

**THE BCS PROFESSIONAL EXAMINATION
Diploma**

April 2005

Examiners' Report

PROJECT MANAGEMENT

General

The number of candidates selecting this module continues to increase. However unlike last year when a credible 70% passed the examination only 53% managed to reach a pass standard this year. The reason is that a large number of candidates scored very low marks in every question they attempted suggesting that such candidates had not prepared themselves to answer questions from any part of the syllabus.

An indication of the points expected by the examiners is given below, together with some comments, to assist future candidates. Any point which was valid and relevant to the question received marks.

Question 1

1. A new financial services company has been formed through the merger of two well-established companies. Each of the old companies had different computer-based accounting packages. These are to be replaced by a single new off-the-shelf accounting package that has already been purchased from a well-known vendor. The accounting system will have at least 600 users of various types distributed across five regions. The new package will be supported by a group of eight technical staff who will provide telephone support and will also carry out training both centrally and locally.
- a) Identify FOUR major problems, apart from that of team-building, which will need to be addressed with regard to the activities needed to change over to the new accounting system. **(8 marks)**
- b) Describe the main methods of 'going live' with a new computer application and explain which approach should be adopted in the scenario above. **(14 marks)**
- c) Explain the meaning and purpose of post implementation reviews. **(3 marks)**

Answer Pointers

a) Among the problems that could be mentioned:

- accounting practices, such as when the financial year starts and the system of accounting codes, will need to be aligned first
- some accounting information may need to be transferred from the old system to the new - how is this to be done?
- a unified architecture for the hardware platform the package will run on will have to be established
- there are only a few central support staff and trainers, who will be overwhelmed with work initially
- there may be feeds from other systems e.g. payroll - will these be different for the two parts of the organization that used to be separate companies? If so how do we cope with this?

1 or 2 marks were awarded for each valid problem identified, up to a maximum of 8 marks

b) Approaches could have included:

- direct change-over - change over at one single point in time
- parallel running - running the old and new systems together for a period of time
- phased take-on
 - by user group e.g. one region at a time
 - by system function e.g. ledger by ledger
- pilot - trial the new system in one place and then implement everywhere

2 marks were allowed for each method (only 1 if little or no explanation, as required by the question) up to a maximum of 8.

With regard to the new application, among the points that might be made were:

- Some parallel running of the old and new systems might be inevitable as old accounts are run down.
- As the new package is OTS, possible bugs in the system *should* not be a major issue, so parallel running should not really be needed for this reason
- Phased take-on by user group might be difficult because it might be difficult to partition the database e.g. all users may use certain accounts so they need to be able to update the same data
- On the other hand phased take-on by region would alleviate the demand for training and initial support by distributing demand over time
- phased take-on by function might be considered - this might allow the old company systems that feed into the central ledger to be converted in phases.

There was no one right answer here, but sensible discussion of options was assessed and awarded marks.

Up to 6 marks were allocated for the discussion

c) A post-implementation review is a review of a delivered application conducted after it has been operational for a period of time, say six months, and which reviews whether it has delivered its projected benefits, and which may make recommendations for modifications to the system's functions or mode of use. It is best conducted by staff not involved in the original delivery of the system.

Examiner's Comments

This was the most popular question with 90% of candidates making an attempt. Of these 62% obtained a pass and the average mark was just above 10 marks.

- a) The question described a specific scenario involving the change-over to a new accounting system. Candidates on the whole did well in identifying possible major problems, but some lost marks by not addressing the particular circumstances of the scenario, for example by citing very general problems that affect nearly all projects such as poor requirements.
- b) A common failing here was not to distinguish carefully enough between the phased take-on and pilot approach, so that the descriptions of these sounded the same. A key difference between the two approaches is usually to do with motivation: a pilot approach might be used where management are not completely confident with a new application and want a trial operational period with it. A phased approach is often adopted where management has confidence in the new system but wish to stagger the work involved in implementation, for example, training. With a phased approach, segmenting the implementation by user groups – for example different regions – needed to be distinguished from segmenting the implementation by functions. Few got close to full marks for the rationale that should have supported the choice of a particular approach.

