Diogenes, a Search for

Unintended Consequences Process

A Class Project for SIE-454/554 Fall 2010

A. Terry Bahill

<http://www.sie.arizona.edu/sysengr/sie554/>

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Document 2: Customer Requirements

The system requirements are discovered in the use cases of document 6 (Daniels and Bahill 2004). They are formalized in document 2. Test engineers can use these requirements immediately to start writing test cases and test procedures. Finally new requirements are derived based on the customer requirements, the mission statement and the concept of operation (Bahill and Dean 2009) and they are put into document 3 (Derived Requirements).

**CuR0-1** Diogenes shall be capable of accepting input of MSOffice 2010 files (not Linux).

**CuR0-2** Diogenes shall operate on IBM compatible personnel computers (not Macintosh).

**CuR0-3** For requirements, Diogenes shall be compatible with Excel and DOORS (not Access).

**CuR1-1:** BICS shall write a sales brochure that includes a case for change. DeriveReqt: FR1-1 of Sell Diogenes use case. Notes: DeriveReqt means that this requirement is derived from the indicated requirement in the use cases. Names of use cases are being set in the Verdana font.

**CuR1-2:** BICS shall send letters to the department heads of Risk Management and Quality Assurance of Potential Customers. DeriveReqt: FR1-2 of Sell Diogenes use case.

**CuR1-3:** BICS shall be capable of communicating with Customers by phone, letter and e-mail. DeriveReqt: FR1-3 of Sell Diogenes use case.

**CuR1-4:** BICS shall be capable of negotiating contracts, arranging schedules and billing. DeriveReqt: FR1-4 of Sell Diogenes use case.

**CuR1-5:** BICS shall create short-course materials (PowerPoint presentations and handouts). DeriveReqt: FR1-5 of Sell Diogenes use case.

**CuR1-6:** Brain Trust members shall be trained to deliver the short course. DeriveReqt: FR1-6 of Sell Diogenes use case.

**CuR1-7:** BICS shall develop, validate and summarize course evaluation questionnaires. DeriveReqt: FR1-7 of Sell Diogenes use case.

**CuR2-1** Diogenes shall execute Built-in Self-Tests (BiST). (Derived from BICS company policy.)

**CuR2-2** Diogenes shall be capable of reading and writing the project PAL. DeriveReqt: FR2-2 of the Search for Unintended Consequences use case.

**CuR2-3** Diogenes shall have cause and effect tools (in both tree and fishbone formats) that have been modified for making UiCs diagrams. DeriveReqt: FR2-3 of Search for Unintended Consequences use case.

**CuR2-4** Diogenes shall have the capability of creating and maintaining five databases: the defects, risks, opportunities for BiST, positive untended consequences and negative unintended consequences of SystemZ. DeriveReqt: FR2-4 of Search for Unintended Consequences use case.

**CuR2-5** Diogenes shall have tools for prioritizing lists. DeriveReqt: FR2-5 of Search for Unintended Consequences use case.

**CuR3-1** The Moderator shall form the Inspection Team. DeriveReqt: FR3-1 of Perform Formal Inspection use case.

**CuR3-2** The Moderator shall collect the inspection work products and other relevant material and distribute them to the Inspection Team TBD days before the inspection. DeriveReqt: FR3-2 of Perform Formal Inspection use case.

**CuR3-3** The Moderator shall chair the overview meeting. DeriveReqt: FR3-3 of Perform Formal Inspection use case.

**CuR3-4** Each member of the Inspection Team shall examine the work products prior to the actual inspection meeting looking for defects, risks, opportunities for BiST, positive unintended consequences and negative unintended consequences of SystemZ. DeriveReqt: FR3-4 of Perform Formal Inspection use case.

**CuR3-5** Each member of the Inspection Team shall record and report the number of hours he or she spent inspecting the materials. Typically, this will be two hours. DeriveReqt: FR3-5 of Perform Formal Inspection use case.

**CuR3-6** The Moderator shall conduct the inspection meeting. DeriveReqt: FR3-6 of Perform Formal Inspection use case.

**CuR3-7** The Recorder shall create and maintain five databases that contain defects, risks, opportunities for BiST, positive untended consequences and negative unintended consequences of SystemZ. DeriveReqt: FR3-7 of Perform Formal Inspection use case.

