

# Mobile HCI Coursework 2021-2022

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## 1. Assessment Groups

**For this assessment you will need to be in a group of 4 to 5 people. See moodle for details.**

Remember, people can contribute to your project in a variety of ways, with contributions varying across the semester. For example, Person 1 may produce most of the prototypes, Person 2 may take the lead in running remote evaluations, Person 3 may participate in other teams' evaluations and work on the report, Person 4 may do most of the implementation. Be fair to each other and communicate well to avoid any issues arising over perceived unfair contributions. Also reach out to us over teams if you have any concerns within your team.

**Advice:** Whilst the group allocation process is on-going, we recommend you individually concentrate on understanding the requirements of the assessed exercises, and doing your own initial reading on project areas that interest you, such that when you meet your group you have some initial ideas / provocations to discuss. In particular, you can find related work via the [ACM digital library](#) and [IEEE Xplore](#). Key relevant conferences include: ACM CHI, ACM MobileHCI, ACM VRST, ACM IMWUT, ACM UIST, IEEE VR – these conferences happen every year and are excellent resources when learning about the latest advances.

## 2. Scenario

Your team have been hired by a mobile device manufacturer to design innovative interactive experiences that showcase the capabilities of their upcoming mobile devices (a flexible phone, a smartwatch, a pair of augmented reality glasses). They would like your designs to show how their new devices can be used in **mobile contexts** (e.g. walking, running, travelling) to support **health and exercise**. This can include:

- Indoor or outdoor exercise, such as cycling, running, football or other activities;
- Activities that encourage physical activity and exploration, for example promoting sustainable active travel;
- Or any other innovative ideas that fit within this overlap of mobility + health and well-being



**Figure 1:** Examples of the future hardware capabilities your project might consider, although you are not required to use any of these demonstrated features.

The device manufacturer is open minded about how you address this design brief, but have asked for your designs to use novel interaction techniques, use multiple sensory modalities, and use at least one of the discussed device types.

You should be creative. Imagine the capabilities of future mobile devices or draw inspiration from cutting-edge HCI research, rather than being limited by the technical capabilities of today's hardware. Your designs can be as imaginative and innovative as you want, but you will need to be able to prototype them (simulating functionality is acceptable). There are a lot of design possibilities, using the many sensory modalities and device types available.

Mobile computing brings with it a number of challenges you should be conscious of, including:

- **User safety and attentional demand** – to what extent can your design be safely used when walking or running in shared public spaces with other pedestrians, or using public transport? How might you present information to your users to reduce distraction?
- **Physical demand** – how does physical activity and mobility affect users' ability to provide input and perceive output?
- **Social comfort and acceptability** – to what extent will users be willing to use your design in public or at work?

For this assessment, focus on interaction design and evaluation over engineering. We want to see you create innovative designs that are refined through evaluation. You will need to create prototypes of your designs, using an appropriate form of media for the design process (e.g., sketches, paper prototypes, digital wireframes, partly implemented prototypes).

Your final prototype does not need to be fully functional, but needs to be interactive for both demonstration and evaluation purposes. You could ‘implement’ this prototype using design tools (e.g., Adobe XD or Figma) or software (e.g., Android development, web-based apps in a browser) – but your implementation needs to be sufficient to enable meaningful evaluation. Focus your attention on interaction, rather than functionality. It is acceptable to simulate the behaviour of your prototype for the purpose of evaluation: e.g., using ‘Wizard of Oz’ techniques to fake gesture or speech recognition, or using images and videos to simulate the output from an augmented reality headset.

## 2.1. Summary of scenario requirements

You must:

- Create a **mobile interactive experience** that supports **health and exercise**;
- Incorporate **novel interactions**;
  - E.g. context-, location-, or sensor-based interactions
- Make use of **multiple sensory modalities**;
  - E.g. audio or haptics output, gesture or speech input;
- Use **at least one mobile device**;
  - i.e., flexible smartphone, smartwatch, XR glasses/headsets, smart wearables

## 3. Project Outline

**The project is split up between two Assessed Exercises (AE1 and AE2)** which will challenge you to complete and report on multiple cycles of requirements capture, ideation, design, and evaluation. You should use an iterative interaction design process, following the principles introduced during Unit 3 and Unit 4 of the course in particular. Throughout this process you should be producing prototypes, documenting your design decisions, evaluating your prototypes, and keeping notes on your findings. Your AE submissions will describe your work and these artefacts are evidence of the process you followed.

