THE BCS PROFESSIONAL EXAMINATION
Diploma

April 2005

EXAMINERS' REPORT

Systems Analysis

Question 1

1. Global Translations

Global Translations is a company that undertakes translations to and from the major languages of the world. All sorts of documents including letters, reports, operating instructions and technical manuals are handled, for a variety of corporate clients. Global Translations requires a new computer information system to help it manage its business more efficiently. The Manager has provided the following description of how the company currently operates:

'When a request for a translation is received, we first check whether the request has come from an existing client and if not, we allocate the client a unique number and add their name, address and telephone number to our records. Then we log the translation request and allocate it a unique code. Next we make a note of the original language and the language or languages into which it is to be translated (often there is a requirement to translate from the original into several different destination languages), the number of pages, the type of document (for example, a letter, a report, a set of instructions) and whether it requires any special vocabulary (for example, medical or computing terms).

'The translation is then allocated to a translator capable of carrying out the work. We keep records of all the translators who work for us. Many of these are part-time staff who work from home. As well as their name, address, telephone number(s) and email address, the translators' records list the languages they know and which kinds of specialised vocabulary they are familiar with. Some translators can translate to and from several different languages and for some languages we have more than one translator. Some (but not all) translators are familiar with one or more specialised vocabularies.

'We make a note of to which translator the translation has been allocated, then give or send it to them. The translator tells us the estimated time the work will take, which we record. At this point we contact the client with an estimate of the cost and time. We charge a different rate for different languages.

'When the translator returns a completed translation to the office they tell us how many hours they have spent on it. We make a note of the date the completed translation was received by us and how many hours it actually took. We then prepare an invoice based on the actual hours spent and the language rate and send it with the completed translation to the client'.

a) Draw a Top Level Current Logical Data Flow Diagram for the above scenario. **(15 marks)**

b) Produce an Entity Relationship Diagram (Logical Data Structure) and a set of normalised tables for the above scenario. You **DO NOT** need to show evidence of the normalisation process. You should include the entity type, 'Translation'. **(20 marks)**

c) Alternatively the system may be developed using object-oriented modelling, in which case a Class Diagram would be drawn.

i) Show what the class 'Translation' would look like using UML notation. **(5 marks)**

ii) Add an association between 'Translation' and one other class. **(2 marks)**

iii) Explain the difference between the representation of 'Translation' as a class and as an entity (as in your solution to 1*b)*, and the difference between a 'relationship' on an Entity Relationship Diagram and an 'association' on a Class Diagram. **(8 marks)**

Answer Pointers

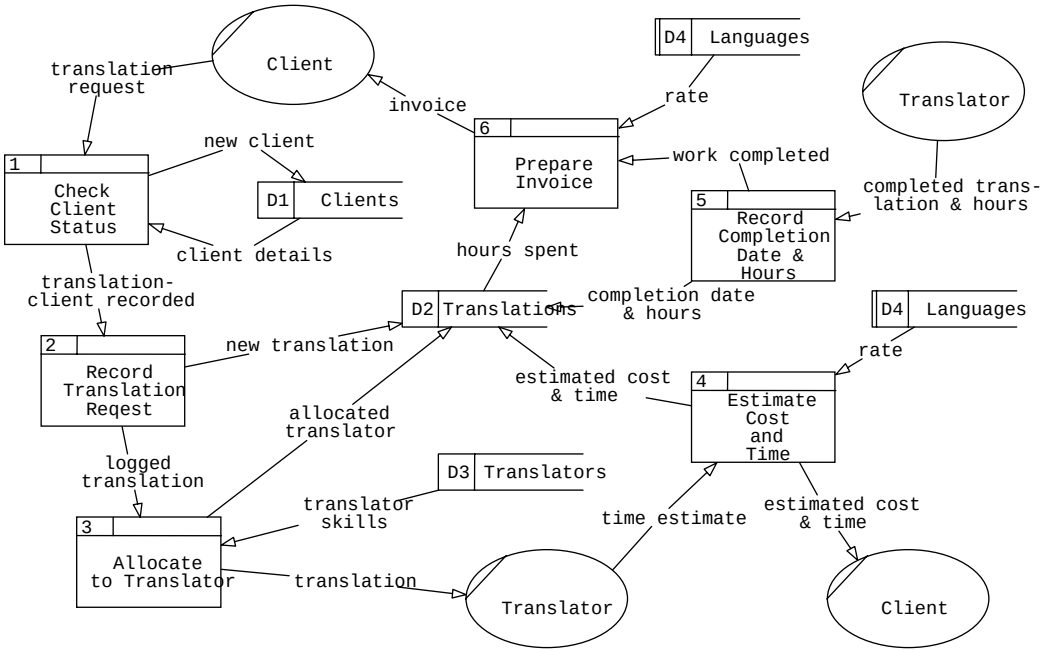
See sample diagrams on following pages.
Plausible alternatives will be accepted.