**CuR3-8** The Moderator and the Systems Engineer shall consolidate and edit the five databases to create five prioritized lists. DeriveReqt: FR3-8 of Perform Formal Inspection use case.

**CuR3-9** The Systems Engineer shall deliver the five lists to their respective owners. **Stipulation** Each owner will know what to do with his list. DeriveReqt: FR3-9 of Perform Formal Inspection use case.

**CuR3-10** Diogenes shall put these five prioritized lists in the project process assets library (PAL). DeriveReqt: FR3-10 of Perform Formal Inspection use case.

**CuR3-11** The Moderator shall verify that all fixes are effective and that no additional defects have been created. The Moderator shall check the exit criteria for completing of an inspection. DeriveReqt: FR3-11 of Perform Formal Inspection use case.

**CuR3-12** The Moderator shall schedule the inspection meeting for two hours. The Moderator shall prepare two dozen pages of documentation for each inspection. DeriveReqt: NFR3-1 of Perform Formal Inspection use case.

Mandatory requirements

This mandatory requirements section contains the Key Decisions of document 1 as well as some additional requirements. Mandatory requirements specify necessary and sufficient capabilities, use the verb *shall,* are passed or failed with no in between and should not be included in tradeoff studies. An example is “The system shall not violate federal, state or local laws.”

Mandatory requirements are not tested only once at total system test. They are monitored continually. They are mentioned at every design review. Because they are so important, some mandatory requirements will become technical performance measures (TPMs) (Bahill and Dean 2009).

Document 3: Derived Requirements

Each requirement must be verifiable by (ordered by increasing cost) logical argument, inspection, modeling, simulation, analysis, test or demonstration (Bahill and Dean 2009). Here are dictionary definitions for these terms.

Logical argument: a series of logical deductions

Inspection: to examine carefully and critically, especially for flaws

Modeling: a simplified representation of some aspect of a system

Simulation: execution of a model, usually with a computer program

Analysis: a series of logical deductions using mathematics and models

Test: applying inputs and measuring outputs under controlled conditions (a laboratory environment)

Demonstration: to show by experiment or practical application (flight or road test). However, some sources say demonstration is less quantitative than test. Demonstrations can be performed on electronic breadboards, plastic models, sterolithography models, prototypes made in the laboratory by technicians, preproduction hardware made in the plant using developmental tooling and processes, and production hardware using full plant tooling and production processes.

The attributes of the following requirements are listed row by row, because this is a Word document. If this were a spreadsheet, they would be listed column by column.

Functional Requirements

**FR0-1** Diogenes shall be capable of accepting input of MSOffice 2010 files.

**FR0-2** Diogenes shall operate on IBM compatible personnel computers (not Linux).

**FR0-3** For requirements, Diogenes shall be compatible with Excel and DOORS (not Access).

**FR1-1:** BICS shall write a sales brochure that includes a case for change.

**FR1-2:** BICS shall send letters to the department heads of Risk Management and Quality Assurance of Potential Customers.

**FR1-3:** BICS shall be capable of communicating with Customers by phone, letter and e-mail.

**FR1-4:** BICS shall be capable of negotiating contracts, arranging schedules and billing.

**FR1-5:** BICS shall create short-course materials (PowerPoint presentations and handouts).

**FR1-6:** Brain Trust members shall be trained to deliver the short course. DeriveReqt: FR1-6 of Sell Diogenes use case.

