

2910315 Human-computer interaction

Examiner's report: Zone B

Overall performance

The overall standard of answers to this examination paper was poor with a low average mark. However, more than three-quarters of candidates passed – although less than half achieved more than half marks. A very small number of candidates achieved higher level passes and there were a larger number of very poor results.

Candidates could choose 3 questions out of a selection of 5 but almost half chose the same three questions, questions 1, 3 and 5. About a quarter chose questions 1, 4 and 5 and a tenth chose questions 1, 3 and 4. Only very small numbers answered some of the remaining combinations of questions. The percentages of candidates answering each question were:

Question 1	<i>Psychology</i>	100%
Question 2	<i>Design & Modelling</i>	34%
Question 3	<i>Evaluation and usability</i>	52%
Question 4	<i>Interaction</i>	45%
Question 5	<i>Task Analysis</i>	69%

Marks for questions 1 and 5 were slightly higher than the average mark for the whole paper whilst marks for all other questions were lower. The highest overall marks were shared by questions 1 and 5 and the lowest by far were for question 2. The question combinations which had the highest average marks were questions 1, 3 and 5 followed by questions 1, 4 and 5 and questions 1, 3 and 4. Questions in order of marks are as follows:

Question 1	<i>Psychology</i>	<i>highest</i>
Question 5	<i>Task Analysis</i>	<i>highest</i>
Question 3	<i>Evaluation and usability</i>	<i>below average</i>
Question 4	<i>Design & Interaction</i>	<i>below average</i>
Question 2	<i>Design & Modelling</i>	<i>lowest</i>

General remarks

There were no essay-type questions in this examination paper and no question with only a single part. All questions were on a single independent topic: there was no mixing of different HCI topics within a single question. All questions were broken up into sections. In some cases a section was further broken down into parts. The marks allocated to each section were clearly indicated. The marks for each subsection or part of a section could be calculated by dividing the mark for the section by the number of distinct points that candidates were asked to identify.

Marking was carried out strictly in accordance with this scheme. If a section or part was not answered, no marks were given for it. Credit was not given for excessive answers to one section at the expense of others. Answering only half the question would attract only half the available marks.

Implications

It is important to take note of the following points and it is encouraging that, each year, more candidates take note of this since not doing so means that questions are not answered as well as they might be:

- Do not spend examination time answering one question at the expense of others: it is generally better to answer three questions fully than one in great detail and two very briefly.
- Ensure that you fully understand the topic area of the question.
- Ensure that you can answer every part and section of the question. Only being able to answer some of the question will not help you achieve a good overall mark.
- Ensure that the level and detail of the answer you give corresponds to the marks allocated to that section. Do not spend too much time and effort on a part of the question that is worth only 2 marks. Similarly, do not merely write cryptic notes or single points for a part of the question, which is worth 12 marks. Try to achieve the balance reflected in the marks indicated.
- Read the question carefully and answer in the way that is requested: wording such as 'describe', 'compare and contrast', 'itemise', 'illustrate', 'explain with diagrams' tells you what sort of answer is expected and what sort of detail you should go into. Make sure you understand what type of answer the Examiner is looking for and do provide diagrams or examples where requested since this is part of the marking scheme for the question.
- Questions in the HCI examination tend to be only on one topic area: there is no mixing of distinct topics so ensure that your response is on the subject dealt with. Read the question carefully to ensure you know exactly what is required.
- Do try to use tables and lists where appropriate – for example, in a question which asks you to contrast two approaches or itemise the differences between two aspects of a topic.
- Do not spend unnecessary time restating the question, either in your own words or in repeating the question text. This is not required and will use up valuable time.
- Do not spend time providing unnecessary diagrams (e.g. of the software life cycle model) where this is not explicitly required. If diagrams are explicitly called for, they should be clearly labelled and described. Providing only a diagram from memory as an answer will not achieve good marks.
- Do not repeat details from one section in another: it is unlikely that this is what the Examiner intended and the focus of your answer in each section should be quite distinct.

Comments on specific questions

Question 1: Psychology

General:

This question consisted of three parts on the topic of human information processing, specifically 'human memory'. Candidates were expected to correctly define each term – are all concerned with memory functions and features. Diagrams and examples were specifically requested and would especially have assisted in answering parts a) and c). The question was answered averagely well, with candidates tending to do best on parts a) and b) but poorly on part c). However, unlike in previous years, almost all candidates did answer the final part.

Specific:

Part a) required that candidates correctly define each of the terms 'short-term memory' and 'long-term memory'. Both are widely and simply described in the course textbook and Subject guide. Candidates did best on the definition of short-term memory but, for both parts of this question, many responses, although correct in principle, were too short. At the other end of the scale some candidates gave excessively detailed answers for the small number of marks available to each definition. Diagrams provided were usually adequate but a few inappropriate diagrams of the Model Human Processor were supplied, despite being specifically requested not to do so. Good answers gave correct detail, supported by diagrams that were suitably labelled, with components appropriately identified whilst poor answers were either too short or incorrect in their detail.