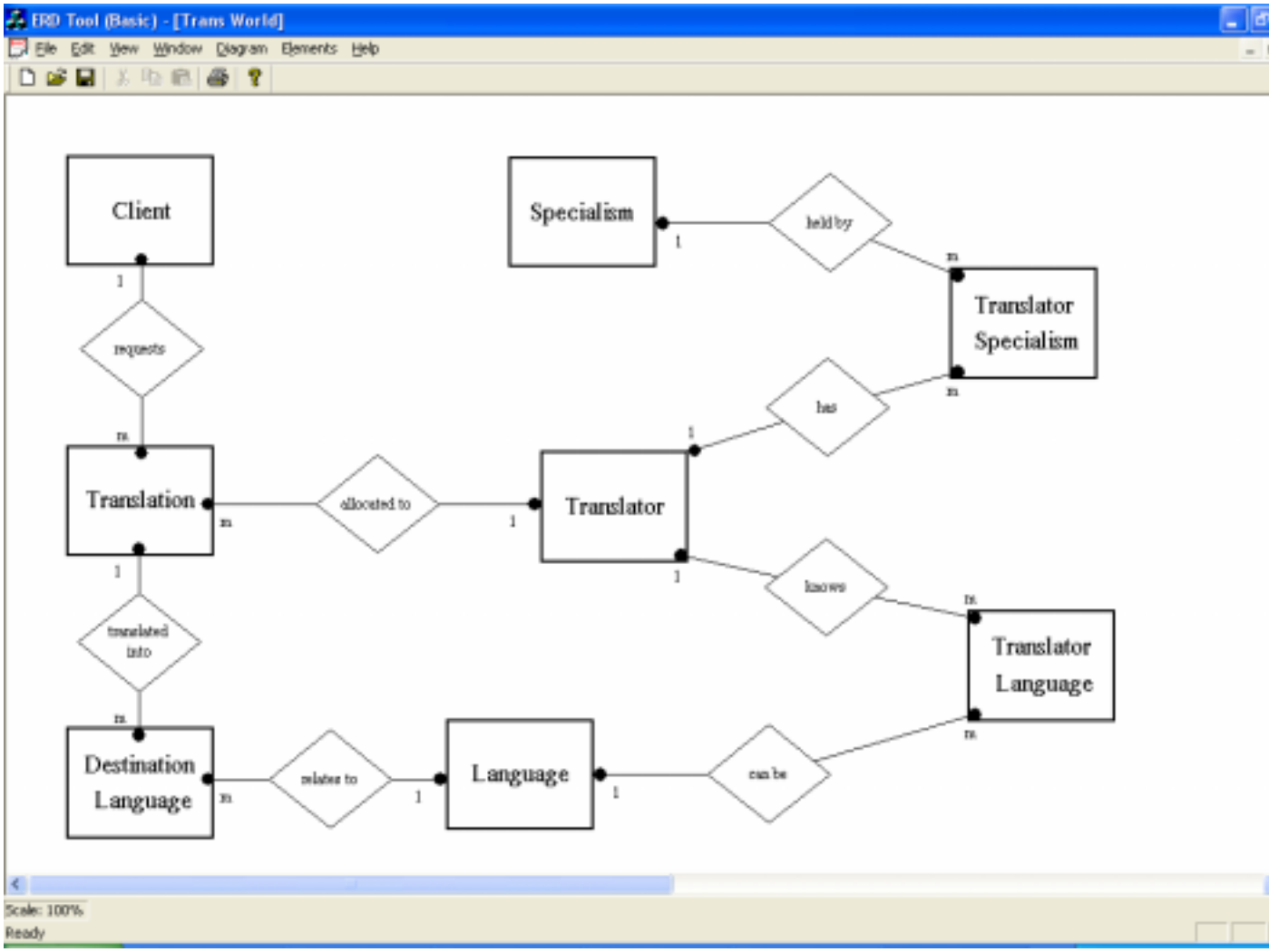
Marking Scheme

a)	Processes		up to 6
	External Entities		up to 2
	Data Stores		up to 4
	Flows		up to 3
	Total		15
b)	Entities	0.5 each	up to 4
	Relationships, including appropriate degree & membership class	1 each	up to 6
	Tables, consistent with ERD & with suitable PK	0.5 each	up to 4
	FKs	0.5 each	up to 3
	Other attributes		3
	Total		20

