THE BCS PROFESSIONAL EXAMINATIONS
Professional Graduate Diploma

April 2006

EXAMINERS' REPORT

User Interface Design

General

The range of answers was very wide. Some answers were very good whilst others showed little or no evidence of study and, particularly, understanding. Candidates should note that they should have studied the materials and that producing common sense observations does not compensate for a lack of study.

That said, candidates also need to be aware that open-ended questions require something more than can be rote-learned from a textbook. At professional graduate diploma level, examiners are looking for *application* of theories and evidence that a candidate can think through a problem situation and come up with a viable solution.

Reading and understanding the question is essential before embarking on the production of a successful answer. Many candidates seem to produce vague and irrelevant answers based on the recognition of one or two words or phrases in the question, rather than fully understanding what is required. Candidates who find that they seem to be writing similar, or in some cases the same, answers to different questions, should see this as a sign that they are perhaps missing the key requirements of the questions. Reproducing the text book version of Shneiderman's rules at every perceived opportunity is a common example of this erroneous examination technique and is one that does not yield high marks.

Question 1

1. It is an established fact that the characteristics of human memory place limitations on how well users can interact with computers. One of the most common problems experienced is referred to as "cognitive overload".

a) What is meant by "cognitive overload"? Provide your own example of how a user interface might result in "cognitive overload". **(10 marks)**

b) How can the use of the desktop metaphor, e.g. in the form of a windows based interface, contribute to avoiding problems of "cognitive overload"? **(15 marks)**

Answer Pointers

(a) Basic points:

- The term cognitive overload refers to problems associated with Working Memory or Short Term Memory.
- Basically, the amount of information needing to be processed exceeds the semantic chunking limit of 5-7 +/- 2.
- An important issue here is human attention. A large number of external stimuli need to be attended to, e.g. in safety-critical situations. This results in lowered "processing capacity" and makes users very sensitive to interpolated tasks (displacement, prevention of rehearsal and re-coding), secondary input that displaces current content and stimuli of short duration.

(b) In essence the question is looking for knowledge of:

- Windows systems provide a framework for "recognition" rather than "recall". During periods of cognitive overload, Working Memory is not working to normal capacity and recall cues become unreliable. Recognition is a highly developed skill that is much less sensitive to disruption.
- Window systems provide a structure that is familiar and users appear to require much less attention. Attention is a phenomenon that has a limited "amount" and the less that needs to be allocated the more efficiently (e.g. speed and accuracy) the users perform.

Examiner's Comments

Overall there were some answers that were near to perfect and a number of very good answers. Some candidates provided very long answers but these tended to contain a lot of material that was not relevant to either part a) or b). It is important to study and understand relevant material and then in the examination to address the questions being asked. There is little to be gained by writing long answers that do not relate to the question being attempted.

While there were very good answers to part a) the main problem was a lack of detail and understanding. This is indicative of candidates not having studied relevant material.

The second part of the question resulted in many good and thoughtful answers. However, there was a tendency to reproduce at length general user interface design guidelines without addressing the actual question.

Question 2

2. You are part of a team developing a shopping list application called *ShopAtHand* for a PDA and your role is to design the interaction between the user and the device. A supplementary barcode scanner is to be used as one of several means of capturing data. The basic application functions include, but are not limited to:

- maintaining a list of items needed to be purchased on the next visit to the shops;
- maintaining a list of frequently purchased items and standard lists;
- presenting lists to the user in a variety of ways whilst shopping (listed by shop, by item type, etc) and allowing the user to check off the items as they are purchased or placed in a supermarket trolley;
- recording and presenting, in flexible ways, records of purchases, summaries, etc.

[In answering this question, you will need to make use of the PDA device description and illustration given on the next page.]