- c) It was surprising how many seemed unsure about the role of post implementation reviews. A key feature of the PIR is that a period of operational has to take place before the review is conducted. The review focuses on how well the new system operates. This review should not be confused with a project review or 'lessons learned' report which takes place at the end of the project and reflects on the conduct of the project.

Question 2

2. A software development company has been using the basic COCOMO model to calculate development effort, that is $(\text{staff-months}) = c \times (\text{kloc})^k$

Rather than use the standard constants, the company has calculated its own based on its own past project data. The overall model seems to be generally satisfactory when past project data are examined. However there are sometimes large discrepancies with individual projects which have, for valid reasons, particularly high or low productivity rates. Another problem is that the number of lines of code estimated for new projects often seems to turn out to be wrong - function point counting has been suggested as a solution to this last problem.

- a) Explain the meaning and purpose of each of the three terms, (c, kloc and k), in the COCOMO equation above.

(8 marks)

- b) Identify solutions to the estimating problems mentioned above, namely:

i) variations in productivity between projects

(8 marks)

ii) inaccurate estimates of the number of lines of code

(9 marks)

Answer Pointers

a)

c is a constant which is a standard productivity rate reflecting the average number of 'kloc' per developer that can be generated in a month.

kloc stands for 'thousands of lines of code'

k is an exponent which reflects the perception that larger projects are less productive because of the additional management costs, etc, that they require. 6 marks

Mention of the variation in c and k according to whether system is 'organic', 'semi-detached' or 'embedded' with explanation of these attracted a further 2 marks

b)

- i) Points that could have been made included:

- The use of k to take account of diseconomies of scale
- Distinction between organic, semi-detached, and embedded types of system
- The main element in COCOMO that deals with variations in productivity is the user of development effort multipliers
 - identification of examples e.g. analyst experience, product complexity, main storage constraints etc.
 - explanation of how they modify estimate e.g. for analyst capability a multiplier between 0.71 for 'very high' to 1.46 for 'very low' is applied.

A maximum of 8 marks were available.

- ii) Possible solutions included:

- function points are specifically mentioned: counts of various externally apparent features of the software to be produced are made and are multiplied by weightings which reflect the difficulty of implementation; these weighted counts are then

summed to get an overall index value that in some way reflects 'information processing size' - this index value can be converted into 'equivalent lines of code (eloc)' which can be fed into COCOMO

- a bottom up approach where the software to be produced could be broken down into components and sub-components and the lines of code for these smaller units are estimated and then aggregated
- use of analogy

Up to 9 marks were available.

Examiner's Comments

This was not a popular question with fewer than 20% of candidates making an attempt and of those only 11% obtained a pass. The average mark was very low.

- This was relatively straight forward. However, candidates from one centre seemed to talk consistently about 'effort cruid' and 'effort improved', which is not the standard terminology and was thus confusing.
- This section related to variations in productivity between projects. A discussion of COCOMO development effort multipliers was appropriate here. Function points, as such, really measure application size, but are often used to then assess productivity so some marks, but not many were awarded if they were mentioned. Some discussed the use of monitoring and control to help reduce the impact of this problem – some credit was given for this, even though it was not the real focus of the question.
 - This section was focussed on the problem of assessing the size of the application to be built or work to be done. A discussion of function points would have been appropriate here as it is an indicator of size that can be assessed earlier in the development life cycle than kloc and which can be produced more objectively. The bottom-up approach to estimating would also be very appropriate as it is based on identifying activities rather than product size. Some candidates got confused as they started to described COCOMO development effort multipliers which clearly relate to productivity, not application size.

Question 3

- The IS department of a medium-sized local firm has been asked to develop a bespoke database system for another department within the firm. No suitable packages are available. Board approval has been obtained based on a feasibility study, requirements have been agreed with the user department, and the data model is agreed.

The project manager has prepared an outline development schedule of eight main tasks, and has allocated staff, as follows:

A	define database functionality	3 weeks	1 system designer
B	design data entry/enquiry screens	2 weeks	1 system designer
C	design reports	1 week	1 system designer
D	code and test database functions	4 weeks	1 programmer
E	code and test screens	4 weeks	1 programmer
F	code and test reports	3 weeks	1 programmer
G	integration testing	1 week	1 tester
H	user acceptance testing	1 week	1 tester

Tasks A, B and C can start at the same time.

