THE BCS PROFESSIONAL EXAMINATIONS
Professional Graduate Diploma

April 2007

EXAMINERS' REPORT

User Interface Design

General comments

As in previous years, the range of answers was very wide. Some answers were very good whilst others showed little or no evidence of study and, especially, 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 should 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.

Whilst candidates are not assessed on the legibility and grammatical correctness of their answers, they should be aware that answers that are unreadable or of a completely nonsensical construction will not be in a position to gain many marks.

Question 1

A typical handheld PDA is illustrated in the diagram below.

[In answering this question, you will need to make use of the PDA device description and illustration given below.]
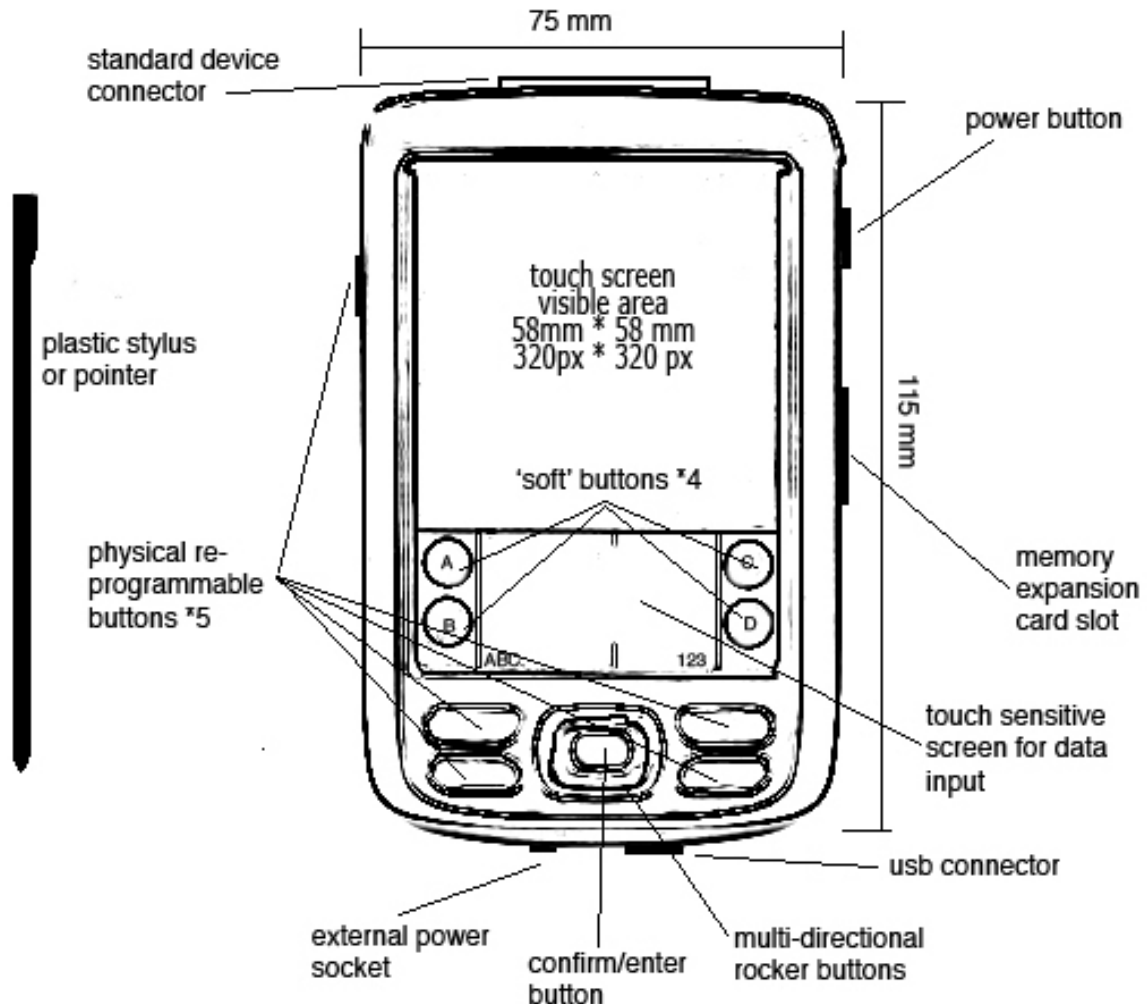
The interface to this device consists of a colour screen with a visible area of 320 x 320 pixels. The screen is touch-sensitive and interaction is typically via a plastic stylus. Most applications for the device can use direct manipulation of interface elements (i.e. drag and drop) on this screen as 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.