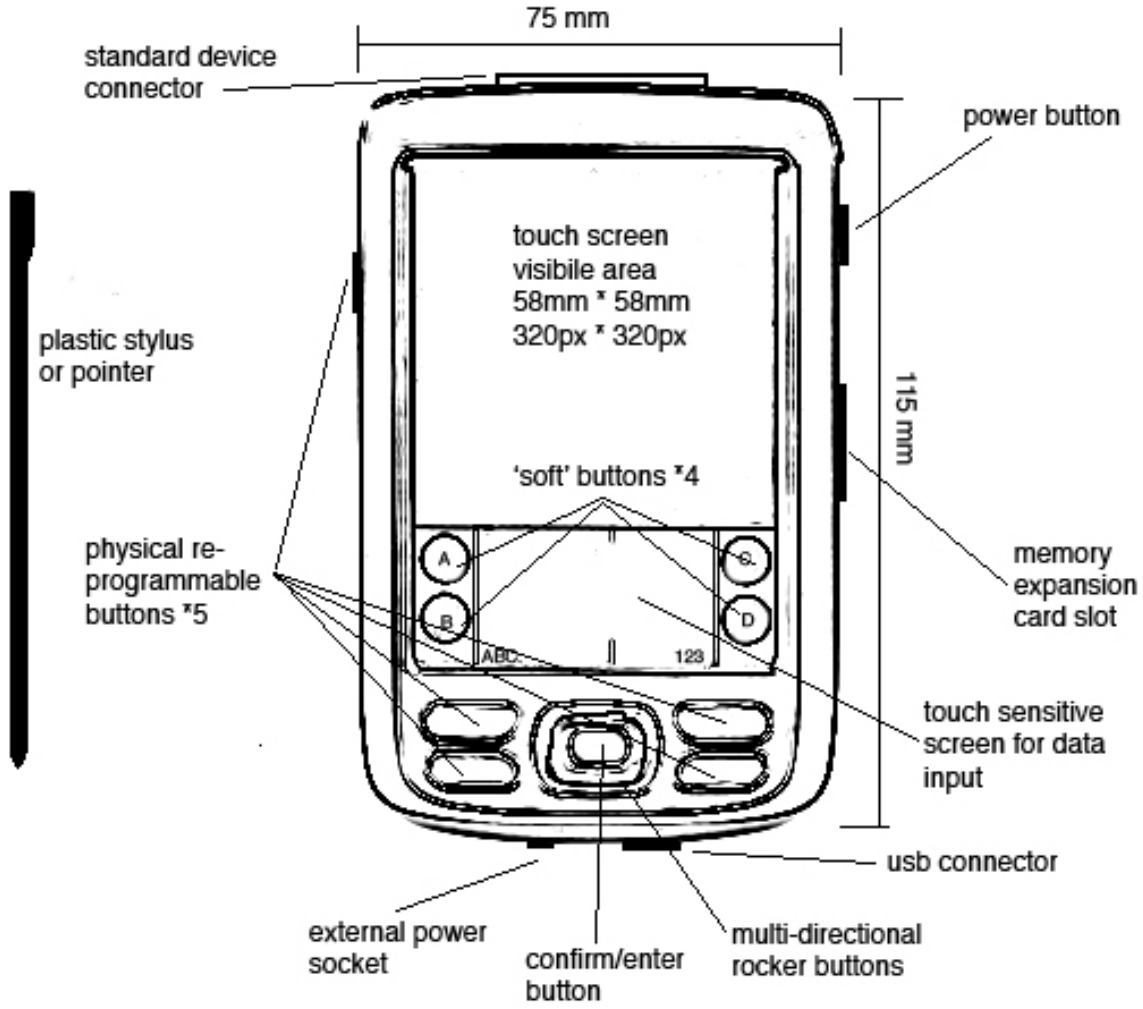
a) Using your knowledge of interface design principles, make initial design decisions on the interfaces for the various functional elements of *ShopAtHand*. These will include screen layouts, button mappings and data input strategies. Present your ideas as a series of no more than six labelled sketches and succinct notes describing functional interfaces and user scenarios. **(15 marks)**

b) Write a justification of your design in relation to interface design principles and theories. Where possible, make reference to specific authors and texts and demonstrate how your designs conform to good interaction practice. **(10 marks)**

PDA Device Description & Illustration for use in Question 2

Device

A typical handheld PDA (personal digital assistant) is illustrated in the diagram below.



The interface to this device consists of a colour screen with a visible area of 320 x 320 pixels. The screen is touch-sensitive and interaction is typically via a plastic stylus. Most applications for the device can use direct manipulation of interface elements (i.e. drag and drop) on this screen as one means of interaction. When not in use the stylus is stored in a slot in the back of the device. There is a further area of screen that is used for data input via the stylus and a form of handwriting recognition. The left side of this area is used for alphabetic characters and the right side for numeric characters. Double tapping either area will replace this screen area with a representation of an alphanumeric keyboard, with which users can tap out characters rather than using the handwriting screen.