Task D is dependent solely on A, task E is dependent solely on B and task F is dependent solely on C.

Task G cannot start until all 3 tasks, D E and F, are completed.

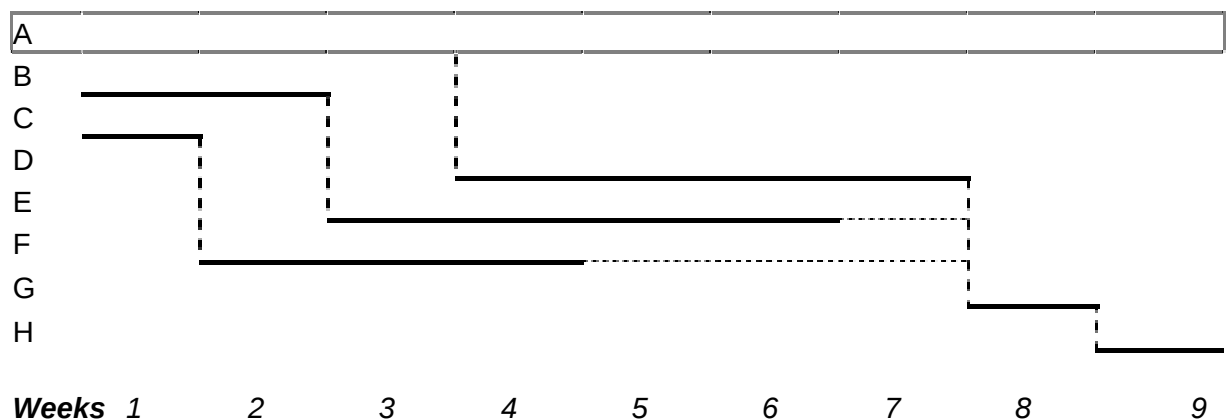
Task H is dependent on G.

- a) i) Draw a Gantt chart showing all eight tasks and their dependencies, assuming no limitation on resources. (11 marks)
- ii) Use the Gantt chart to identify the minimum duration for the project, and the float belonging to individual tasks.
- iii) Explain the significance of free float, as opposed to other types of float, with reference to this Gantt chart.
- b) Shortly before week 1, the project manager is told that only two system designers are now available for the next three weeks. Re-draw the Gantt chart to take account of this limitation. Is there any change in the overall duration, and if so, why? (6 marks)
- c) Identify and explain briefly SIX factors that the project manager might consider when allocating staff to such a project. (8 marks)

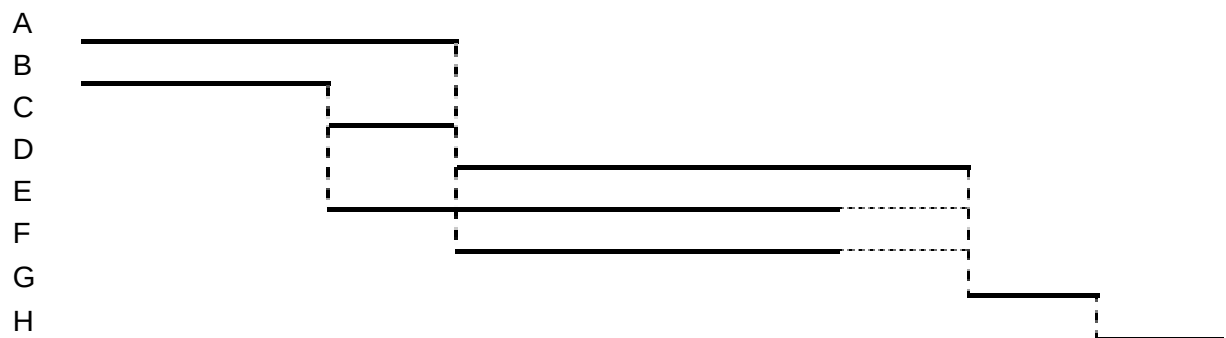
Answer Pointers

Part a) expected a Gantt Chart similar to that below, with a duration of 9 weeks and float identified as 1 week for tasks B and E, and 3 weeks for tasks C and F (all other tasks are on the critical path and thus have zero float). (6 marks for the Gantt chart, 1 for the duration and 2 for the individual task floats)

The discussion of float should highlight that free float is float that can be used without any effect on subsequent activities. Thus tasks E and F have free float, but tasks B and C do not. (2 marks)



Part b) expected a re-drawn Gantt chart similar to that below, with no change to the overall duration. The discussion here should highlight that there is sufficient float on tasks C, F to accommodate the re-schedule. (4 marks for the re-drawn diagram and 2 marks for the unchanged duration and explanation).