Scenario

You have been given responsibility for creating a set of six icons to represent the high level functions of the PDA. These will appear as the first screen on start up of the PDA.
The six functions are:

- clock;

- diary / calendar;

- to-do list;

- contacts / address book;

- calculator;

- note pad.

The PDA design team have already decided that they do NOT want to supplement the icons on this screen with text labels, so your designs must be graphical only. The set of icons must have a coherent look and feel to them.
The PDA screen limits the size of each icon to 64px * 64px.

Tasks

(a)   (i)   Show in sketch form your designs for each of the six functions.   **(6 marks)**

       (ii)   Write a brief report (no more than 100 words) to your colleagues on the PDA design
              team giving the rationale behind your design decisions.   **(6 marks)**

(b)   Jef Raskin, author of the Humane Interface (2000) and Apple GUI pioneer said, "An icon is a
       symbol equally incomprehensible in all human languages. Whatever language you know, you
       have to learn the meaning of an icon anew." (jef.raskincenter.org/published/ubiquity.html)
       Describe the issues inherent in graphical icons that make their use problematic as the sole
       method of interaction with a machine.   **(13 marks)**

Answer Pointers

(a)   (i)   Marks will be awarded according to the understanding of the issues involved in
              icon design demonstrated in the answer. Highest marks will be awarded to well-crafted
              drawings that take account of size limitations and the need for a coherent family of icons.

       (ii)   Marks will be awarded according to the clarity of the report and the degree to
              which reference is made to appropriate authors or theory. Reports clearly over the
              maximum of 100 words will be penalised.

(b)   Marks will be awarded according to the degree to which the answer addresses the issues
       of icon design and use. The question seeks only the problems of icon use – marks will not
       be awarded for advantages. The best answers will make reference to specific authors and
       texts and provide illustrative examples. Issues include:
              size
              small message space
              poor recognition potential
              constraint on design
              communicativeness
              ability to transmit meaning
              learnability
              memorability
              number needed for modern apps
              icons are culturally and socially situated
              icons often need explaining rather than explain
              sorting, indexing icons
              violation of the principle of visibility

Examiners' Guidance Notes

There were a number of reasonably good answers to this question, although, often, candidates were unable to demonstrate a consistent standard across all three sections.

Section a) i) required sketches of possible icons. In many cases, such sketches were extremely rough and lacked sufficient thought or detail to adequately show the designer's intent. The use or indication of colour and inclusion of dimensions was, more often than not, overlooked.

Section a) ii) was generally not well done. In many answers the 100 word limit was ignored and the requirement for writing in a report format was not followed. With one or two notable exceptions, candidates were more concerned with describing their sketches *("This is a picture of a clock and it represents the clock function")* instead of trying to justify their design decisions and the overall look and feel of the whole icon family.

Question 2

You run a small HCI Consultancy and are engaged by a client to evaluate their website, but on a modest budget and tight time scale. The website belongs to a small, ambitious independent music producer who uses it to promote the emerging bands they have as clients. The website also hosts fan forums, promotes concerts and sells downloadable and CD versions of their music.

Website traffic and sales have been below expectation and the client would like you to write a report evaluating the website to see if the navigation and functionality, or other factors, are responsible and suggesting revisions.

Using your knowledge of standard usability evaluation techniques applied to web site evaluation:

(a)   Describe how you would use expert user evaluation.   **(10 marks)**

(b)   Outline a realistic user testing strategy you could use, within the budgetary and time
        constraints.   **(10 marks)**

(c)   What should your report include?   **(5 marks)**

Answer Pointers

This is a broad-ranging, open-ended question. It requires the candidate to demonstrate knowledge of standard usability evaluation techniques applied to web sites, and show practical insight into selecting approaches that are appropriate to the brief and evaluation task. It also requires the candidate to show insight into the issues affecting web site usability.

Candidates' answers will vary, but they would be expected to cover most of the points below, although any other reasonable strategies will be accepted. Marks would be given as indicated, depending on the quality of the answer and the coherence of the strategy. Extra marks will be given for points specifically addressing the time and resource constraints of the brief.

(a)   Expert User Evaluation

                - heuristic walkthrough;
                - structured walkthrough using typical user scenarios (e.g. buying a CD);
                - evaluation of navigation and layout;
                - analysis of site logs;
                - cross platform/browser compatibility evaluation;
                - standards compliance and accessibility;
                - search engine strategy (both external search engine indexing and intra-site);
                - comparison with equivalent sites.