The input area also has four 'soft' buttons (i.e. invoked by tapping the button with the stylus) that are reprogrammable according to application. Additionally there are five 'hard' or physical buttons that are generally used, but are also completely reprogrammable, to invoke high level PDA functions and applications, e.g. diary and clock.

Finally, there is a central set of buttons that mirror the functions typically found on a mouse. The four-way rocker buttons move pointers or screen focus either left, right, up or down and the central button fulfils the 'click' function of a mouse.

The device can interface with a personal computer through a standard USB connector or via Bluetooth. There is also a standard device connector to allow supplementary devices such as a camera or scanner to be fitted to the PDA. A memory expansion slot allows additional flash memory to be used.

Answer Pointers
(a) Marks will be awarded according to the degree to which the candidate demonstrates knowledge and understanding of the specifics of interface design.
Highest marks will be awarded to those answers that:

- provide clear and labelled drawings of all the main functions and screens of the application;
- supplement those drawings with clear and concise notes;
- show that the candidate has thought through the functionality of the application and the implications of functionality to the interface;
- demonstrate coherent strategies for data input;
- consider and illustrate how menus and other interface devices will be used in the application;
- show button mappings that conform to principles of good practice in interface design;
- demonstrate innovative thinking in the design.

(b) Marks will be awarded according to the degree to which the candidate demonstrates her/his understanding of the principles of good interaction design practice.

Highest marks will be awarded to those answers that focus on relating the candidate's designs from part one of the question to the accepted wisdom.

Examiner's Comments
The key point of this question is that it is not expecting, nor requiring, candidates to reproduce large sections of a textbook. The expectation is that candidates will think through a solution to a contemporary interface design problem and demonstrate through their answer their ability to *apply* theories and to present an outline design in a visual manner.

The question requires "a series of no more than six labelled sketches and succinct notes describing functional interfaces and user scenarios". Many candidates chose to ignore this guidance and did not use any visual means to present their solutions. Other candidates produced illustrations that were, at best, poorly presented and unclear. The best solutions were presented in a clear and concise manner with appropriate attention being paid to the illustrations and associated notes.

Question 3

3. In October 2000, the usability guru, Jakob Nielsen, controversially wrote in his web-based Alertbox:

> "About 99% of the time, the presence of Flash on a website constitutes a usability disease. Although there are rare occurrences of good Flash design (it even adds value on occasion), the use of Flash typically lowers usability. In most cases, we would be better off if these multimedia objects were removed. Flash tends to degrade websites for three reasons: it encourages design abuse, it breaks with the Web's fundamental interaction principles, and it distracts attention from the site's core value." (http://www.useit.com/alertbox/20001029.html)

a) Explain what is meant by the term 'usability'. **(3 marks)**

b) Describe the 'fundamental interaction principles' of the web that Nielsen refers to in his article. **(5 marks)**

c) How does multimedia development software, such as Flash, encourage 'design abuse'? **(7 marks)**

d) Create a list of six 'top usability tips' for designers who wish to build multimedia objects for the web. Write a brief paragraph explaining the rationale for each of your tips. **(10 marks)**

Answer Pointers

(a) Marks will be awarded to the candidate according to the completeness of her/his answer. Highest marks will be awarded to those drawing on definitions from accepted sources and that discuss quality components such as those covered in Jakob Nielsen's definition below.

> "Usability is a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process.
>
> Usability is defined by five quality components:
>
> Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?
>
> Efficiency: Once users have learned the design, how quickly can they perform tasks?
>
> Memorability: When users return to the design after a period of not using it, how easily can they re-establish proficiency?
>
> Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
>
> Satisfaction: How pleasant is it to use the design?
>
> There are many other important quality attributes. A key one is utility, which refers to the design's functionality: does it do what users need? Usability and utility are equally important: it matters little that something is easy if it's not what you want. It's also no good if the system can hypothetically do what you want, but you can't make it happen because the user interface is too difficult. To study a design's utility, you can use the same user research methods that improve usability."
> (http://www.useit.com/alertbox/20030825.html)

(b) Marks will be awarded to the candidate according to the level of understanding demonstrated in her/his answer. Fundamental interaction principles include:

- browser-based control;
- back button, forward button, stop button;
- browser-based scrolling;
- navigation through hyperlinks; and
- accessibility through customisation of style sheets & ability to change text size.