(4 marks)

In part c) the factors could include:

- Staff skills (eg with this database software)
- Staff experience (eg with each program type and/or application)
- Staff fulltime availability (eg commitment to other projects)
- Staff holidays
 - Staff development needs/enthusiasm to learn
 - Variety of work for staff ("rotation")
- Need for staff training
 - Staff/team compatibility
 - Match staff to complexity of work involved
 - Need for experienced staff on critical path tasks
 - Staff motivation, etc etc

(5 marks for 6 clearly different factors and a further 3 for the brief explanations)

Examiner's Comments

Almost 75% of candidates selected this question of whom 66% reached a pass standard and some of whom obtained almost full marks.

Parts a i and a ii were usually answered well though some candidates omitted items such as a scale, any dependencies, and float from the Gantt chart. A significant number used an erroneous method and miscalculated the float for C as 2, not 3, weeks. Some candidates highlighted the critical path which, though not specifically asked for, did add value to their Gantt chart.

Very few understood the meaning of free (or other types of) float.

Of those candidates who attempted part b, several did not realise that the original dependencies should still apply. However, most concluded that the duration would be unchanged, though very few explained this by referring to the float available on the tasks concerned – which was disappointing in the context of the overall question.

In part c, most candidates listed a sensible range of factors, but very few then explained how these might affect the project manager's staff allocation. Little reference was made to the nature of the project itself and how this might affect the relative importance of some of the listed factors (such as the importance of specific experience for those allocated to critical tasks). Several candidates included project management skills in their list here – which was not appropriate to the question as stated.

Question 4

4. A retail business is considering the replacement of one of its main stock management and distribution systems.
- a) i) Identify up to SIX factors (quantitative or qualitative) that might contribute to the business case for such a project.
ii) Name two specific financial measures that could be used to assess the financial value of a project when assessing the business case. **(11 marks)**
- b) The project has been approved and will include 4 main components:
i) a new off-the-shelf database package
ii) some key bespoke systems development to extend this package
iii) replacement computer hardware (PCs and servers)
iv) improvements to the data communications network
- Select THREE of these components and for each of these describe TWO specific potential problems and explain their possible impact on the original business case. **(9 marks)**
- c) The bespoke software component is to be undertaken by the in-house IT department. Identify THREE key reports that the project manager would require in order to monitor and control this component of the project and ensure that the business case is maintained. **(5 marks)**

Answer Pointers

In part a) factors that might contribute to the business case for a project of this type could include:

Quantitative - reduced business costs (eg more efficient stock holding, transportation)
- increased sales (due to better/wider stock availability)
- reduced system maintenance costs
- staff savings (?)
- better stock usage records
- more efficient re-ordering

Qualitative - better customer service
- faster delivery
- quicker stock replacement/better stock availability
- quicker/better information re stock availability
- easier for staff to use (happier staff!)
- facility to increase product range

Typical financial measures might be: NPV, payback period, or internal rate of return (Up to 9 marks for the six factors and a mark for each legitimate financial measure)

In part b) potential problems for each of the 4 main components could include:

New (package) software

- Delay, new product, not fully proven, teething problems
- Too many unnecessary features (as it is a package)
- Lack of staff knowledge of this software
- Poor compatibility with other existing business systems

Bespoke software

- Lack of staff knowledge, additional staff training needed (costs and time)
- Underestimation of work required with unknown software
- Testing delays with new software (time and cost)

Replacement Hardware

- staff unfamiliarity, additional training needed (again)
- New products, initial unreliability
- Inadequate capacity for new software package
- Increased cost of disposal of old hardware

Data Comms

- New software requires greater transmission size and rate than anticipated (cost), (thus lack of required service)
- Increased security risks

Discussion of impact on the business case should mention where appropriate some of the factors identified in part a. If problems with cost are mentioned then these should be identified as an increase in anticipated/estimated costs as set out in the business case. Similarly any development or implementation delays might reduce customer service and lead to loss of anticipated sales.