Global Translations: Table Types

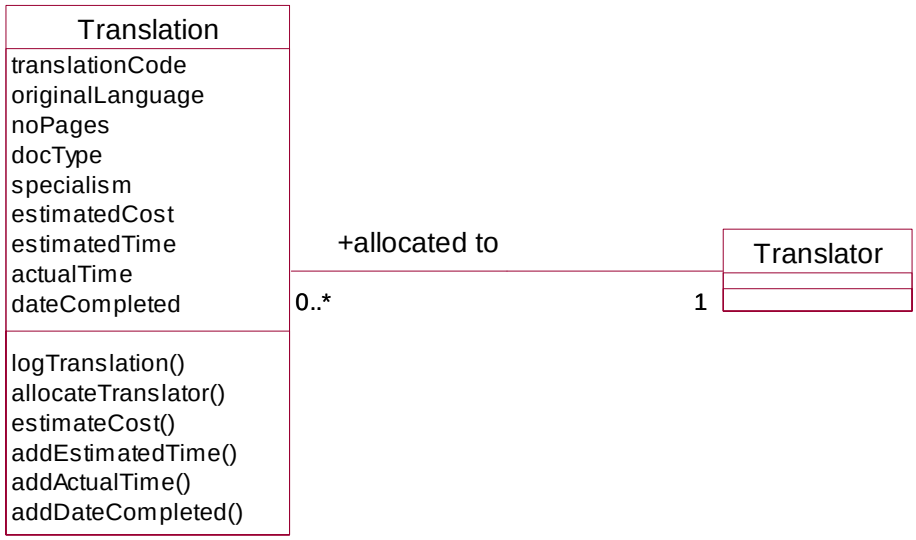
Client	(client_no, client_name, client_address, client_tel)
Translation	(translation_code, original_language, no_pages, document_type, specialism, estimated_cost, *translator_no*, estimated_time, actual_time, date_completed)
Language	(language_no, language, rate)
Destination Language	(*translation_code, language_no*)
Translator	(translator_no, name, address, tel_no, mobile_no, email)
Translator Language	(*translator_no, language_no*)
Specialism	(specialism_no, description)
Translator Specialism	(*translator_no, specialism_no*)


Client
translation request
invoice
D4 Languages
rate
Translator
6
Prepare Invoice
work completed
completed trans-lation & hours
1
Check Client Status
new client
D1 Clients
client details
5
Record Completion Date & Hours
hours spent
translation-client recorded
D2 Translations
completion date & hours
D4 Languages
2
Record Translation Reqest
new translation
rate
estimated cost & time
4
Estimate Cost and Time
allocated translator
logged translation
D3 Translators
translator skills
time estimate
estimated cost & time
3
Allocate to Translator
translation
Translator
Client


ERD Tool (Basic) - [Trans World]
File Edit View Window Diagram Elements Help
Client
Specialism
held by
Translator Specialism
requests
has
Translation
allocated to
Translator
knows
translated into
Translator Language
Destination Language
relates to
Language
can be
Scale: 100%
Ready

Marking Scheme for Question 1 continued

c)



(i)	Class 'Translation':	1 mark	
	Attributes consistent with b):	2 marks	
	Operations consistent wtih a):	2 marks	
(ii)	Any association consistent with b):		2 marks
(iii)	Class encapulates data & behaviour:		2 marks
	Entity has only data:		2 marks
	Relationship represents ability to join the 2 entity types (in SQL):		2 marks
	Association represents potential for message-passing between objects of those classes:		2 marks
	Total:		15 marks

Examiner's Comment

Overall, there was a wide range in the standard achieved by candidates, with excellent work from some while that from others was disappointing.

a)
Many candidates constructed a data flow diagram (DFD) that effectively represented the business processing of the system. However, data flow names were frequently either not named, or mis-named as processes. Process naming was generally poor. In some cases a context diagram was provided, either in addition to or instead of the top-level DFD; it should be noted that no extra marks are obtainable by providing a model that was not asked for. A few diagrams formed a flow chart rather than a DFD.

b)
The entity-relationship diagrams (ERDs) were generally of a better standard than the table types. However, the models were often simplistic, not dealing with complexities such as the translation into more than one language, and the translators' competence in multiple languages and more than one type of specialized language. Many-to-many relationships were often not decomposed on the ERD and, more seriously, not represented by a table type. Normalization was a weak point; tables often contained repeating groups so they were not even in first normal form. It should be noted that the primary key of each table should be clearly identified (it was not in many scripts), by an accepted convention such as underlining it.

c)
Competence in object-oriented (OO) modeling is improving. Candidates should be sure to check what the question is asking; only **one** class ('Translation'), with an association with one other class was required. The association needed to be consistent with the equivalent relationship on the ERD. The theoretical background is less well understood than the practical modeling; few candidates correctly explained an *association* on a Class Diagram as representing the potential for message passing. The fundamental differences in approach between the structured and object-oriented paradigms need to be clearly understood; some candidates appear to believe it amounts to little more than different notation conventions.

