**SE1020-SOFTWARE MAINTENANCE AND ADMINISTRATION**

***1. Mini Case Study - The 'Software Airbag*'**

Prior to the inclusion of an airbag into a make of car that did nothave one, a feasibility study would be carried out to establish how such acomponent would be designed, and how its addition would affect otherparts of the car. On approval of the change, the airbag would bedesigned. After it had been established that its inclusion adhered tocurrent quality and safety regulations, the design could then be approvedand construction of the airbag finally commissioned.Because of the tendency to treat software change in a less formalway, the software "airbag" will be bolted onto the car with no regard tosafety considerations or appropriate design. Issues of safety, correctplacing, and how other components are affected are unlikely to beconsidered until problems with the bolted-on version arise.

***2. Mini Case Study* - *Upgrading an Operating System***

At the research institute attached to the ACME Health Clinic2 aSolaris 1.x3 was upgraded to Solaris 2.x (Solaris is a UNIX-basedoperating system for SUN4 machines). As a resultofthischange,manyapplications that previously ran on Solaris 1.x had to be modified in orderto use Solaris 2.x. This also meant the users had to retrain and learn theuse of new commands. Some administrative practices became out of dateas a result of the upgrade.The end result was a more efficient and cost-effective system butthe cost of accommodating the upgrade went well beyond the retail priceof the new software.

**3. *Mini case study - redundant functionality***

The ACME Health Clinic, during reorganisation, switched itsdiabetes education program from a general clinic to a specialist clinic.Thus the diabetes education module was no longer necessary as part of its general clinic's software system and was removed, thus increasing resources, notably disk space and memory

***4. Mini Case Study* - *The Analysis of Patient Questionnaires at theACME Health Clinic***

The person whose job it was to analyse patient questionnaires became disillusioned with the tediousness of sifting through sheets of paper and collating responses. She had the idea of computerizing the process and thereby automating it. The objectives were to speed the process up and to allow the computer to deal with the tedium of addingand collating, removing the time-consuming need for double-checking ofcalculations done by hand, thus making the process more reliable.

The technician had to ask the following:

a) Would it be feasible?

b) Could the job be done with available equipment and resources?

5.What was the last software project you worked on?Was it a commercial project, an undergraduate projector a personal project? Write a critical appraisal of thelife-cycle model to which you worked. Was it wellstructured or *ad hoc?* Would you work to a differentmodel if you were to start this project again?

6.You are the IT manager in charge of a large librarysoftware system which fails unexpectedly one Mondaymorning. How would you go about the process ofsolving this problem

1. if it is imperative that it is up and running withintwo hours?

2. if the library is able to function adequately forseveral days without its software system?

7. Suppose that as a programmer, you are asked to: (i)provide a message handling facility for an operationalManagement Information System (MIS); and (ii)integrate the MIS into other office automation

packages. What information about the MIS would youneed, to be able to effect these changes? Indicate yourreasoning.

8. Carry out specification and design recovery on all orparts of a software system that you are not familiar with(the system should be at least 2K lines of code inlength).What technique(s) do you use to identify the

specification and design and why?What form of representation do you considersuitable for these tasks? Indicate your reasons.What lessons did you learn from this work?

9. A bank has a substantial investment in a Cobolsoftware system that is at least one million lines of code

in length and has been running for over 20 years. It isused on a daily basis to perform various operations suchas managing customer accounts and loans. After severalyears of modification - both planned and *ad hoc* - thesystem has become too expensive to maintain. As aresult, the bank wants some advice on the next step totake. Suppose that you have been employed as asoftware maintenance consultant. What advice wouldyou give the bank? Indicate the reasons for anyrecommendations you make.

10Team A on the new system will be more expensive than the lessexperienced team. If Team A is switched to this project, you will have toemploy a new team to work on the major upgrade, but because of thecomplexity and deadlines, you will not be able to employ aninexperienced team to train up. Your options are:-

Team A on the new project, a new experienced team on the majorupgrade,A new trainee team on the new project, a new experienced team onthe major upgrade.

Discuss the pros and cons of these options.

11. A bank has a substantial investment in a Cobolsoftware system that is at least one million lines of codein length and has been running for over 20 years. It isused on a daily basis to perform various operations suchas managing customer accounts and loans. After severalyears of modification - both planned and *ad hoc* - thesystem has become too expensive to maintain. As aresult, the bank wants some advice on the next step totake. Suppose that you have been employed as asoftware maintenance consultant. What advice wouldyou give the bank? Indicate the reasons for anyrecommendations you make.

12. You have just joined a team of software engineers inwhich you are the only one who has studied and

practised software reuse and reusability. The companyyou work for has no reuse programme although they arewilling to start one. You are asked to implement thereuse programme.

* What is the first step you would take?
* Outline the technical, managerial and organisational steps you would go through.
* What tactics do you need to employ in order for the programmeto succeed?
* What difficulties do you anticipate and how would youovercome them?

13. A mechanical engineering contractor has been using alarge and complex Fortran software system for over 12years. There is no documentation for thesystemandthemaintenanceprogrammers have moved to a differentcompany. In order to take advantage of state-of-the-artparallel machines, the contractor wants the software tobe reimplemented on a parallel platform.

Briefly describe the techniques that will be needed toaccomplish the task.How would you go about performing the job, bearing in mindthe merits of software reuse?

14.Write a test plan for a program (of a reasonable size -at least 100 LOC) that was not developed by you. If youare undertaking a course that has involved a substantivepiece of software development, swap your code with afellow student and write test plans for each others code.The originators of the code should study the test plansproduced for their code and discuss the strengths andweaknesses. In particular, look for anything unexpectedthat has come to light about your code.

15. Reports and analyses of the Therac-25 incidents areeasily obtainable. The case study given earlier is a briefsummary. It does not cover, for example the true extentto which the users were key in unearthing the problems,nor does it go into any depth on the issue of reuse ofsoftware subroutines from the earlier versions of thesoftware. Other well-documented events are thecracking of the enigma codes in the 2nd world war

[286] and the failure of the Ariane 5 spacecraft, flight501 in 1996 [8]. Choose one of the following toinvestigate in depth:

Concentrating on the users of the systems, comparethe roles played by the users of the enigmamachines (code creators and code breakers) withthe role played by the users of the Therac machines.Compare the reuse of software subroutines, and the

problems this caused, in the Therac-25 machine andthe Ariane 5 spacecraft.