(Up to 3 marks for each of the 3 main components discussed)

For part c) the candidate should bear in mind that typical problems with this type of project are likely to be time and cost overruns for scheduled/estimated tasks, or the creation of additional tasks to overcome unforeseen circumstances (such those relating to the integration of the new software and hardware).

Thus reports required by the project manager might include:

Cost-to-date v budget.

Progress (Time-to-date) v schedule

Staff time sheets linked to progress on individual tasks

Milestones reached.

Exception report to highlight specific problems/potential delays

thereby enabling the project manager to identify potential problems and take the appropriate timely action to minimise any effect on the business case.

(Up to 5 marks for identifying three reports and discussing their usefulness to the project manager in this context.)

Examiner's Comments

Around half the candidates selected this question of whom a disappointing 25% obtained sufficient marks to reach a pass. The average mark was low although some candidates scored well.

In part a) very few candidates demonstrated a sound knowledge of the concept, and the terminology, of preparing a business case – ie “to improve the business in some cost-effective, measurable way”. Indeed, many candidates who attempted parts b and c omitted part a completely – which was disappointing as this is an important aspect of project management (for computer projects in particular) that practitioners need to understand.

Very little distinction was made between qualitative and quantitative factors, and very few candidates named any of the alternative financial measures that might have been used.

Many candidates tended to concentrate more on software selection issues here (rehearsing the pros and cons of package software v off-the-shelf software), or on the

various project management skills that might be required, or on the phases of software development – none of which were really relevant to this question.

The quality of answers in part b) was also quite disappointing. Whilst many candidates listed a sensible range of anticipated likely problems for each component, very few continued to discuss the possible impact on the initial business case.

However in this part too a significant number of candidates again rehearsed a standard discussion of off-the shelf packages, with many stating, for instance, that a package might not meet the full business requirements and therefore would need to be extended (an issue that had already been addressed clearly in the stated project components). There was also a worrying underlying assumption in many answers that all such packages are expensive and thus not “value-for-money”

The key point in part c) was to identify reports that would assist the project manager **both** to monitor and control the bespoke software development component **and** to ensure that the business case was maintained. Thus these reports should normally be received and used by (**not** produced by) the project manager. Many answers listed 3 “standard” reports, stating (correctly) that 2 of these would normally be produced **by** the project manager. To be valid such answers needed an explanation of how the project manager might use them to secure decisions or actions from the recipients (the Project Board) that would help maintain the business case.

Question 5

5. a) Explain the purpose and responsibilities of the following project management roles.
- i) project board (or steering committee) (4 marks)
 - ii) project manager (4 marks)
 - iii) programme and project support office (4 marks)
 - iv) project assurance. (3 marks)
- b) In the scenario described above in Question 1 above, a new IT management team will have to be created. Describe, making reference to established organisational behaviour models (where appropriate), the possible obstacles to the smooth operation of the new team and explain how the obstacles could be overcome. (10 marks)

Answer Pointers

- (a) i) A group that represents the sponsors of the project. They are the custodians of the business case for the project. In PRINCE, it has three ‘roles’ represented: the Executive, the Senior Supplier, and the Senior User. The Project Board would have to approve changes to the project objectives, increases in the resources to be consumed and extension to project deadlines
- ii) Has the day-to-day running of the project. Collects progress information from team leaders and takes corrective action (if it does not affect overall projects costs or objectives) where there are deviations from plan. Produces exception reports for approval by the project board when required. Is responsible to the project board.
- iii) A ‘programme’ is a group of projects, usually using resources drawn from a common pool or contributing in some way to a common objective. The support office provides administrative support to a project or group of projects, for example, in collecting and processing time-sheets.

iv) Some checks need to be made that a project is adhering to relevant standards. When a project manager is under pressure it is easy to 'cut corners' for example with change control procedures or inspection processes. Project assurance is the process by which these checks are made.

b) Points that could be made include:

- Tuckman/Jensen model of team development: forming, storming, norming, performing, adjourning: purposive team-building can accelerate this; general need to build trust
- Belbin management team roles: chair, plant, monitor-evaluator etc. There is a need for a balance between these roles in a project. Teams with an 'elite' membership who do not have the right balance may in fact be rather ineffective.
- 'cultural differences' between different groups that are being brought together
- organizational change will probably induce feelings of insecurity and defensiveness etc., etc,

Examiner's Comments

Almost 75% of candidates selected this question of whom only 48% reached a pass standard and the average mark was around a bare pass of 10 marks.