With increasing use of object technologies, OO systems analysis techniques will continued to be assessed in this examination.

Question 2

2. *a)* Explain with examples the difference between 'Functional' and 'Non-functional' requirements.

Answer Pointers

Functional: The systems functionality that specifically supports business processes or specific user identifiable requirements..
E.g. Produce a list of X customers, create customer account, produce invoice, etc.

Non-functional: Requirements more concerned with the operational environment of the system. E.g. security, ease of use, particular interface styles, portability, maintenance, etc.

2 marks for definitions of both functional and non-functional a max' of 2*2 = 4 marks
3 marks for e.g. of both functional and non-functional to a max' of 3*2 = 6 marks
Q2a = 10 marks

Examiner's Comment

Generally good answers provided with most candidates attempting this question.

b) Describe **THREE** of the following approaches to identifying user interface requirements.

i) Structured Approach
ii) Scenario Based Approach
iii) Ethnographic Approach
iv) Storyboarding
v) Prototyping **(3 x 5 marks)**

Answer Pointers

A description of three of the following acceptable:

- Structured approaches
- Scenario based approaches

- Ethnographic approaches
- Storyboarding
- Prototyping

5 marks for each approach described to a max of 3*5 15 marks
(NOTE: If answers focus on systems development in a general manner rather than developing interfaces specifically allow max' of 2 marks per description)

Q2b = 15 marks
Total for Q2 = 25 marks

Examiner's Comment
This popular question was attempted by most candidates but there were relatively few good answers. A large number of candidates provided detailed insights into Structured and Prototyping approaches as development strategies but few actually related these approaches to identifying interface requirements as was required in this question. However, some candidates did provide good insights into Storyboarding and some also described how prototyping can be used to identify interface requirements.

Question 3

3. Describe and justify the contents of:

a) A Project Initiation Document (PID) **(10 marks)**

b) A Requirements Specification **(15 marks)**

Q3a Answer Pointers
PID will contain:

- Introduction
- Background to the problem
- The boundary of the study
- Time scales involved
- Details of Steering Group (SG)
- Details of Communication process between development team and SG
- Problems with the current system
- Aims and objectives of the development
- Resources available
- Constraints
- etc.

2 marks for each item identified, described and justified to a max' of 2*5 = 10 marks
(Focus should be on project initiation rather than listing subsequent fact-finding and process or data modelling.)

Q3a. total marks = 10 marks

Examiner's Comment
Not a popular question but some good answers provided by those attempting this question. Many candidates presented strong answers that clearly located the PID as the starting point of a project with strong managerial and control elements. In this respects candidates were justifying the content even though the justification was rarely made explicit.

A few candidates incorrectly identified the PID as being the document which reported back to management the outcome of a Feasibility Study. Whilst this is fundamentally incorrect some credit was given to such answers because candidates often presented the Feasibility Study as a 'project initiation' decision point.

Q3b Answer Pointers

Contents of a Requirements Specification is likely to include:

- Background to the problem situation (PID as appendix)
- Details of fact-finding undertaken, who, what and how.
- Objectives of the proposed system – can be measurable to facilitate auditing the resultant system
- Detailed analysis and definition of the user requirements, functional and non-functional. This can be presented as a UC model or simple text list (Supplementary list) or both presented together as a requirements model.
- Models produced as outcome of systems analysis, e.g. UC diagram and associated descriptions, DFD, ERM, ELH or OO models.
- Specification of new system in sufficient detail to feed forward into and support the design of the new system.
- Appendices including project team members, documents from users, plan for the next stage, etc.

3 marks for each item identified, described and justified to a max' of 3*5 = 15 marks
(Focus should be on the transition from SA to SD rather than repeating the content of the PID or TOR.)

Q3b. total marks = 15 marks
Q3. total marks = 25 marks

Examiner's Comment

Good answers provided by those attempting this question. Many candidates presented strong answers that clearly identified the requirements specification as a pivotal point between analysis and design. Most candidates correctly stated the content of the requirements specification and, pleasingly, presented them in terms of systems models. However, very few candidates explicitly justified the content of the requirements specification.