(c) Marks will be awarded to the candidate according to the level of understanding demonstrated and to the amount of relevant description and examples included in her/his answer. To be of pass standard, an answer is expected to contain reference to at least:

- issues surrounding Flash intros (c.f. with splash pages);
- gratuitous animation;
- decreased granularity of user control;
- the ease with which non-standard GUI controls can be created; and
- accessibility issues.

(d) Marks will be awarded for each tip. In allocating a mark, account will be taken of the value of the tip and the understanding of the design issue demonstrated in the rationale. A tip without a rationale will be awarded a minimum mark.

Tips might include such things as:

- don't overuse animation;
- use standard scrolling techniques;
- link Flash movie navigation with browser back button;
- keep button targets a reasonable size (Fitt's law);
- use visual cues to differentiate content from navigation;
- avoid hidden menus and 'mystery meat navigation';
- design for interaction not broadcast; and
- avoid Flash intros or provide a 'skip intro' button.

Examiner's Comments

Successful solutions to this question demonstrated a candidate's ability to synthesise three elements of their knowledge: an awareness of contemporary web-design and the use of Macromedia Flash as the overwhelming tool of choice to deliver animation and elements of visual design to the interaction; an understanding of Neilsen's concerns regarding the indiscriminate use of Flash and its potential detrimental effect on usability; and finally, a knowledge of interface design, with particular reference to web design, grounded in a variety of theories and ideas.

As one of the most well-known commentators (if not *the* most well-known) on usabilty, Neilsen, his work and ideas should be familiar to candidates. That said, the keys to successful answers to this question all lie in the provided quotation from Neilsen. Reading, understanding and forming an opinion on Neilsen's views and supporting that opinion with reference to other known ideas and theories is the route to the highest marks.

Candidates who find themselves rewriting Shneiderman's rules for different sections of this question, should revisit the requirements and rethink their answers.

Question 4

4. You are a consultant working for Usable World, a global usability consultancy company. One of your clients, an international engineering corporation, has produced a web site for marketing their services across the world and wants to evaluate the usability of the web site. Your job as a consultant is to provide advice on evaluation methods.

a) What advice would you offer on how the web site should take into account different languages and cultures? **(10 marks)**

b) Provide advice on how the web site might be evaluated in terms of general usability. Your advice should include: how to define usability; how users might be recruited for a usability study; what kind of usability data should be collected; and how the usability study should be carried out. **(15 marks)**

Answer Pointers

Both components of this question involve open ended problem solving.

(a) As regards language, a key issue would be requirements that identify the different languages in use amongst likely users.

- Also, what are the most commonly used shared languages amongst likely users.
- This provides input to decisions about the provision of different language versions. The provision of a translation service could also be considered.
- As regards culture a global web site should consider "cultural neutrality", i.e. with an understanding of diverse cultures it is possible to avoid any strong association to specific aspects of a given culture.

  More specifically an answer should cover issues such as:
  - Avoid religious and political reference or symbolism, including language.
  - Sensitivity to specific issues, e.g. in masculine dominated cultures.
  - Observe protocols and etiquette, e.g. in addressing users.
  - Careful use of images, e.g. avoid imaging that may be offensive in a particular culture.

(b) This is very open ended and any solutions that are assessed as being realistic is acceptable. Answers that address the multinational aspects earn high marks.

Typically an answer might address:

- How usability might be defined through usability criteria extracted from the literature or through a special study, e.g. using a focus group.
- User recruitment might take the form of sampling typical users after the population of typical users has been defined.
- Defining the user group can for example be based on existing marketing surveys.
- User groups should take account of different countries, languages and culture, etc.
- The collection of data could take many forms, e.g. experimental studies, observational studies, surveys, focus groups, etc.
- A study that uses a number of methods to collect data is desirable.
- The procedure for carrying out the study is linked to how the usability data is to be collected. Typically, a study could be carried out under controlled conditions in a laboratory or participant observation could be used, etc.