We want to see evidence that you have considered and evaluated multiple interaction designs; we do not want the final report to only present a single design from start to finish. By prototyping and evaluating alternative designs, you will be able to clearly justify the decisions that led to your final design. We also want to see variety: use a variety of prototyping methods, use a variety of evaluation methods (at an appropriate stage in the process).

### 3.1. Note: In-Person and Remote Evaluations

Your chosen evaluation methods will need to be suitable based on any constraints within your group about in-person versus remote attendance to labs, as well as any changes to Covid-19 restrictions. Both approaches are acceptable for this project.

*If remote evaluation is necessary*, consider that most of the evaluation methods from Unit 4 can be conducted online: e.g., using Discord, MS Teams, Zoom, Google Forms surveys, etc. Think about how you can leverage technology to conduct your evaluations. For example:

- Could you share your screen so a ‘usability expert’ can see your prototypes for a heuristic evaluation or cognitive walkthrough?
- Could you deploy a prototype to a ‘user’ and get them to share their screen so you can see how they interact during a think aloud evaluation?
- Could you implement a prototype for conducting a remote usability test, capturing performance data in-code and supplementing it with an online survey?

## 4. Design Process Outline

You are free to follow whatever design process you like, but the next sections give suggestions of activities you may wish to consider and include in AE1/2 submissions.

### 4.1. Step 1: Understanding the Requirements

Think about the requirements and how you might satisfy them. Consider questions like:

- What type of activity are you going to focus on?
- Who are your intended users?
- What might their motivations be for using an app or interactive experience like this?
- What could you do to encourage or support them in this form of activity?
- What interaction challenges arise from this form of activity?
- How can you incorporate one or more of the device types?
- How can you incorporate non-visual interactions?
- What are the unique selling points of your ideas?

At this stage, you may wish to think about what existing solutions look like. What smartphone apps already exist for health and exercise? How do they support or encourage participation? Are they aimed at enthusiastic athletes or complete beginners? Look at existing solutions and think about how users interact with them. Think about their experience when using these existing solutions. What do you think is good and bad about these? What features do existing apps have that help users? Can you identify potential improvements? The aim of this exercise is to break away from traditional apps and come up with something exciting and innovative, incorporating state-of-the-art mobile interactions using cutting-edge or anticipated future mobile devices.

By the end of this step, you should have a better understanding of your users, an awareness of existing solutions and their core interactions, and a set of possible features for your project. There are many potential outputs from this step of the design process. For example, an app definition statement, a list of core requirements, user personas, storyboards. Use these initial outputs as inspiration for the rest of the design process. Remember, these are not final and can be changed as needed.

### 4.2. Step 2: Concept Generation

Begin your interaction design process by coming up with creative ideas about how you can satisfy your project requirements. What will the core interactions with the system be like? How will users provide input and how will output be presented to them? You may wish to use

storyboards at this stage to develop your ideas, and will be supported in this through the Storyboarding lab in Unit 3.

Come up with as many interaction ideas as possible. Be as creative as possible. Try to envisage alternative ways of accomplishing the same goal. Consider all of the usage contexts. Think about all aspects of the interaction:

- How is interaction initiated?
  - Does the user take an action? Is an action triggered by context? etc
- What is presented to the user?
  - What does the “display” look like? Is there audio? Is there vibration? etc
- What can the user do next?
  - Is input required? What can they do next? Where do they go next? etc
- What can the device sense about the user (e.g. physiological data), their environment (e.g. location) and their activity?
  - Can the interaction be made simpler or more usable through this data?

You may find it helpful to divide the group at this stage, come up with your own design alternatives, then discuss your ideas together afterwards.

**Remember:** notes, sketches, etc., from this stage can be helpful when you write the final report.

### 4.3. Step 3: Initial Prototyping

Take your favourite design ideas from before and begin creating sketches or paper prototypes. The aim of creating paper prototypes is to be able to quickly evaluate and refine them. Don't be a perfectionist, don't spend too long making them look beautiful – because you will change and discard ideas that don't work! Think about how you can sketch and prototype interactions for wearable devices like smartwatches and augmented reality glasses. Use your imagination and think about how you can convey elements of your designs through paper.

At this stage in the process, you should focus on individual interactions, rather than the complete app. For example, you may prototype two methods of presenting information to the user, or you may prototype three ways of giving the user feedback about an action. Evaluate the interactions on their own at this stage because you want to identify the best ones to later combine in a complete app. Continue to iteratively design and evaluate your paper prototypes until you converge upon one or two designs that look like promising candidates.

**Remember:** keep copies of your prototypes, take photographs to help document the design process, and take notes about your findings. You may also find it helpful to directly annotate the prototypes. As before, any notes, photos and images from now will be helpful when you write the report.