Question 4

4. Structured systems analysis and design approaches often develop three related views or models of systems.

a) What are these views and how do they relate to each other? **(9 marks)**

b) Explain how the three models developed to represent these views may be checked against each other for completeness and accuracy. **(16 marks)**

Q4a. Answer Pointers

- Process, data and time views.
- Relate to each other as follows:
  - Process & Data:
    - Process model shows stores and these are likely to be entities on the data model
    - Data model has to contain sufficient data to support processing modelled on process model
  - Data and time model:
    - Time model allows data entities and the processes applied to them to be viewed over their life in the system rather than from either one of the other two views.
    - Time view is a dynamic view as opposed to 'static' data view.

        - Events affect entity states.
    - Time and process model:
        - Shows the processing in time sequence.
        - Events on the time model correspond to data flows on the process model.

1 mark for identifying each of the three views 3 marks
2 marks for explaining how each model relates to the other views 2*3 = 6 marks
Total marks for Q4a = 9 marks
(NOTE: if systems models presented as 'the views' give half marks)

Examiner's Comments
This was not a popular question.
The three views were well know, understood and expressed by many candidates, but some candidates presented systems models instead of the views they represent. For example many candidates stated the three views as:

DFD
ERM/LDS
ELH

Indeed, this was done without sufficient explanation of how they represent particular insights into systems processes and data. Many (perhaps even – most) candidates made no attempt to explain how they relate to each other, though some candidates did do this in a thorough and technical manner.

Q4b Answer Pointers
Time view & process model - Allow us to check that all processes that are applied to entities during its life in the system are identified and modelled. Time modelling may highlight missing processes that were not identified in process or data modelling.
Time view & data model – Allows to check that all states an entity may be in during its life in the system are supported by sufficient data structured and data elements.
Process and Data – Allows checking that processes are supported by sufficient data in the data model.

5 marks for explaining how each model relates to the other two 5 * 3 = 15 marks
1 extra mark for examples or particular thoroughness 1 mark
(NOTE: If candidates suggest that models may be checked using CASE – allocate marks for evidence on understanding what CASE is checking for).

Total marks for Q4b = 16 marks
Total marks for Q4 = 25 marks

Examiner's Comments
Some good answers were forthcoming in response to this question.
Many candidates expressed the interconnectedness of the models very well.

Question 5

5. Identify suitable fact-finding methods that you would use in the systems analysis phase of the Global Translation project. Justify your choice by reference to the advantages and disadvantages of each method identified and its appropriateness for supporting this particular development. **(25 marks)**

Answer Pointers

Major methods are (SQUIRO) ….

- Sampling
- Questionnaire
- Interviews – Structures/unstructured
- Reading/Research or Review Documents
- Observation – participant or not

Which would be used for Global Translations project …..

- Sampling – Could be justified if there were too many of a particular thing (orders or translators, for example) to review/question all of them. Could be used to sample orders and outcomes to confirm other fact-finding and to identify trends/patterns. Major use is when large amounts of materials exist that cannot and do not need to be reviewed individually.
- Questionnaire – May be used ….
    - Staff are in many locations
    - Access to staff and customers for interviews may not be possible.
- Interviews – Structures/unstructured – Will certainly be used.
    - Time consuming, but very rich data can be obtained,
    - Can develop good relationships with Trans World staff
    - Can triangulate results from other methods
    - Most flexible method
    - But – costly and very time consuming
- Reading/Research or document review – Yes, it would be expected that the following would be reviewed …
    - Company history and mission statements,
    - Operating procedure manuals,
    - Reading all documents relating to 'job processing'
    - Great insight can be obtained
    - May link to pre/post interview sessions
- Observation – participant or not – Yes , may be used, especially is seeking to:
    - understand the 'job processing' process
    - Gain insights into the life history of a job

5 marks each for identifying at least 5 methods to a max of 5 marks
3 marks for each set of advantages, disadvantages and uses identified to max of 3*5 = 15 marks
5 marks for a clear statement and justification of which would be used for Trans World project to a max of 5 marks
(NOTE: If fewer than 5 presented then mark according to level of detail and justification provided)

Total marks for Q5 25 marks

Examiner's Comments

A very popular question resulting in some very good, detailed and mostly accurate answers. However some candidates, again failed to gain full marks for not explicitly addressing all aspects of the question. Many candidates presented considerable information about all the fact-finding methods they know but failed to evaluate them

against the particular needs of GT. However, some candidates did structure their answers to explicitly reference all parts of the question and did so in manner that was clearly visible. Statements such as, 'I would use X and Y for GT because ……', were pleasing to see and assured the examiner that those candidates were clearly addressing the needs of this particular question rather than reproducing a standard, prepared-earlier answer to a general question about fact finding.