U08784: Software Project Management, Semester 1, 2013

Individual Coursework 3

Department of Computing and Communication Technologies

Oxford Brookes University

Introduction

This coursework consists of 4 questions. It contributes 40% toward U08784 overall mark. Students should attempt all questions. This is an individual assignment so an independent submission is required from each student.

It is expected that each question should require no more than 4 A4 sides, so approximately 16 sides in total maximum to be submitted.

Question 1

Configuration Management Procedures for Website Development

Devise a simple set of configuration management procedures for developers, managers and QA staff to follow for a small company that is providing website design services.

The system you devise should be in the form of a project manager's guide and should define the procedures to be followed with forms etc. that could be used by those involved (project manager, quality assurance, developers and customers).

The procedures should provide the following features:

- Record the development process for each project from contract to release
- Allow customer change requests to be recorded and progressed following approval
- Record the changes required or made to the configuration items associated with each project
- Allow the project manager to monitor each project status and progress
- Provide adequate documentation to satisfy quality assurance and possible audit requirements

You may devise a paper based system using a set of forms and appropriate written procedures, or you may wish to develop a database or other solution that provides a user interface for the project manager or QA to use. In either case you may find it useful to first produce a UML or similar analysis leading to a workable data model design.

Question 2

PERT Chart Calculations using Z tables

A software development project consists of activities A to I where the activity dependencies are given below.

For this exercise you need to derive the optimistic, most-likely and pessimistic durations for activities A to H from your student number as described below. The duration for task I is as given in the example.

Let the 8 digits of your student number be represented as elements of the integer array s[8]. Also let activities A-H correspond to index 1 to 8, so A=1 through to H=8.

For activity i the optimistic-time[i] is given by s[i]+1, the most_likely_time is optimistic_time[i]+abs(s[i]-s[9-i]) and the pessimistic-time[i]=most-likely-time[i]+abs(4-s[i]). Abs is the absolute value function, e.g. abs(4)=4 and abs(-4)=4. You can assume the durations are given in days.

For example with student number 13456789 activity dependencies together with activity optimistic, most likely and pessimistic durations are as follows

Activity	Dependencies	Optimistic time	Most-likely time	Pessimistic time
A	-	2	10	13
B	-	4	9	10
C	B	5	8	8
D	A, C	6	7	8
E	B	7	8	10
F	E	8	11	14
G	E	8	14	18
H	D, F	10	18	23
I	G, H	1	2	3

To check the calculation for your own student number use the Q2_activity_durations Excel spreadsheet supplied with this file.

Using the activity durations calculated as described above, the best estimate activity durations together with the standard deviation of the activity durations can be computed as described in the Risk Management lecture. You should then produce a PERT chart to determine the project critical path, the final project duration and the standard deviation for the overall project as follows. Note that non whole number duration and standard deviation values will be required for the calculations.

Your task:

a) Calculate the expected duration for each activity A to H, based on the times derived from your own student number.
b) Calculate the duration standard deviation values for each activity, again based on the times derived from your own student number.
c) Draw the project PERT chart using your calculated expected activity durations.
d) Determine the project critical path using the expected activity durations.

e) Determine the standard deviation time for the project critical path. If your PERT chart has more than one critical path then just choose one of the critical paths.
f) Determine the probability that the project will be completed late by 1 day, 2 days, 4 days, 8 days etc, until the probability value becomes negligible.
g) Determine an earliest time by which it is 95% likely that the project will have completed.

Question 3: Estimating techniques - COCOMO

Consider the software project of the OxfordBikes company which was part of the Assignment 2 of this module. In Assignment 2 you had to prepare quality plan, configuration management and risk assessment for the project. In this assignment you are required to estimate the time duration and efforts required for this project.

a) Using the Intermediate COCOMO, estimate the efforts and time schedule for this project. The following information is available to do the estimation:

   i) The project mode is considered as “embedded”.

   ii) The COCOMO model to be used is “Intermediate”.

   iii) The original (or new) code which has to be written for the system is estimated to be 45k.

   iv) It is assumed that 15k of code is to be adapted from existing systems (or libraries), either from third party or from company own systems. It is also assumed that adaptation of the existing code is equivalent to developing 4.5k of the original (or new) code. That is, adaptation of the existing code will take the same amount of efforts/time as writing original (or new) code of 4.5k. You must take this into account when estimating the size of the system.

   iv) Cost drivers (influencing estimate) must also be taken into account. Values for cost drivers are given in the following table. You are required to assign appropriate values to the cost drivers and give justification for assigning such values.

