

**THE BCS PROFESSIONAL EXAMINATION
Diploma**

April 2002

EXAMINERS' REPORT

Project Management

This year there was an increase of over 60% in the number of candidates selecting this option. Although the pass rate also increased, to 65%, there were a significant number of candidates who were not well prepared across the syllabus and thus failed to obtain a pass mark in more than one question.

An indication is given below of the points expected; however any valid point, which was relevant to the question, received marks.

Question 1

1. a) Explain what is meant by a 'successful' project. (4 marks)
- b) Identify not more than SIX of the major types of activity that would be carried out in a software development project. (6 marks)
- c) For THREE of the activities identified in b) above, describe a major risk that could affect the success of the activity and how the risk might be avoided. (15 marks)

Answer Pointer

Of the 95% of candidates who attempted this question 79% achieved a pass standard. The average mark was 14.

Part (a) asked for an explanation of what is meant by a 'successful' project, and attracted the full 4 marks for identifying that it should:

- deliver the required functionality
- be on time
- be within budget, and
- be of the required quality

This was well answered overall, though some candidates confused 'means' with 'ends' and listed various project management methods that might have been used - but then overlooked the end result. Several answers stated "within **cost and** budget" - implying a possible lack of understanding of the two terms.

Part (b) asked the candidate to identify not more than SIX of the **major** types of activity that would be carried out in a software development project. The question was looking for typical 'waterfall' model phases e.g.

- requirements gathering
- analysis
- external design
- internal design
- build
- test

- install etc.

and full (6) marks were awarded for SIX of these - or other sets of phase names for this or other methods (eg models 'b' and 'v') as set out in one of the recommended Primary Texts. Again this was well answered overall, but some candidates listed typical project management stages (ie not software development) and some listed up to EIGHT, or more.

Part (c) asked the candidate to consider three (only) of the above phases and then to describe a (single) major risk that could affect the success of each of the 3 selected activities (ie a total of 3 different risks altogether). For this 2 marks were awarded for each risk (provided both cause and effect were identified and it was clearly relevant to activity), with a further 3 marks for each set of avoidance actions (15 marks in all). In this context, clear practical actions which reduced significantly the **probability** of the risk occurring were acceptable, whereas those that reduced the **impact** were not.

The standard of answer in this part was disappointing. The most frequently selected risks were 'poor (usually **under**, but not rarely **over**) estimating', 'incomplete or inaccurate requirements gathering', 'staff turnover', and 'testing, or acceptance, failure'. However many answers lacked any precision, failing to distinguish at all between cause and effect and/or proposing somewhat simplistic or idealistic actions, such as 'employing experienced staff'.

Question 2

2. **Although MNO is a company which specialises in developing software for clients, it has until now used an external agency to provide a payroll service for its employees.**

MNO has now reached a size where it would like to carry out payroll processing in house.

- a) **Write a brief memorandum to the management of MNO explaining the advantages and disadvantages of using an 'off the shelf' package as opposed to MNO writing their own software. (10 marks)**
- b) **Explain the steps that would need to be taken to select an appropriate payroll application if a decision were made by MNO to obtain an 'off the shelf' package. (8 marks)**
- c) **Identify the factors you would need to consider when deciding the approach by which the application was to 'go live'. (7 marks)**

Answer Pointer

Of the 83% of candidates who attempted this question 62% achieved a pass standard.

The average mark was 11.

This question set out briefly a situation where a software development company wished to bring its payroll processing operation in house from an external agency or bureau.

In part (a) candidates were asked to write a brief memorandum to management explaining the advantages and disadvantages of using an 'off the shelf' (ie payroll) package rather than writing the software in house. An initial 3 marks were awarded for a sensible memorandum format and clear relevance to the company's situation, including the fact that this was a

payroll system, thus requiring great accuracy of calculation and reliability. There were then 7 marks for the comparison, where typical advantages for an off the shelf package could have been:

- cost and time advantage (economies of scale, no development)
- reliability (if software has already been tried and tested first by lots of others)
- visibility (can actually try it out)
- staffing (avoids need to dedicate specialist development staff to project)
- user documentation and training usually available from the supplier
- ongoing support usually available from the supplier (important for regular legislative changes)

Against these typical disadvantages might have been:

- functionality of the package may not be an exact match with user requirements
- need to change current procedures to fit in with package
- maintenance - has to be done via supplier; depends of supplier's continued existence
- the package might depend on specific hardware or operating software

As a software house there was also the possibility that a good in-house development might then be marketed as a package, though of the candidates who mentioned this few really understood the very considerable staff implications of supporting and maintaining a payroll package.