(b)   User testing

                - this would have to be small-scale;
                - current user analysis (e.g. locality from logs, profiles from fan forums);

- identify target users and recruit representative sample (consider strategies like using students, free CDs/tickets as payment for usability testing);
- basic open-ended "look and feel" questions;
- simple realistic scenarios (e.g. download purchase);
- use of a very specific version of questionnaire (e.g. modified Shneiderman);
- open-ended user comments for feedback to clients.

(c)   Report

- should include suggestions for improvement;
- include any instruments used so they can be used for re-evaluation;
- be up-front about statistical limitations;
- recommendations for improving search engine ranking (meta-headings, submission;
- although small user numbers may limit the amount of quantitative statistics obtainable, descriptive results are still helpful;
- where possible, particularly with the expert evaluation, quantifying as much as possible will allow comparative re-evaluation after changes have been made.

Examiners' guidance notes

Some answers contained a systematic approach to evaluation and demonstrated knowledge of standard evaluation techniques and methodologies, but many lacked this. There was a general failure to demonstrate how knowledge of basic usability evaluation can be used to address the specific issues raised in the question scenario and standard techniques adapted to use for website evaluation. Too many candidates simply stated their opinion of the requirements for a music website with no attempt to relate this to evaluation. A few candidates took a user-centred approach to this question, but most rather adopted a system-centred perspective, and placed too much emphasis on technical aspects of music downloads rather than usability.

Question 3

You work as a web-developer for Somesuch College, a regional provider of higher education. Whilst providing traditional face-to-face lectures, seminars and workshops to support students, the college also offers opportunities to study from home, through an extensive collection of web-based materials, resources and discussion groups.

Your line manager has asked you to take responsibility for communicating a number of web-related issues to various groups of staff in the college. The tasks are listed below.

(a)   Write an article for the staff newsletter explaining the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C). The newsletter is mainly read by academic staff who are knowledgeable, but not necessarily technically aware, with regards to the web.
The length of your article must be limited to 150 words and needs to be pitched at a suitable level for the expected readership of the newsletter. **(10 marks)**

(b)   A number of your colleagues in the web-development department of the college still insist on coding web pages using tables and other HTML structures to layout the design. Draw up a set of slides (to be implemented in, for example, Microsoft PowerPoint®) to convince your colleagues that they could and should be using more recent approaches to web-design.
Suggested topics to include in the presentation are:

- Reasons for separating out content structure, visual design and behaviour

- Accessibility issues

- Web standards and the move from HTML to XHTML

- Cascading Style Sheets (CSS)

Your presentation is limited to 10 minutes and should contain no more than six slides. It is not necessary to include a title slide. Each slide should contain a number of succinct bullet points highlighting the key elements of your presentation.
In your answer, sketch out how each slide will look. Do not add any other information (e.g. slide notes or explanations and justifications for the slides) to your answer. **(10 marks)**

(c)   Write a brief (100 words) FAQ (frequently asked questions) for the college website explaining the answer to the question: "why don't the links to external sites on the college webpages open in a new browser window?" Focus your answer on the reason for the absence of the target="_blank" attribute to the <a> tag in XHTML 1.0 Strict. **(5 marks)**

Answer Pointers

(a)   Marks will be awarded for a coherent and concise description of the W3C WAI. Knowledge about the WAI and issues of accessibility in general will be expected. Highest marks will be award to those candidates who produce a newsletter-style article written with the specific audience in mind.

(b)   Marks will be awarded according to the knowledge and understanding displayed in the slide set. Areas included are expected to be:
- accessibility issues on the web
- using html for content structure, css for layout and javascript for behaviour
- understanding that the move is intended to allow the user to determine how something should look on the web

Highest marks will be awarded to those candidates that show an ability to synthesise the key issues down to a coherent and concise set of bullet points targeted at the intended audience.

(c)   Marks will be awarded according to the level of knowledge and understanding displayed regarding the accessibility issues involved in opening a link in a new window. Highest marks will be awarded to those candidates who write the answer in the required FAQ-style.

Examiners' Guidance Notes

The least number of candidates attempted this question and, with notable exceptions, it was not tackled well. There was little knowledge evident of the Web Accessibility Initiative (WAI) and candidates were, generally, also extremely vague on section c). As usual, some candidates chose to ignore instructions regarding length of report and/or the format of the answer. That said, for this question most answers tackled the sections in appropriate format and kept reasonably well to the length restrictions.

Question 4

Using speech as a means of communication with machines is an often a goal of user interaction designers.

