The BCS Professional Examination
Professional Graduate Diploma

April 2003

EXAMINERS' REPORT

System Design Methods

Question 1

1. *a)* Discuss four reasons why object oriented systems design approaches are replacing structured systems design approaches. **(12 marks)**

b) Discuss two reasons why prototyping and RAD (Rapid Application Development) approaches are replacing the traditional waterfall model of systems development. **(4 marks)**

c) Outline the situations in which formal notations based on mathematical logic are appropriate for systems design activities and when they are not. **(9 marks)**

Answer Pointers

a) Supports OO programming languages, allows greater reuse and ease of maintenance, better suited for GUI type systems.

b) Prototyping and RAD allow shorter project durations and greater user involvement.

c) Formal methods are suitable for complex mathematically based systems where a high level of quality is required, less suitable for management information type systems.

Examiner's Guidance Notes

This question was answered in a reasonable manner. However, some students were not fully aware of the perceived benefits of OO such as reuse and ease of maintenance.

Question 2

2. *a)* Adopting either a structured or object oriented approach, state which techniques you would use to model each of the following:

i) user requirements (functional),
ii) user-system interactions/external communications,
iii) structure of the system i.e. conceptual components,
iv) relationships between conceptual components,
v) system dynamics

Justify your choices. (**15 marks)**

b) Discuss the similarities and differences between Entity Life Histories (ELHs) and State Transition Diagrams (STDs). Illustrate your discussion using as an example entity X which is affected by a sequence of events Ev1, Ev2, Ev3. **(10 marks)**

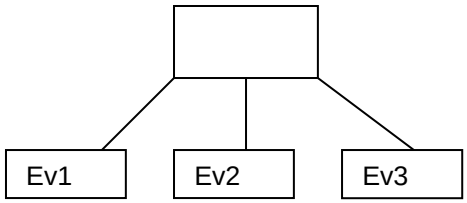
Answer Pointers

(b) The following (or appropriate alternatives) would be expected:

Similarities: both show 'dynamic' aspect of entities/classes.

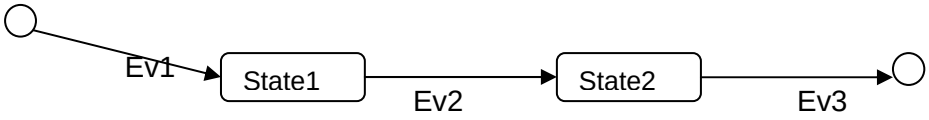
Differences: in ELHs the emphasis is on events, in STDs the emphasis is on states

Entity Life History



STD

Initial State End State



Examiner's Guidance Notes

For part (a) many candidates suggested a proper 'allocation' of modelling techniques to different 'aspects' of a system. Some candidates did not properly justify their choices. A number of candidates did not stick to one paradigm i.e. they discussed OO modelling techniques and Structured modelling techniques.

For part (b) a significant number of candidates identified some differences and similarities. Some answers did not illustrate ELHs and STDs using the required scenario i.e. Ev1, Ev2, Ev3.

Question 3

3. You are a web development manager in a retail company, and have been asked to develop a systems design method for website development projects within your company.

a) Discuss which systems life cycle model you would consider appropriate for website development projects (e.g. waterfall, spiral, or prototyping) justifying your choice. **(9 marks)**

b) Outline how you would approach the task of selecting or creating a systems design method for website development projects within your company. **(8 marks)**

c) Briefly discuss the suitability of object oriented modelling techniques for website development. (**8 marks)**

Answer Pointers

(a) The following (or appropriate alternatives) would be expected:

- Prototyping would typically be considered the most appropriate systems life cycle model for website development projects because the requirements for an organisation's website will often be vague and uncertain, and prototyping can assist in clarifying requirements through successive iterations.

- In addition websites tend to be quite dynamic IT systems, thus the requirements for the website may well change during the course of the project. A prototyping approach copes well with changes to requirements that can be incorporated in the next version of the prototype.