For part b), candidates were expected to provide a considered list of specific aspects of human memory which can be utilised in a practical fashion for good interaction design (e.g. capacities and capabilities of STM; ditto of LTM; the advantages of recognition over recall or the primacy of chunking mechanisms). Answers to this part were fair but with few outstanding answers.

For part c), candidates were expected to present a discussion of the use and exploitation of human memory in the design of interactive systems, using specific illustrative applications. It was expected that particular attention be paid to the visual design of human-computer dialogues, including those of text display, iconic representations; the overall usability of Direct Manipulation styles in terms of maximising recognition strategies; the problems of navigation in menu and form-filling interfaces; mnemonics, command sequences, etc. and the employment of user interface metaphors. Most candidates did discuss such implications in terms of usability factors such as learnability and consistency. Answers to this section were variable but good answers would have itemised and identified design principles, described them correctly and matched them to memory processes.

Question 2: Design & Modelling

General:

This question consisted of three parts on the topic of design and modelling. In part a) candidates were asked to describe design models; in part b) to provide examples demonstrating why an understanding of a user's knowledge of a system is important in HCI design, and, in part c), describing how a knowledge of the concepts of mental models and metaphor could be used to design a new interface for an online

application. The question was attempted by a very small proportion of candidates and attracted the lowest marks of all questions, parts a) and b) being especially poor.

Specific:

For part a) good answers would have explained the concept of models as used in HCI Design: a user's model is the user's view of a system and may be inaccurate, incomplete and different for different users; a designer's model is the designer's view of the system, a conceptual model of the structure and functions. A user interacts with the system image. Users develop mental models of a system via the system image, metaphor and previous knowledge, learning and expectations.

For part b) good answers would have explained that metaphors are employed by users to make sense of system functions and to relate them to real-world activities, allowing greater learnability and comprehension. They would have noted that user modelling helps in design strategy by focusing design and designers on users; by describing the users' tasks to give designers useful information about what users expect to see at the interface; by making prescriptions about how tasks should be supported by predicting in advance of user testing the usability of the system and by providing different information for evaluation (such as consistency, use of mental resources, time to complete tasks, where errors are likely to occur, etc.). Additionally, they would have shown that the Model Human Processor is the underlying Information Processing model underpinning much HCI theory.

For part c) there are many potential answers and no one is 'correct' but some may be more suitable and realistic than others. Good marks were allocated for general discussion of metaphor and system image; for well-considered examples; for discussion of interaction strategies and interface concepts and for breadth of knowledge in the example used. In terms of the design the metaphor chosen should have been appropriate, complete and accurate and the importance of documentation and meta-communication should have been noted. Diagrams were especially useful in this answer. However, candidates did need to fully understand and be able to describe the appropriate mental models and just what is meant by metaphor.

Question 3: Evaluation and usability

General:

This question consisted of two parts on the topic of HCI evaluation and asked candidates to describe, in part a), three different techniques and to identify, in part b), three categories of usability principles and to detail the principle of 'flexibility'. This topic is a fundamental concept in HCI, covered in the course textbooks and subject guide. The question was answered well but not exceptionally so. Candidates did much better on part b,i) and on parts a,i) and a,ii). Some very poor answers were given for part a,iii) and for part b,ii).

Specific:

Very good answers to part a) should have described the overall benefits of usability evaluation in terms of cost-saving, meeting usability targets, testing specific systems and checking design assumptions. In terms of the three techniques identified, they should have been able to identify

formative/summative and formal/informal criteria; to distinguish why those techniques are used, the point in the design cycle they can be utilised and benefits and disadvantages of each.

Good answers to part a,i) fully described the discount usability technique of Cognitive Walkthrough. CW is a technique that is assumed to be usable by HCI specialists and does not directly involve users since specialists/designers 'walk through' the interface answering a set of questions relating to how the user can make progress towards a goal and how progress can be assessed. The theory has a number of components that give rise to a set of nine questions, which govern the procedure of the walkthrough. Very good answers identified CW problems, in that it can be time-consuming to apply and form-filling tends to give way to assessing procedures instead.

Good answers to part a,ii) fully described the discount usability technique of Heuristic Evaluation, which also involves the use of HCI specialists who assess an interface against a set of heuristics, usually from a set by Nielsen and Molich. Very good answers listed both procedures and a set of heuristics with a good degree of detail, and provided description, not a mere memorised list.

