

UNIVERSITY OF BRISTOL
JANUARY EXAM PERIOD 2023
FACULTY OF ENGINEERING
COMPUTER SCIENCE

Third Year Examination for the Degrees
Bachelor of Science and Master in Computer Science

COMS30027-J
HUMAN-COMPUTER INTERACTION

There are FOUR questions

Answer ALL questions

The maximum possible mark is 100

Time Allowed:
2 hours

Do not turn over until instructed to start

This is an open book exam.

Question 1

You have been hired by Mike & Oussama, a high-end hair and beauty brand, to implement a sales app which can run as a graphical user interface (GUI) on their desktop website. They later hope to implement the app on a walk-up-and-use touchscreen experience at their flagship store on Oxford Street in London.

- (a) You are prototyping the desktop website for mouse users. You are debating whether you should place the basket checkout button either (1) in the centre of the screen or (2) in the top-right corner of the screen. The mouse cursor is motion-limited to the edge of the screen, you can assume this makes the width of the button in the direction of the cursor travel infinite in that case. Using Fitts' Law, derive in the general case (ie on average) why option (2) is better.

*Answer in 3-5 paragraphs
(8 marks)*

- (b) Compare and contrast the use cases of the store-based touchscreen and the web-based desktop GUI versions of the app. Explain why an optimal interface layout for pointing and selection might be different in the touchscreen case.

*Answer in 2-4 paragraphs
(6 marks)*

- (c) Being incredibly stylish, Mike & Oussama want to stop their touchscreen getting dirty with fingerprints, so the store is also considering using a touchless camera-based hand tracking system which offers users mid-air gestures. What additional variables or latencies are introduced into the Fitts' calculation in this scenario compared to the touchscreen case?

*Answer in 1-3 paragraphs
(5 marks)*

- (d) What is the positive value of using Fitts' Law for this job in the way you work with the client? Answer by naming three benefits of using Fitts calculations in this setting over more descriptive methods.

*Answer in 2-4 paragraphs
(6 marks)*

Question 2

After few months of deployment in their flagship store, Mike & Oussama call you back again, this time to relay to you the frustration that some of their clients have been experiencing when using the touchless interface in their store. You decide to examine the potential issues that customers may be experiencing by applying an analysis of affordances in the three systems to figure what could be going wrong.

- (a) Using Gaver's notion of affordances, speculate on what could be working well and not so well on the desktop website, the touchscreen app, and the touchless camera-based hand tracking system. Answer by outlining Gaver's notion of affordances and giving one example for each notion as it could apply to each of the three systems.

*Answer in 3-5 paragraphs
(8 marks)*

- (b) Choose one of the examples you identified in (a) that might not be working well, and describe how you might re-design the interface to fix the affordance in that example

*Answer in 1-3 paragraphs
(5 marks)*

- (c) Discuss how Gaver's notion of affordances differs from Norman's notion and illustrate this with 3 examples from the touchscreen interface used at Mike & Oussama's flagship store.

*Answer in 2-4 paragraphs
(6 marks)*

- (d) Discuss where and how Gaver's and Norman's notions of affordances intersect with the theory of External Cognition. Answer by presenting 3 examples from one of the three interfaces that were deployed to highlight how the design of their interfaces fails or succeeds in implementing principles of External Cognition.

*Answer in 2-4 paragraphs
(6 marks)*

Question 3

The COVID pandemic hit while you were still in the design phase of the alpha version of the touchless camera-based hand tracking system. Under lockdown conditions, you and your team moved to working online using Teams and Miro (a collaborative whiteboard platform). You also used these two platforms to engage with key personnel from Mike & Oussama to collect design requirements, and to get feedback on your design iterations.

- (a) Give a brief Distributed Cognition analysis of one the design meetings you would have had with your team. Describe the details of the distributed cognitive system in a scenario of your choice and explain your rationale for the analysis.

*Answer in 3-5 paragraphs
(8 marks)*

- (b) Give a brief Activity Theory analysis of one the meetings your team would have had with personnel from Mike & Oussama. Explain your rationale for the analysis to justify each element of your choice of activity system to analyse.

*Answer in 3-5 paragraphs
(8 marks)*

- (c) Explain what primary and secondary contradictions in an activity system are, illustrate these two levels of contradiction with examples from the analysis you produced in (b).

*Answer in 1-3 paragraphs
(4 marks)*

- (d) Outline some of the design insights you may have gained from the Activity Theory and Distributed Cognition analyses and explain in what ways an Activity Theory analysis differs from a Distribution Cognition analysis.

*Answer in 1-3 paragraphs
(5 marks)*

Question 4

Ultimately, your contacts at Mike & Oussama reported anecdotal evidence suggesting that their customers experienced misalignments between their identities, values and outlook, and the extent to which these were reflected and supported by the systems you developed.

- (a) During one of the meetings with Mike & Oussama, you suggested that their clients may be experiencing *Breakdown* situations. How would you explain this notion to Mike & Oussama's personnel? Answer by defining *Breakdown* as grounded in Phenomenological analysis and include illustrative examples from the walk-up-and-use touchscreen system of *present-at-hand*, *unready-to-hand* and *ready-to-hand* modes of tool use.

*Answer in 3-5 paragraphs
(8 marks)*

- (b) You debate what motivated costumers to engage in purchasing Mike & Oussama's beauty products. What design principles would you consider in order to help their customers to develop *intrinsic motivation* to use their app?

*Answer in 2-4 paragraphs
(6 marks)*

- (c) Contrast the approach you would take in (b) with an approach that targets Flow Experiences instead. What principles would guide your redesign in this case? and how do these principles contrast a Self-Determination Theory approach?

*Answer in 2-4 paragraphs
(6 marks)*

- (d) Going back to the drawing board with a phenomenological analysis perspective, your team decide to explore intersections of phenomenological analysis and Flow to pin down experiences of breakdown. Where does the phenomenological notion of *Breakdown* intersect with that of Flow? How might you use the notion of *Breakdown* to your advantage in achieving a better re-design of the system?

*Answer in 1-3 paragraphs
(5 marks)*

THIS IS THE END OF THE EXAM