10 marks

Part (b) asked for an explanation of the steps to be taken if a payroll package were to be purchased. These would include:

- requirements analysis
- definition of selection criteria and method of evaluation (for product **and** supplier)
- identifying candidate packages
- evaluation, which might involve:
 - demonstrations, trial usage, site visits, supplier questionnaires/interviews
 - reference checking
- processing evaluation results, weighting criteria results to get overall judgement
- contract negotiation and selection

The quality of answers here was quite poor. Many listed a number of possible selection factors, but not the steps required to make this selection in a methodical way. There was also very little consideration of the particular requirements for a payroll package.

8 marks

Part (c) then asked what factors should be considered when deciding **the approach** by which this (payroll) application might 'go live' (eg parallel run, pilot run, incremental by department or location, or 'big bang'). This expected points such as: the nature of application (e.g. can it be made operational in increments), the criticality of application accuracy (which itself could justify parallel running), seasonal peaks/troughs and cycles, training (number of users, their geographical dispersion), data take-on (from the bureau, all at once or phased). Many answers listed only the steps to go live, rather than discuss these different go-live methods. Very few considered any payroll-related factors.

7 marks

Question 3

3. Many estimating methods involve the following two components:

- **Assessment of the size of task to be done;**
 - **Assessment of the productivity of the developers and the environment in which the software is to be developed.**
- a) **Describe the following estimation methods and the extent to which they consider the two components above.**
- i) **Function points** (8 marks)
 - ii) **COCOMO** (8 marks)
- b) **Both function points and COCOMO can be used to produce estimated effort for a development project as a whole. Explain how you would produce estimates of effort for the individual activities within a project.** (9 marks)

Answer Pointer

Of the 28% of candidates who attempted this question 32% achieved a pass standard.

The average mark was 8.

In part (a) of this question, the candidate was asked to describe the function point (FP) and Cocomo models, and to explain the extent to which the approaches could be used to assess the size of a development task and development productivity.

The key points here were that FP's and lines of code (LOC) can both be used as indicators of system size. For completed projects, productivity can be calculated as effort/size (e.g. hours/FP). Where this has been done, then for new projects where the size of the application has been assessed, the historical productivity rate can be used to forecast effort (effort = size x productivity).

The question was surprisingly poorly answered, given that FPs and Cocomo are specifically mentioned in the syllabus. Almost all the candidates from one very large centre avoided this question, which might suggest the topics have not been properly covered. Tutors and candidates should also note the advent of the new Cocomo II.

3(a)(i) The precise mechanics depend on the flavour of FPs used, but in general terms, the following points might have been made:

- count occurrences of various types of externally apparent feature
- in some way weight the number counted for an instance of a feature to take account of its complexity
- weight overall total for a feature type to take account of the relative amount of work required compared to other feature types
- Total weighted counts at application level
- Use application level counts as size measure to calculate productivity using past projects i.e. productivity (e.g. hours/FP) = effort/size
- For new project estimated effort = size x productivity

8 marks

3(a)(ii) With CoCoMo, relevant points might have included

- lines of code (or 'equivalent lines of code' derived from FPs) used as a size measure - you might need to guess this!

- converted to nominal effort taking account of application type ('organic', 'embedded', 'semi-detached')
- diseconomies of scale (i.e. big projects take disproportionately longer) are catered for by the exponent constant
- apply development effort modifiers (DEMs) to take account of local productivity e.g. experience of analysts and developers, use of 'modern' development techniques etc

8 marks

Question 3(b) asked for an explanation of how the effort for individual activities within a project might be estimated.