Cost Driver	Description	Rating					
		Very Low	Low	Nominal	High	Very High	Extra High
RELY	Required software reliability	0.75	0.88	1.00	1.15	1.40	-
DATA	Database size	-	0.94	1.00	1.08	1.16	-
CPLX	Product complexity	0.70	0.85	1.00	1.15	1.30	1.65
TIME	Execution time constraint	-	-	1.00	1.11	1.30	1.66
STOR	Main storage constraint	-	-	1.00	1.06	1.21	1.56
VIRT	Virtual machine volatility	-	0.87	1.00	1.15	1.30	-
TURN	Computer turnaround time	-	0.87	1.00	1.07	1.15	-
ACAP	Analyst capability	1.46	1.19	1.00	0.86	0.71	-
AEXP	Applications experience	1.29	1.13	1.00	0.91	0.82	-
PCAP	Programmer capability	1.42	1.17	1.00	0.86	0.70	-
VEXP	Virtual machine experience	1.21	1.10	1.00	0.90	-	-
LEXP	Language experience	1.14	1.07	1.00	0.95	-	-
MODP	Modern programming practices	1.24	1.10	1.00	0.91	0.82	-
TOOL	Software Tools	1.24	1.10	1.00	0.91	0.83	-
SCED	Development Schedule	1.23	1.08	1.00	1.04	1.10	-

b) Now change the values of cost drivers PCAP and ACAP. But their values should be different than 3(a). What would be the effects on the estimates in 3(a) of the changes in the values of PCAP and ACAP? Use the table (given above) to choose values for PCAP and ACAP.

Question 4: Functional Point Analysis (FPA)

Use the FPA method (as discussed in the lecture/practical) to estimate the effort and elapsed time (time schedule) for the software system which is to be developed for the following case study.

Case Study:

GoHolidays is a (fictional) company that offers coach trips and holidays around Great Britain. It has offices in different cities and has fleets of coaches on the road all through the year. A booking system is required that will keep a track of all bookings for scheduled trips throughout the year. The system should search the trips on keys like “Edinburgh" or "December 27" and display lists of possible trips. Once a customer has selected a likely trip then the system should display the seat plan for the coach showing available seats for selection. The system should take a booking there or put customers on a waiting list if the trip is full. Deposits are paid on booking and the rest is paid on the day of the trip unless the booking is for an account customer (e.g. a company or school) and they are sent an invoice. The system should provide various reports and list for the operational staff as well as financial reports for management.

From the above requirements the following information was gleaned that affects the system complexity factors.

GoHolidays has different offices and systems will be installed in them all with a central shared database at the main office. There is likely to be some slight variation between sites. The response and throughput time must be such that customers do not give up and go away through having to wait too long. The system must be exceptionally easy to use and have extensive automatic backup and recovery procedures. The requirements for this system cannot be made too firm at this stage because this is a fast evolving dynamic business so any system developed must be straightforward to change and enhance. The system should provide the desired level of security.

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Based on the above case study, your task is to complete all the sections of the following worksheet.

FUNCTION POINT WORKSHEET

Section 1: Project Information

PROJECT NAME / NUMBER: …….. DATE: ……..

DOCUMENTATION (e.g., case study, requirement documents, etc):
……..

ESTIMATOR: ……..

Section 2:

Calculate the Total Function Point Count (FPC).

In order to calculate the total FPC, you are required to identify all the required functions from the above requirements and define the size of each function. For example a function "issue invoice" will require certain number of inputs (customer id, name, etc), entities (data from files such as customer, payment, etc), and output (customer id, name, total cost, booking details, etc). You must provide a coherent and well described list of the data elements (or components) for the inputs, entities and outputs. Recall, that the size of each function is estimated in terms of input data, output data and file accesses (number of entities).

