Software Engineering Process Models

Question 1

(a) Indicate in your exam book what your project group number is, and give a description of the software engineering process model your group followed in developing your initial product. [4 marks]

Spiral model in combination with a learning evolution model.

Assuming that a classic *Waterfall Model* development process was used to develop the initial system (rather than the process you described above):

(b) Give two reasons for and two reasons against using the waterfall model for the full scale project.

[8 marks]

(c) Your software development manager has decided that the waterfall model is now inappropriate for re-engineering the system. Your manager has chosen to use the *incremental development* model.

- Provide two reasons for using this model for the new project.
- Suggest one risk in moving to the incremental development model.

Explain how you would make use of this model to achieve the goal of a functioning full scale robot system.

[8 marks]

[Total for Question 1: 20 marks]

ad: 1. documentation is produced at each phase and that it fits with other engineering process models.

2. provides a sequential, linear flow between phases.

is: 1. ~~component~~ Commitments must be made at an early stage in the process.

2. rigidity and linearity make feedback difficult.

> ad: 1. The model is incremental development ~~to deliver partial functionality~~ early and provide ~~feedback~~ on ~~requirements~~.

2. Maybe, is ~~associated~~ with incremental delivery.

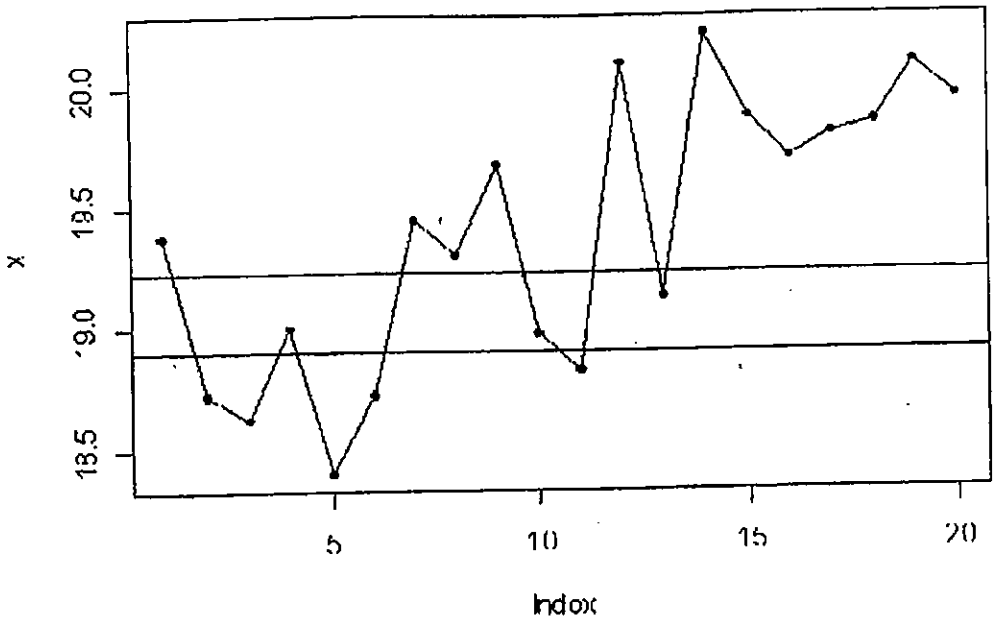
3. ~~Approach maybe combined with waterfall model~~.

ad: 1. Customers do not have to wait until the entire system is delivered before they can gain value from it. The first increment satisfies their most critical requirements so they can use the software immediately.

2. Customers can use the early increments as prototypes and gain experience that informs their requirements for later system increments.

3. There is a lower risk of overall project failure. Although problems maybe encountered in some increments, it is likely that some will be successfully delivered to the customer.

Xbar-chart:



(b) Construct an R-chart of the data

D_3=0, D_4=2.828, n = 4. We use the first 15 samples to estimate the natural value.

The control limits for R-Chart is : $\bar{r}D_3 = 0.4533333 * 0 = 0$

$$\bar{r}D_4 = 0.453333 * 2.282 = 1.024507$$

> xbar

[1] 19.375 18.725 18.625 19.000 18.400 18.725 19.450 19.300 19.675 18.975

[11] 18.825 20.100 19.125 20.225 19.875 19.700 19.800 19.850 20.100 19.950

4. As the highest priority services are delivered first, and later increments are integrated with them is inevitable that the most important system services receive the most testing. This means that customers are less likely to encounter software failures in the most important parts of the system
dis : ① Increments should be relatively small and each increment should deliver some system functionality. It can be difficult to map the customer's requirements or to increments of t right size.
② Most systems require a set of basic facilities that are used by different parts of the sy
As requirements are not defined in detail until an increment is to be implemented, it can be hard to identify common facilities that are needed by all increments.

Task Management

Question 3

If an incremental development model has been chosen (as in Question 1) we need to create a project time line that reflects this chosen process.

(a) Identify a series of milestones (at least 4) for the new project.

[8 marks]

(b) Draw a project timeline for the new full version robot system, assuming that the starting point for the project is the city mapping robot system already developed by your group. The project timeline should include the milestones identified above and should show the important aspects of the incremental development model.

Note that you do not need to provide any time estimates for any work unit.