Descriptions relevant estimating methods could attract up to 4 marks, while the explanation of how the methods could be applied to component activities within a project could obtain an additional 5 marks

Answer could have covered:

- standard percentage breakdowns of top-down estimate to stages/phases of project
- use of bottom up approach to estimating
- expert opinion/delphi
- analogy

FPs and CoCoMo could, arguably, be used for lower level components - but the risk when these approaches were used at a low-level needed to be stressed

9 marks

Question 4

4. The XYZ organisation has a small software development team which deals mainly with software maintenance and user support. XYZ have decided to rewrite their central business application which has been in existence for several years. The replacement system is to be built using up-to-date technologies and techniques. Existing staff will not be familiar with these new technologies and techniques and for this reason, together with the increased workload, additional staff will be required.

a) Discuss the various ways in which XYZ might obtain their new staff.

(10 marks)

b) Once recruited, the new staff will need to be placed in development teams. Describe the factors that can affect team performance and the actions that can be taken to develop good team performance.

(15 marks)

Answer Pointer

Of the 92% of candidates who attempted this question 47% achieved a pass standard. The average mark was 9.6.

This question outlined a very brief scenario of a development project.

Part (a) asked the candidate to discuss the various ways in which staff for the project might be obtained. This could largely be answered by using 'common sense' or just the kind of background knowledge an IS/ICT practitioner might have. Common reasons for poor answers included:

- ignoring the 'discuss' element, which expected the candidate to discuss the relative merits and demerits of different approaches
- describing selection criteria, which was definitely outside the scope of the question
- describing one approach in great detail, e.g. devising job descriptions, placing advertisements, interviewing etc., at the expense of not discussing a range of different options.(the question mentioned "various ways").

Sources of staffing might have included:

- internal transfers/promotion e.g. tester to developer - training/development needed
- external recruitment of permanent staff - may have existing experience
- use of contractors - expensive; need to ensure knowledge transfer to permanent staff
- software house - management of development effectively outsourced
- placement students from ICT courses - might need additional training in specific techniques, but would be less expensive as a result
- ICT graduates, as for placement students

10 marks

Part (b) had two parts: a requirement to describe factors that could affect team performance, and to describe the actions needed to develop good team performance. Once again 'common sense' could be applied here, but additional credit was given where the candidate used organizational behaviour models to support their analysis. A common fault was to lose sight of the focus on *team* performance and to discuss individual motivation in detail.

Factors might have included:

- organisation/location: are staff who need to communicate co-located?
- isolation of new staff in existing teams
- unfamiliarity with new co-workers
- security/insecurity of existing staff
- leadership or lack of
- personality clashes

8 marks

actions to be taken might have included:

- communications analysis
- steps to improve communication between team members and between team members and managers e.g. meetings
- general good management practice: allocating staff appropriately to tasks, equitable treatment of staff, clear expression of goals and management expectations, feedback and so on
- design of jobs and responsibilities to create meaning and interest
- Belbin style psychometric testing
- rotation of jobs, where appropriate, to provide variety and promote broader understanding of development processes
- team-building exercises

7 marks

An interesting element in some of the answers was that different circumstances would apply in some overseas countries as opposed to the UK, and account and credit was allowed where this had been mentioned.

Question 5

For each of the following, identify and describe the main document which would record the information, and draw up a sample of the document, explaining its content.

- i) the major activities that a project will have to carry out and the components and sub-component activities of these major activities; (6 marks)**
- ii) who will carry out each activity and when; (6 marks)**

- iii) the latest time that each activity can finish without the overall duration of the project being extended.

(6 marks)

- b) Explain how sometimes a change in one of the documents above could lead to changes in the content of the other documents relating to the same project.

(7 marks)

Answer Pointer

Of the 34% of candidates who attempted this question 57% achieved a pass standard. The average mark was 11.

In part (a) candidates were asked to identify, describe and draw up a sample of (with an explanation of content) the main document used to record different sets of key information (at three specific project stages). For each example 1 mark was awarded simply for the identification (ie name), 2 for the description and then 3 for the example with explanation.