**FR1-7:** BICS shall develop, validate and summarize course evaluation questionnaires.

|  |  |
| --- | --- |
| Identification tag (Id) | FR2-1 |
| Name | Execute BiST |
| Text | Diogenes shall execute Built-in Self-Tests (BiST). |
| Comment | This comes from BICS company policy. |
| DeriveReqt: | CuR2-1 |
| Verify method | During design and construction, this requirement will be verified by test, thereafter it will be verified by weekly demonstration. |
| Priority | High |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Identification tag (Id) | FR2-2 |
| Name | Read & Write PAL |
| Text | Diogenes shall be capable of reading and writing the project PAL. |
| Comment |  |
| DeriveReqt: | CuR2-2 |
| Refined by |  |
| Verify method | Initially inspection, later demonstration |
| Priority | High |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Identification tag (Id) | FR2-3 |
| Name | Cause & Effect Tools |
| Text | Diogenes shall have cause and effect tools (in both tree and fishbone formats) that have been modified for making UiCs diagrams. |
| Comment |  |
| DeriveReqt: | CuR2-3 |
| Refined by |  |
| Verify method | Initially inspection, later demonstration |
| Priority | Medium |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Identification tag (Id) | FR2-4 |
| Name | Creating & Maintaining Databases |
| Text | Diogenes shall have the capability of creating and maintaining five databases: (1) defects in requirements, programming code, test plans and designs, (2) risks that could adversely affect SystemZ, (3) opportunities for inexpensive Built-in Self-Test (BiST), (4) positive UiCs that could beneficially affect other systems and (5) negative UiCs that could adversely affect other systems. |
| Comment |  |
| DeriveReqt: | CuR2-4 |
| Verify method | Test during design and construction, thereafter demonstration:  |
| Refined by |  |
| Priority | High |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Identification tag (Id) | FR2-5 |
| Name | Prioritize Lists. |
| Text | Diogenes shall have tools for prioritizing lists. |
| Comment |  |
| DeriveReqt: | CuR2-5 |
| Verify method | Test during design and construction, thereafter demonstration:  |
| Priority | Low |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Identification tag (Id) | FRVV-1 |
| Name | Gather V&V Data |
| Text | The system shall facilitate gathering evidence that can be used to prove verification and validation (V&V) of the system and the requirements. |
| DeriveReqt: | Gather Evidence of Verification and Validation use case |
| Verify method | Inspection |
| Priority | High |
| Date of last change | September 25, 2010 |

We can impose requirements on our system, but we cannot impose requirements on operators, pilots and other secondary actors. This is still true. However, in the following requirements we specify the Moderator and members of the Inspection Team. That is all right, because they are a part of Diogenes.

**FR3-1** The Moderator shall form the Inspection Team.

**FR3-2** The Moderator shall collect the inspection work products and other relevant material and distribute them to the Inspection Team TBD days before the inspection.

**FR3-3** The Moderator shall schedule and chair the overview meeting and the inspection meeting.

**FR3-4** Each member of the Inspection Team shall examine the work products prior to the actual inspection meeting looking for defects, risks, opportunities for BiST, positive unintended consequences and negative unintended consequences of SystemZ.

**FR3-5** Each member of the Inspection Team shall record and report the number of hours he or she spent inspecting the materials.

**FR3-6** The Moderator shall conduct the inspection meeting.

**FR3-7** The Recorder shall create and maintain five databases that contain defects, risks, opportunities for BiST, positive untended consequences and negative unintended consequences of SystemZ.

**FR3-8** The Moderator and the Systems Engineer shall consolidate and edit the five databases to create five prioritized lists.

**FR3-9** The Systems Engineer shall deliver the five lists to their respective owners. **Stipulation** Each owner will know what to do with his list.

**FR3-10** Diogenes shall put these five prioritized lists in the project process assets library (PAL).

**FR3-11** The Moderator shall verify that all fixes are effective and that no additional defects have been created. The Moderator shall check the exit criteria for completing of an inspection.

**Nonfunctional performance requirements**

**NFPR3-1** The Moderator shall schedule the inspection meeting for two hours. The Moderator shall prepare two dozen pages of documentation for each inspection. Trace to FR3-2 and FR3-3.