Examiner's Comments

In an open ended question like this candidates should not be afraid to produce their own solutions but should realise that any solution must be based on an understanding of the material.

The first part of this very open ended problem solving question allowed many candidates to produce thoughtful and insightful answers that addressed issues relating to multinational Web sites while also showing technical expertise. Sadly, quite a number of answers did not demonstrate that candidates had addressed this part of the question in any detail. The approach here should be to analyse the question and to systematically address issues that are identified as potentially important.

The second part of the question may on the surface seem simple but is quite hard as candidates have to make a number of choices that show whether they have studied and understood relevant material. Indeed, many candidates did just that. However, a number of candidates provided answers that were lacking in detail, quite vague in terms of approach and too general.

Question 5

5. The digital design company for which you work has landed the contract to design and build the DVD interface for the latest teenage block-buster movie (such as 'Harry Potter'). Your responsibility in the development team is to test and evaluate the interface in terms of the user experience. This includes the usability of the interface, but also covers compatibility of the design in terms of market and user demographics and the overall look and feel of the movie.

a) *i)* List and briefly describe five different types of *quantitative* evaluation data that you could collect to test the interface. **(7 marks)**

ii) Design and describe in detail a test and evaluation process that uses one of the types of quantitative data you have listed in your answer to part *a) i)*. Your answer should at least include notes on: test reliability and validity, the test environment, the protocols for data collection, the kinds of data you will collect and how the data will be useful to the design team. **(5 marks)**

b) *i)* List and briefly describe five different types of *qualitative* evaluation data that you could collect to test the interface. **(8 marks)**

ii) Design and describe in detail a test and evaluation process that uses one of the types of qualitative data you have listed in your answer to part *b) i)*. Your answer should at least include notes on: test reliability and validity, the test environment, the protocols for data collection, the kinds of data you will collect and how the data will be useful to the design team. **(5 marks)**

Answer Pointers

(a)(i) Marks will be awarded for each method of quantitative data collection listed and described. Methods without a brief description will be awarded a minimum mark. Descriptions will be assessed on their relevance and succinctness.

Methods include:

- measurement of time to achieve a given goal (e.g. change movie language to Finnish);
- count of number of navigation errors;
- closed question survey – user rating of interface features;
- attitude survey (Likert-type scales);
- count of button presses to achieve a given goal;

- count of smiles or grimaces during operation; and
- measurement of response times to user actions.

(a)(ii) Marks will be awarded to the candidate according to the completeness of the answer and the degree with which the answer demonstrates an understanding of the test and evaluation process. Highest marks will be awarded to those answers that provide suitable coverage of the whole of the testing process, including:

- evidence of understanding of user demographics;
- numbers of testers required at each stage;
- how reliability and validity of the test process will be ensured;
- the testing environment (physical/virtual space) etc; and
- how the data will 'look' and how it can be usefully employed in an iterative design process.

(b)(i) Marks will be awarded for each method of quantitative data collection listed and described. Methods without a brief description will be awarded a minimum mark. Descriptions will be assessed on their relevance and succinctness.

Methods include:

- open question survey;
- interviews;
- user diaries;
- expert reviews;
- focus groups; and
- observation of user interaction (real-time/video).

(b)(ii) Marks will be awarded to the candidate according to the completeness of the answer and the degree with which the answer demonstrates an understanding of the test and evaluation process. Highest marks will be awarded to those answers that provide suitable coverage of the whole of the testing process, including:

- evidence of understanding of user demographics;
- numbers of testers required at each stage;
- how reliability and validity of the test process will be ensured;
- the testing environment (physical/virtual space) etc;
- how the data will 'look' and how it can be usefully employed in an iterative design process.

Examiner's Comments

As with other questions on this paper, the solution cannot be found in a textbook. Candidates are expected to have a thorough grasp of test and evaluation techniques and to be able to *apply* them to the particular problem set out in the question.

Candiates are urged to read the question carefully. DVD interface design is a contemporary issue for user interface designers as well as being a pervasive entertainment medium in modern society. It is surprising, therefore, that in answering this question, a number of candidates seemed not to be able to relate DVD interfaces to the design domain and chose instead to write about web-based applications and/or online DVD retail or rental services. Such answers were unsuccessful.