Section 3:

3.1) From the above requirements and YOUR EXPERIENCE you are required to rate each of the complexity factors from 0 to 5. (**0: no influence, 5: strong influence**).

You must provide a rationale behind the rating assigned to each factor.

Complexity Factor	Rating	Complexity Factor	Rating
Data communications		Installation ease	
Distributed functions		Operational ease	
Performance objectives		Multiple sites	
Heavily used configuration		Facilitate change	
Transaction rate		Interface to systems	
On-Line data entry		Security/privacy	
End-user efficiency		User training	
On-Line update		Third party use	

Complex processing		Documentation	
Design for Reusability			
		Total Complexity Factor (CF) =	**……**

3.2) Calculate the Adjustment Factor (AF) by taking into account the Total Complexity Factor (CF).

Section 4:

Calculate the Adjusted Function Point Count (AFP).

Section 5:

Use the following table to select the productivity rate (using 3GL or 4GL)

Function Points	**Productivity**		**Function Points**	**Productivity**	
	3GL	4GL		3GL	4GL
50-199	.742	1.183	500 - 599	.728	1.162
200-299	.826	1.323	600 - 699	.644	L029
300-399	.833	1.330	700 - 899	.518	.826
400-499	.812	1.290	900 +	.406	.581

Based on the above information:

5.1) Calculate the Effort (Man-days).
5.2) Calculate the Delivery.
5.3) Calculate the Total Elapse Time.

Section 6:

Distribute the effort and timescales obtained in step 5 over the project phases. A crude breakdown for phases can be made using the following guidelines.

	Effort	Elapse time	Effort	Elapse time
Requirement Analysis	11%	20%	….	….
Requirements Specification	11%	15%	….	….
Logical System Specification	5%	5%	….	….
Physical Design	10%	10%	….	….
Code and Unit Test	46%	25%	….	….
System Test	12%	15%	….	….
Implementation	5%	10%	….	….
Total	**100%**	**100%**	….	….

Hand in

The hand in deadline is **1 pm Monday, 09 December 2013 (Week 12).**

Submission of assignment to the U08784 post box in the Turing building entrance foyer (behind the stairs).

Please attach the coursework coversheet to your report.

Marking Scheme

1. A change control procedure for software development = 10% of marks
2. PERT Chart Calculations using Z tables = 10% of marks
3. Estimating Techniques (COCOMO) = 8% of marks
4. Functional Point Analysis (FPA) = 12% of marks

To obtain a pass you must:

Q1:

- Record the development process
- Allow changes to be recorded
- Allow the project progress to be monitored
- Provide suitable records to satisfy audit procedure requirements

Q2:

- Determine optimistic, most likely and pessimistic times for each activity
- Produce a PERT chart for your project
- Calculate standard deviation values for each activity
- Use Z tables to compute probability values

Q3:

- Correct use of COCOMO model
- Size of the system (in lines of code) should follow the right method
- Estimate the efforts and time for the given case study
- Use appropriate values of the cost drivers

Q4:

- Correct use of FPA technique
- Estimate the efforts and time for the given case study
- Appropriate definition of the inputs, outputs and entities for FPC
- Use appropriate values of the complexity factors

To obtain a distinction you must:

Meet the criteria for a pass, and also:

Q1:

- Deal with traceability during the development process
- Provide a comprehensive change management procedure
- Produce a comprehensive project management system

- Produce comprehensive records to satisfy audit purposes

Q2:
- Produce an accurate PERT chart for your project with correct values for activity durations and standard deviation
- Correctly determine the critical path
- Correctly determine the overall duration standard deviation for the project using Z tables
- Accurately use Z tables to interpret probability values

Q3:
- Correct use of COCOMO model to estimate the efforts and time for the given case study.
- Correct calculation of the size.
- Justify the selection of cost drivers and their importance in relation the given case study of the OxfordBikes.
- Give clear description of the effects on the estimates of changing the values of cost drivers.

Q4:
- Correct use of FPA technique to estimate the efforts and time for the given case study. Complete all the steps correctly.
- Provide a coherent and well described list of the data elements (or components) for the inputs, entities and outputs required by the FPA technique.
- Give justification for the selection of complexity factors of the FPA technique in relation to the case study of GoHolidays.