[8 marks]

[Total for Question 3: 16 marks]

a).

milestone 1 : set up an interface (GUI mockups). { map display, map loading, map saving

milestone 2: Basic Robot movement { Robot f/b/L/R 30cm, upload the source code, compilation of source code, stop

milestone 3 : Map editor { load XML map. show map display on GUI, save XML map.

milestone 4 : Communications { build and run host side software, build ~~and~~ upload and run robot side software, connect robot and host by wireless. host to robot movement commands, host to robot light sensor request.

b).

The first step is to ~~[illegible]~~ requirements gathering.

↓

Sceond step is ~~[illegible]~~ initial planning

Please go on to the next page...

(assign requirements to increments)

↓

third step is to write code for every milestone.

↓

[illegible] is to testing.

Requirements and Testing

Question 6

(a) Many of the user requirements for the extended system are still unclear at this stage, and need further clarification. Describe one technique you would use to clarify the requirements? Briefly explain the reasons for choosing this technique.

interviews, observations, scenarios rapid prototyping [4 marks]

(b) Using the proforma, below, write a functional user requirement relating to the *back to base* indicator feature of the full scale system.

- Title
- Description
- Rationale
- Acceptance criteria

[8 marks]

(c) For the requirements above, describe an acceptance test that can be used to determine whether or not the acceptance criteria are satisfied.

[5 marks]

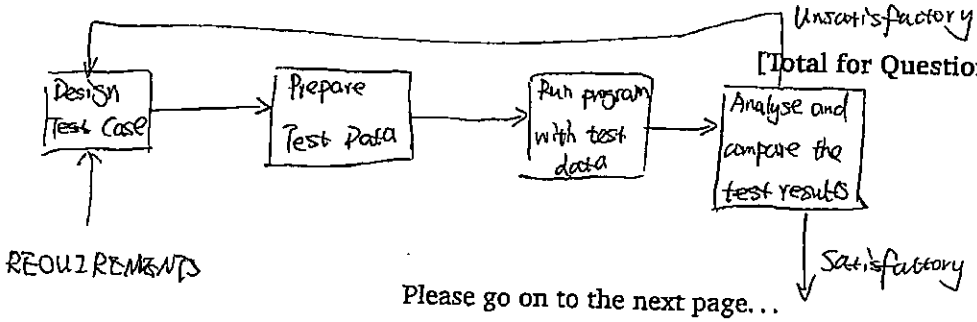
(d) In developing a test plan you identify the following steps:

- Analysis,
- Create test cases,
- Define results of tests,
- Execute tests,
- Check results.

However tests never go smoothly. Describe the process that your test regime would use to manage the test process with particular emphasis on how you will handle tests that fail. Use a flow diagram to illustrate your answer.

[4 marks]

(e) Using the proforma given in Question 6(b), write a non-functional safety requirement relating to the new features described in the scenario outline.



[7 marks]

[Total for Question 6: 28 marks]

Past Exam Paper 2006

Question 1

a) Description:

- Group Number 05 – Nexus Software
- The SE process model used was the Evolutionary Model because
  1. Specification and development stages are interleaved
  2. Allows exploratory development
  3. User develops better understanding of the problem, this can reflected in the software system
  4. Based on the idea of developing an initial implementation, exposing this to user comment and refining this through many versions until an adequate system has been developed
  5. Rather than have separate specs, development and validation activities, these are carried out concurrently with raped feedback across the activities

b) Waterfall model:

- Two reasons for :
  1. Waterfall model reflects engineering practice
  2. If all the requirements are well defined , then waterfall model have a good performance
- Two reasons against:
  1. Difficult to respond to changing customer requirement
  2. Inflexible partitioning of the project into its distinct stages
  3. lead to badly structured systems as design problem are circumvented by implementation tricks

c) Evolutionary model:

- Reasons for:
  - Allowed the use of rapid prototyping to get client feedback every week, thus allowed the group to either throw away the prototype or develop more
  - The specification can be developed incrementally.
  - Allow for requirements change
  - As user develop a better understanding of their problem, this can be reflected in the software system(clear requirements can be gathered)
- Risks:
  - Systems are often poorly structured – Continual change tends to corrupt the software structure. Incorporating software changes becomes increasingly difficult and costly

- Process is not visible – Managers need regular deliverables to measure progress, if systems are developed quickly, it is not cost effective to produce documents which reflect every version of the system
- Special tools and techniques may be required – These allow for rapid development but they may be incompatible with other tools or techniques and relatively few people may have the skills which are needed to use them

d) Yes, I would suggest the use of a Evolutionary Model in conjunction with the Spiral model.

- Allows the group to work closely with the client to evolve a system from initial requirements
- Spiral model takes consideration of risk may appeared in the process.
- In each loop abound the spiral resolves more risks and (possibly) yields a prototype
- Allows each milestone / prototype to have risk assessed
- Prototyping may be used in one spiral to resolve requirements uncertainties and hence reduce risk
- Consideration of risk analysis
- Offers flexibility for changing requirements if needed
- Allows for client feedback into the feedback loop
- Allows the client to gather confidence in the team by seeing gradual progression o f the system
- Prototyping may be used in one spiral to resolve requirements uncertainties and hence reduce risk