148

DEFINITION

A newer, longer doc (~100 pages).

Focused on definitions

TERM

SWEBOK

DEFINITION

Software Engineering Body of Knowledge

Focused on descriptions

TERM

DO-178C

DEFINITION

Avionics Software Standard

Based on consequences of failure

Full bidirectional traceability

TERM

Requirements Maturity Levels

DEFINITION

0 - Chaos! No Requirements

1 - Written requirements

2 - Organized

3 - Structured

4 - Traced

5 - Integrated

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Change Request Management

DEFINITION

Single Channel for Approval

Requirements to

Design to

Code to

Test to

Maintenance

TERM

Why is Traceability so important?

DEFINITION

Quality

-Can we determine that the req is validated/verified?

Impact Analysis

-What other reqs are impacted?

-What people are affected?

-What downstream artifacts are affected?

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5 Step CHANGE MANAGEMENT Process

DEFINITION

1. Plan for change

2. Baseline the reqs

3. Change Control Board (CCB)

4. Use a Change Control System

5. Maintain Traceability

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Types of Decomposition

DEFINITION

Flow-down

Refinement

Completion

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Flow-down Decomposition

DEFINITION

- Assigning requirements to appropriate subsystems

-An Architectural effort

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Refinement Decomposition

DEFINITION

-Ensure reqs reach level of specificity where implementation can easily follow

-A Requirements effort

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Completion Decomposition

DEFINITION

-Adding reqs to complete missing back traces from code to reqs

-Design or even implementation effort

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Requirements specify ____ to build, not ____ to build it

DEFINITION

what/how

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SMT-LIB

DEFINITION

well recognized standard for specifying formal constraints to be solved by an automated constraint solver