Good answers to part a,iii) described the empirical evaluation technique of experimental evaluation – which involves assessing interfaces with the help of users. Data on the actual use of the system by representative users is gathered and analysed and survey methods such as questionnaires, protocols or observations are often used in addition. Very good answers identified that experimental studies also assume the systematic manipulation of some variable in the environment that is then measured and can be used to describe metrics.

In part b), good answers correctly identified and described the three categories of usability principles as described by Dix et al. (learnability, flexibility and robustness) and gave detail on 'flexibility' as requested (the sub principles and a definition in terms of the ways in which an end-user can exchange information with the system, thus enhancing flexibility of interaction). Very good answers would have provided a level of detail suited to the question and the marks allocated to it.

Question 4: Design & Interaction

General:

This question consisted of two parts on the topic of design interaction and asked candidates, in part a), to describe four different HCI techniques to support user-centred design, and to provide detail on information required for the technique to be operable together with any evident disadvantages. Part b) required candidates to describe an HCI design process utilising one of the techniques listed previously. Again, this basic topic is covered in the course textbooks and subject guide. The question was answered in an average fashion with both sections achieving similar marks but with a great amount of variability shown in answers to the individual parts of a). In particular, a,i) was answered well and a,ii) and a,iv) badly. Some candidates did not attempt part b) at all.

Specific:

In part a), good answers described each term correctly, emphasising user involvement, identifying when the techniques may be used, and why, and the appropriate time in the design life cycle when each is appropriate. Very good answers would have incorporated some identification of where the technique comes from and a discussion of any current or textbook

applications. Those should have described specific examples of systems where the techniques have been used, focusing on usability aspects; on mechanisms of obtaining user requirements; on iterative design and prototyping, and on HCI evaluation aspects.

For part b), there is no one right answer so it could have been approached in a number of ways. The question was a design exercise on the topic of multimedia interaction and interface design. It was expected that candidates would describe how to use their chosen prototyping technique to mock-up an interface and engage in early user testing to gather information on task and user requirements. The focus of the question was on the process of design and testing – and how this could be achieved – and not on the implementation of any proposed system. Good answers chose one suitable technique (from those listed) and described how to gather disparate process and user information, sometimes also considering aspects of user population identification, task analysis and initial requirements setting before deciding on the use of a design technique. Poor answers took the wrong tack and concentrated too much on the final design or interface of a proposed system.

Very good answers would have explained how a design method could ensure rapid and early prototyping, and usability evaluation at a suitable stage. A justification of why a particular technique was used and an identification of some of the problems and drawbacks of undertaking user-centred design in commercial situations in terms of applicability, resource and implementation requirements, appropriateness and expected outcomes could have been included.

Question 5: Task Analysis

General:

This question consisted of four parts on the topic of HCI Task Analysis. Candidates were asked, in part a) to provide a list of at least four practical uses of information derived from TA. Part b) asked for detail on the outputs from three different HCI TA approaches – but not to, as in previous years, provide worked examples of the techniques. Part c) required candidates to identify and describe three specific data collection methods for TA. Part d) asked candidates to identify and explain the stage of a design process at which each such technique might be used. This was a popular question and candidates who answered it achieved above average marks. All sections, with the exception of Part d), were almost fully answered. However, some responses were much too brief – some candidates did not allocate appropriate time to the different parts, providing too much detail for Part a) for the available marks.

Specific:

Part a) concerned the practical uses of TA in the design and implementation of prototypes, new systems, redesign and user support and training materials. Good answers adequately and correctly gave the information requested while poor answers gave only a cursory list.

Part b) required candidates to identify outcomes from three different HCI TA techniques, which should have included manuals, user help, requirements capture for design and the interface design itself. There are a number of techniques to choose from and many examples are provided in the textbooks. Good answers correctly detailed exactly what the question asked, using an acknowledged HCI TA technique (GOMS, KLM, TAKD, HTA) with correct notation and descriptions. Almost all

candidates described GOMS and KLM, many described HTA but very few described Knowledge Based Task Analysis with sufficient understanding. Poor answers merely gave the name of a technique; gave the wrong name, named a systems analysis technique not used in HCI or gave incorrect outputs.

Parts c) and d) required candidates to describe in full the three techniques identified for data capture and to define, for each, the stage in a design process when each might be used (from initial requirements through to prototyping and system testing). The majority of candidates did very well in part c) with only a small number missing out one or more of the three parts. A smaller number did well in part d) but some candidates did not complete this section or ran out of time. Good answers correctly detailed exactly what the question required, describing each term and identifying an appropriate design stage. Each technique is a standard one in both SA and HCI and specific stages in the development life-cycle (i.e. initial requirements gathering, prototyping, implementation, validation, post-delivery evaluation) where each could be employed should have been identified. Poor answers gave very limited information; repeated much of the answer given in another part; did not consider when such a technique might be used; or did not complete the entire question.