- a) The answers to the various sections were very variable. A common mistake was to describe the skills and qualities needed to carry out a particular role rather than 'purpose and responsibilities'. Many candidates clearly did not understand the role of a 'Programme and Project Support Office' and, for example, described it as the place where programming took place.
- b) The question specifically mentioned the need to refer to specific behavioural models, but very few candidates did so. There was also a tendency to ignore the fact that the question relates to an 'IT management team' and to discuss user resistance.

Question 6

6. a) Giving examples, explain the difference between quality control and quality assurance. (4 marks)
- b) Identify FOUR different types of testing. In each case, explain the purpose of testing and who should carry it out. (8 marks)
- c) i) Explain how you can assess and ensure the quality of the testing process. (7 marks)
ii) Explain how you can reduce errors occurring in the software in the first place. (6 marks)

Answer Pointers

Part a):

Quality control focuses on checking that the products of project activities meet their specifications and are fit for the purpose for which they were intended. Quality assurance checks that the quality control processes have in fact been carried properly. Testing is a prime example of quality control. Quality assurance would check that testing had been carried properly e.g. that test cases has been reviewed properly, that errors had been recorded accurately etc.

(4 marks for QA v QC definitions and clear examples of each)

Part b) expected a range of different testing types that might include:

unit testing - of an individual software component: might be tested by a software developer;
integration testing - to ensure components work together properly - this might be carried out under the supervision of the designer of the overall system;

volume testing - to test that the software performs adequately in terms of response time etc, under realistic operational conditions. This could be carried out by simulation executed by technical experts, or a type of acceptance test by users; acceptance testing - to test that the application meets user expectations - carried out by users.

(Up to 8 marks for four distinct testing types, together with purpose and identification of most likely tester for each)

In part c i) a good answer might have included:

- use of inspections of the test cases and expected results to check, for example, that all features described in the specification have been covered;
- inspection of the testing process itself: use of automated testing using pre-prepared scripts might for example mean testing is more consistent;
- collection of statistics e.g. how many errors have got through to operational running? How many errors per kloc have been found in the software under test;
- error-seeding: put (or leave) errors in the software to see if they are discovered.
- etc. etc

(Up to 7 marks - but 'bonus marks' were allowed for really comprehensive discussion)

For part c ii) the main vehicle was expected to be an inspection process, but a wide range of other suggestions was acceptable, covering such aspects as early prototypes, formal methods, design methods, training etc.

Examiner's Comments

Almost as popular as question 1 with around 85% selecting the question. However the pass rate was disappointing at just below 50%, although the good candidates obtained over 90% of the marks available.

In part a) most candidates were aware of the difference between QA and QC, but had difficulty in explaining it clearly – and many omitted to give any examples. Some used aide-memoires such as “verification v validation” or “right product v product right”, but again did not develop these into clear distinction between the meaning of each.

For part b) most candidates identified clearly four different types of testing. However answers here were required also to expand on and explain the **purpose** (not necessarily the method), as well as the likely user, of each testing type. This explanation was often omitted. Many answers listed “black box” and “white box” testing, but without any proper context, and again without the purpose of each being clearly identified.

In part c i) the key words in the question were “assess and ensure”, but few candidates developed a valid discussion along these lines whilst relating it directly to the quality of the testing process. For instance, some form of measurement might have been appropriate, as well as a comprehensive monitoring of the purpose and scope of the different testing types being used, together with an assessment of the completeness of the different types of test data to be used in each case.

In part c ii) the question referred specifically to reducing errors “in the first place” (ie **before** the testing phase is reached). Many candidates overlooked this and repeated a discussion of different types of testing.

Different types of inspection (such as program walkthroughs, peer reviews and technical reviews) were all acceptable methods here, as were broader approaches such as allocating staff with adequate experience and, where appropriate, involving users to ensure that specifications are interpreted correctly. On the whole this part was answered well.