- A prototyping systems life cycle model for website development would be well supported by the variety of visual website development tools available to developers.

(b) The following (or appropriate alternatives) would be expected:

- Examine current systems design methods used within the organisation and whether these could be used or adapted for use in website development projects within the organisation.

- Examine the current working practices of IT staff engaged in website development work within the organisation. Examine whether such working practices could be formalised into a systems design method for website development projects. In addition the views of internal IT staff on a website systems design method could be sought as a basis for developing such a method.

- Assess current website system design methods used in other organisations, or those promoted by academic or commercial organisations as to their suitability for website development within your organisation.

- Use an appropriate combination of the above in order to develop a website systems design method that would be appropriate for use in your organisation.

(c) The following (or suitable alternatives) would be expected:

- Use case modelling can be used to identify website users and their requirements.

- Class diagrams can be used to model the objects required in the website and associated back end processes.

- Object diagrams and sequence diagrams can be used to model the user interactions with the website and the back end processing required for the website.

State diagrams can be used to model the detailed processes required for the website and associated back end processing

Examiner's Guidance Notes

For part (a) most candidates chose evolutionary prototyping as a suitable life cycle model. Some chose spiral model combined with prototyping. A few suggested the waterfall (which is rather inappropriate for this type of projects). Most candidates fully (or partially) justified their choices (by arguing that web projects have such characteristics as User Interface, Vague requirements, Volatile requirements etc. which make them suitable for prototyping).

For part (b) many candidates struggled to identify factors influencing method selection and only a small number produced an outline of a method selection/creation process. Some candidates confused software life cycle models (e.g. spiral) with methods.

For part (c) only a small number of candidates discussed suitability of OO modelling techniques (such as e.g. UML diagrams) for website projects in more detail. A few had a general discussion instead. The great majority in fact confused OO modelling techniques with such fundamental OO features/concepts as encapsulation, inheritance, polymorphism etc.

Question 4

4. You are a manager in an expanding software house that currently employs thirty staff. You have decided to introduce a systems design method for use in IT projects undertaken for clients.

a) Explain how you would attempt to motivate the IT staff in the company to use the systems design method. **(9 marks)**

b) Systems design methods have a number of limitations and pitfalls that you have to consider. Some of these limitations/pitfalls are related to productivity, required skills, method complexity, and tool support. Explain the nature of each of these limitations. **(8 marks)**

c) Discuss the different ways in which you could educate and train the IT staff in the software house in the use of the new method, explaining the advantages and disadvantages of each approach. **(8 marks)**

Answer Pointers

a) Motivation – explain benefits e.g. better quality, easier to plan and manage projects, also train staff involved.

b) Productivity can be slowed by documentation required, high level of skill may be required to use some methods, some methods may be overly complex especially for small projects, tool support may not always be available.

c) Internal training courses, train the trainers approach, hands on training or external training course or other appropriate alternatives.

Examiner's Guidance Notes

This question was generally answered well, although some students were a little unsure regarding some of the pitfalls of systems design methods.

Question 5

5. *a)* Explain how techniques such as reviews, inspections and walkthroughs can be used to improve the designs produced for information systems as well as the use of systems design techniques themselves. **(10 marks)**

b) Software quality can be improved by using systems design techniques that model different aspects of a system and hence allow cross-checking. Discuss the cross-checking that can be achieved by using systems modelling techniques that model the process, data and life history (i.e. dynamic) aspects of a system. **(15 marks)**

Answer Pointers

a) Reviews, inspections and walkthroughs help to find errors and omissions and weaknesses in actual artefacts produced, they also help to ensure consistent and appropriate use of the design techniques themselves.

b) Datastores on DFDs should match with entities in ER diagrams. ELH for each entity on ER diagrams. DFD processes and ELH events should match.

Examiner's Guidance Notes

This question was generally answered in a reasonable manner. However, some candidates were unfamiliar with how techniques such as reviews and walkthroughs could aid the actual use of the design techniques themselves. Some students were not fully aware of how process, data and life history modelling techniques were used together.