Surprisingly few candidates attempted this question, and the quality of answers varied considerably between different centres, with a significant proportion not recognising any of the document types concerned, even though they are all key to standard project planning.

- (i) "the major activities that a project will have to carry out and the component and sub-component activities of these major activities." This expected a **work-breakdown structure** (or equivalent) and, where recognised, was well answered.

6 marks

- (ii) "who will carry out these activities and when". This expected a **Gantt chart** (or equivalent) and again this was generally well answered where recognised. Some candidates also mentioned a resource histogram and the way in which resource smoothing might change the timing of competing activities - which perhaps indicated some understanding of the use of standard packages in project planning - whereas few commented on the implicit, or explicit, task dependencies in such charts.

6 marks

- (iii) "the latest time that each activity can finish without the overall duration of the project being extended". This expected some form of **activity network diagram** (eg activity on node or arrow). Most recognised this, but many then continued to concentrate almost solely on the critical path, overlooking the need to identify the "latest" dates (and/or activity float) in the various diagram types in order to answer the question fully.

6 marks

In part (b) candidates were asked to explain how sometimes a change in one of these documents could lead to changes in the content of the others. A good answer here would have demonstrated how, for example, an additional activity of the WBS would mean an additional activity on the activity network, which would add an activity to the Gantt chart and change the start dates of activities dependent on the new activity. Many mentioned a change in the duration of a critical path activity which would indeed change the activity network itself and thus the duration of the activity concerned on the Gantt chart - but is unlikely to result in a change in the WBS.

7 marks

Question 6

6. a) Describe the steps that can be taken to monitor and control the quality of products created by a project. (10 marks)
- b) A project must be managed so that the underlying business case is preserved. In general terms this means that the expected benefits of the project must exceed the costs of the project. Describe how a project is monitored and controlled so that the business case is preserved. (10 marks)
- c) 'When taking action to bring a project back on course, the project manager needs to consider the balance between time, cost and quality'.

Explain this statement

(5 marks)

Answer Pointer

Of the 66% of candidates who attempted this question 28% achieved a pass standard. The average mark was 7.2.

Part (a) a good answer might have referred to:

- use of internal inspections, walk-throughs and reviews of intermediate documents
- recording/monitoring that these have taken place
- monitoring change control records to see corrections being made to earlier documents
- audits
- external monitoring
- user reviews to ensure that system remains compliant with user requirements
- incremental/evolutionary approach allowing early versions of software to be evaluated
- error reports at system testing stage
- measurement of cost of conformance versus cost of non-conformance

In general, this was disappointingly answered. A common short-coming was to write about monitoring and control in general terms and to ignore the reference to the quality of products. Sometimes, concepts such as 'quality management systems' were mentioned, but their practical application was not then explained.

10 marks.

Part (b) This was poorly answered generally. A key idea here was that a project might be on time, but only because more resources had been used than planned. In such a case, the project might be jeopardising its business case as costs might be exceeding benefits. On the other hand, a project might late because the resources that should have been deployed had not. The need to collect cost information, particularly via staff time-sheets, was central part of any satisfactory answer.

Two parts of a good answer would be:

Cost monitoring:

- identify activities and the effort/cost needed for each one
- find out how much time/money is really being spent e.g. from time-sheets
- compare costs to functionality delivered (cost could be low because staff have not been available and work on project has not been done): Earned Value Analysis could be brought in here.
- increased cost could undermine business case

Benefits:

- scope of project could have been increased, which *might* have led to possible new benefits. This points to the need for good change control

- scope of project could have been reduced, leading to reduced benefits
- time - late delivery could reduce value of benefits (DCF); especially if there was a narrow 'window of opportunity' when benefits can be obtained

10 marks

Part (c) This referred to the relationship between time, quality and cost. The key concept was that there had to be a trade-off between these three constraints. If time was short, then extra staff effort could be deployed, but at extra cost, or quality could be sacrificed by reducing testing, and so on. There seemed to be some guessing of what was required in many cases.

2 marks were awarded for evidence of understanding of the nature of trade-offs, while a discussion of specific mechanisms attracted a further 3 marks.