**NFPR3-2** Each member of the Inspection Team shall record and report the number of hours he or she spent inspecting the materials. Typically, this will be two hours. Trace to FR3-5.

|  |  |
| --- | --- |
| Identification tag (Id) | NFPR3-2 |
| Name | Desired Inspection Time |
| Text | Before the inspection meeting, each member of the Inspection Team shall spend two hours inspecting the materials in accordance with scoring function 3-5: bitonic hill shaped, LL = 1.0, BL = 1.5, S = 2, MP=2.0, BL2= 3.0, S2=-1, UL = 4.0 |
| DeriveReqt: | CuR3-5 |
| Refines | FR3-5 |
| Verify method | For each inspection, the TestEngineer will record the amount of time spent by each member of the inspection team, compute the average and the standard deviation of the inspection time and present the results to the Brain Trust. |
| Priority | Medium |
| Date of last change | November 8, 2010 |



Test requirements

|  |  |
| --- | --- |
| Id | TR1 |
| Name | Provide questionnaires |
| Text | The system shall provide student course evaluation questionnaires and manager course evaluation questionnaires for use by the course instructor and the Brain Trust. |
| Comment | At the end of each short course, where BICS teaches companies how to use Diogenes, the students will be given a course evaluation questionnaire. Also each student will tell his or her manager what the student learned in the course and give the manager a form. The form will ask questions such as, “Did this student’s learning match your expectations for this course?” This form and the questionnaire will be returned to the instructor. The student and manager responses will be reviewed by the Brain Trust. |
| DeriveReqt: | Document 4b: BiST for Diogenes |
| Verify method | Inspection, look and see if the questionnaires are ready |
| Priority | Medium |
| Date of last change | November 9, 2010 |

**TR2** The system shall provide a forum for the Brain Trust to discuss the student course evaluation questionnaires and the manager course evaluation questionnaires.

**TR3** The system shall provide a complete explanation of Diogenes for use by the TestEngineer.

**TR4** The system shall provide a means for the TestEngineer to schedule and interview members of the Inspection Team.

**TR5** The system shall provide a means for the TestEngineer to record the test results and put them into the PAL.

**TR6** The system shall provide a means for the Recorder to capture data from the inspection and put it into the PAL.

**TR7** The system shall insure that Diogenes is documented, approved and placed among the company processes.

**TR8** Before each inspection, the system shall notify the head of Risk Management, the head of Test Engineering, the head of Marketing, the head of Legal and the Project Manager of the location of Diogenes in the company processes.

Cost Requirements

|  |  |
| --- | --- |
| Id | CoR1 |
| Name | Selling Price |
| Text | The manufacturer’s (BICS) recommended selling price of Diogenes shall not exceed $150,000. |
| Comment | This is still a soft target. |
| DeriveReqt: |  |
| Verify method | Analysis |
| Priority | Medium |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Id | CoR2 |
| Name | Total Lifecycle Cost |
| Text | The total lifecycle cost shall be computed from the design costs, purchase costs, government subsidies, installation costs, operation and maintenance costs, and retirement and replacement costs, in conjunction with the amortization period. |
| Comment | This requires a definition of the design life. A rough suggestion is that companies buy the two-week course and then buy two-day courses annually. |
| DeriveReqt: | Evaluation criteria |
| Verify method | Analysis |
| Priority | Medium |
| Date of last change | September 25, 2010 |

|  |  |
| --- | --- |
| Id | CoR3 |
| Name | Operations Cost |
| Text |  |
| Comment |  |
| DeriveReqt: | Evaluation criteria |
| Verify method | Analysis |
| Priority | Medium |
| Date of last change | October 5, 2010 |

Schedule Requirements

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| --- | --- |
| Id | SR1 |
| Name | Due Date |
| Text | The documents describing the design model for Diogenes shall be submitted on or before 3 PM, December 8, 2010. |
| Associated performance requirement | Late projects will be assessed a penalty of 5% per day. |
| DeriveReqt: | Customer’s statement in the SIE-454/554 syllabus |
| Verify method | Inspection |
| Priority | High |
| Date of last change | September 25, 2010 |

Risk Requirements

|  |  |
| --- | --- |
| Id | RR1 |
| Name | Check for Competing Patents |
| Text | Initiate patent search. If no other product is found, then initiate patent application. Otherwise, discuss licensing. Immediately contact BICS’s lawyer and ask if putting this document on my web site constitutes disclosure. |
| DeriveReqt: | Risk analysis done on September 25, 2010 |
| Rationale | If a similar system has already been patented, then we will not be able to market the BIMS. |
| Verify method | Analysis |
| Priority | Medium |
| Date of last change | September 25, 2010 |