(a) List five advantages (write no more than one sentence for each) that speech input may have over other means of user interaction. **(5 marks)**

(b) List five problems (write no more than one sentence for each) inherent in implementing speech input as the primary means of user interaction. **(5 marks)**

(c) As an interaction specialist, you have been engaged by a client to advise on implementing a speech-based input system for two applications:
   - to enable a person with a physical disability to control a number of functions in his/her home – for example, turning on lights, controlling electrical devices such as the TV and stereo and adjusting the central heating;

   - to act as an information point to assist travellers arriving or departing an airport with such things as directions to check-in desks, restaurant facilities and hand-baggage regulations.

   Write a report (of no more than 500 words) to your client explaining the main differences in conditions for the two applications that designers will need to take into account and highlight why your client cannot assume that development work on one application will necessarily be of use on the other application. **(15 marks)**

Answer Pointers

(a) Advantages include, but are not limited to:
   - natural language for human communication
   - speech does not require use of hand or tools
   - broadens the bandwidth for communication – accessibility
   - space saving
   - when user's eyes are occupied or dysfunctional

   1 mark each

(b) Problems include, but are not limited to:
   - difficult to implement
   - cognitive load compared with some other input techniques
   - background noise and interference
   - needs fuzzy logic to understand accents, variations in tones etc
   - computer interpretation of voice commands

   1 mark each

(c) Marks will be awarded according to the knowledge and understanding displayed in the answer. Key issues include:
   - speaker dependent v speaker independent systems
   - discrete word v continuous phrase recognition
   - single user v multi-user

   Highest marks will be awarded to candidates who address the requirements for a client report in terms of level, length and style.

Question 5

(a)   What does it mean if a software system has good learnabilty?   **(2 marks)**

(b)   You are asked to evaluate the learnability of a software system. How would you go
about it in terms of:
    i.   type of evaluation method you would employ; and   **(6 marks)**

    ii.   data parameters you would collect.   **(4 marks)**

(c)   What is flexibility in a software system and how does it help usability?   **(5 marks)**

(d)   Flexibility of a software system can be designed into the system at a number of levels.
Describe these levels and give examples of how this can be implemented.   **(8 marks)**

Answer Pointers

This question aims to test the candidates' understanding of learnability and flexibility in software systems. Some sections call for open-ended answers, but candidates' answers should include some of the following points.

(a)   A usable system should be easy to learn when initially used and also allow irregular users to return to it with minimum effort.

(b)   This is an open-ended section and candidates' answers will vary. Any reasonable approach would be accepted, but answers may include the following points:
    i.   An evaluation would likely comprise a controlled study, with selection of users who have no prior exposure to the system being evaluated;
        Previous experience with similar systems and level of computing experience and use should be recorded;
        Standard task scenarios should be used to allow comparison between users;
        Tasks could be repeated with interpolated tasks to elucidate effects of short and long-term learning;
        Conditions should be the same for all users e.g. machine and environment;
        The study should be repeated after a period of days/weeks without use of the system in between.

                           6 marks

    ii.   Data parameters could include:
            Time taken to complete tasks;
            Number and type of errors;
            Time taken to recover from errors;
            Use of manual/help/other support.

                           4 marks

(c)   Flexibility in software improves usability by allowing users to work in different ways that are comfortable for them. Flexible software also copes with changes in user needs/demands (e.g. changes in tasks). Examples of how flexibility may be achieved are: through enabling customisation (e.g. customisation of toolbars and menus) or enabling a number of different ways of performing a task (e.g. menu selection, keyboard shortcut, palette button).

(d) This is an open-ended section requiring candidates to understand the whole development process, but should cover the following points:

- Flexibility can be designed into a system to facilitate changes to the system at the following levels:
- User interaction level: allowing tasks to be carried out in different ways by using unmodified UI and functionality, e.g. uses keyboard shortcuts rather than menu selection;
- User Interface level: enabling modification of the UI using customisation, e.g. toolbar customisation, i.e. within prescribed limits;
- Application level: allowing functionality to be customised by user, e.g. macros, scripting etc.;
- Code level: design enables modification of UI and/or functionality at a code level, e.g. easy modification of forms, queries, scripts, modification of code;
- Architecture level: the entire architecture of the system enables easy and rapid modification of the software, e.g. object orientated design, modular design, layering of architecture.

Examiners' Guidance Notes

Only some of the candidates were able to demonstrate knowledge of the basic definitions and issues covered by this question. In particular, many candidates had difficulty with how a controlled study should be used to evaluate how easy it is for users to learn how to use a system. The need to retest users of the system after a period of time had elapsed was not included in many answers. Many candidates appeared to have difficulty thinking through the software development process for the section of the question on how flexibility can be designed into a software system at the different levels, and most answers did not show signs of systematic thinking about this.