**Advice:** in the early stages of design, it is acceptable to evaluate your designs within your teams. You may take on the role of usability experts rather than designers. You will also need to test with other people. Evaluate with naïve users who do not know about your designs. They are not

familiar with your designs, so will be the best people to help you understand any weaknesses that need to be improved. For example, it may be obvious to you which button to press or which speech command to give, but an unfamiliar user may have difficulty.

**Advice:** help each other! There will be many project teams needing participants for evaluation. Remember that participating in evaluation counts as work towards this project, so one person in your team could spend an hour evaluating other teams' projects while the rest of you evaluate your own designs.

#### **4.4. Step 4: Refined Prototyping**

By now, you should have a robust set of interaction designs that you have prototyped and evaluated. You should next start to think about how the individual interactions fit together, to create a cohesive interactive experience. For this, you may prefer to switch to using higher fidelity prototyping, by creating digital wireframe layouts (although paper is still okay). These should emphasise the core aspects of your designs and should represent how you envisage the final product.

Many wireframing tools are available, including Adobe XD, Balsamiq, Figma. You can also use tools like InVision to create interactive prototypes from photographs of your sketches and paper prototypes. See Moodle Unit 3 for more information about prototyping tools.

Your prototypes at this stage should be sharply focused on the core requirements for your app. They should fit together to create a cohesive interaction experience. Remember, focus on the core requirements and the core experience outlined by your app definition statement; avoid “feature creep” and introducing too many inessential interactions.

Evaluate your refined prototypes again. At this step, you should use an interactive evaluation method – with people ‘using’ your prototypes or giving feedback on them. For example, you might use the Think Aloud method, with Wizard of Oz elements to provide the system response. The Think Aloud method is about knowing what your users are thinking, not just what they are doing. It should focus on both positive and negative aspects of interaction. Encourage your users to talk while performing tasks and prompt them to tell you things like:

- What they are thinking;
- What they are trying to do;
- What questions arise as they interact with your prototype;
- The things they read;
- The things they try to interact with;
- How they think a task should be accomplished;

You may wish to make an audio or video recording of this process (with the participant's permission), so you can analyse it in more detail later. Take field notes about your observations and your users' comments. Divide responsibilities between your team: one person can prompt

the participant with questions, one person can take notes, one person can be the Wizard of Oz to facilitate the interaction.

**Remember:** all notes, recordings, images, etc., will be useful when it is time to write the report. Also, make sure you reflect on the evaluation process: what are the key outcomes?; what decisions did you make as a result of evaluation?; how will you refine your designs? etc

**Advice:** as before, help others – you do not need all members of your group to run an instance of an evaluation, so help out other teams by being a participant for them (there will be a moodle forum to help here). Get as many participants as possible. You could pair up with another team so that everyone can take part in evaluating the other team's prototype.

#### **4.5. Step 5: Implementing a Demonstrator Prototype**

You should now have an idea of what your final design is going to look like. Your evaluation results from the previous iterations should have helped you consolidate your design. Refer back to your app definition statement and storyboards: are these still valid, or do they need updated?

Now you should begin to create an interactive demonstrator prototype. Remember, the emphasis of the exercise is on the user interface and the interaction design, not a fully functioning implementation. You may choose to implement interactive prototypes using any software platform you like (e.g., native smartphone apps, web-apps in a browser, a Java or Python window shaped like a smartphone). For the smartwatch and augmented reality glasses, it is fine to simulate these (e.g., using differently sized windows in a browser, using Android Virtual Devices, or as a video that plays at the same time as the user interacts).

We are not going to consider the quality of the code when assessing your work. It is up to you to determine how you will build your prototype. It needs to be interactive and have sufficient functionality for you to evaluate and demonstrate it. As mentioned earlier, it is completely fine to 'fake' behaviour. You do not necessarily need to produce software.

Your final activity on the project will be to evaluate your prototype. You can use similar methods as before, but this time, your prototype should be fully interactive. The aim of final evaluation is to determine if your design is a success. No app is ever perfect first time round, so be honest in your report about what you learned and what you could improve if more time was available.

### **5. Assessed Exercise Deliverables**

For both AE deliverables, use the template available on Moodle (Word or Latex). Submissions should be uploaded by one person in the team to Moodle. The first page should include all student names and matric numbers for your team; Only one submission per AE deliverable should be made by each team, uploaded to Moodle by one person (nominate someone in your team to handle submission).

The project is split across two AEs:

- AE1 (mid-way through the course) – Proposal and Initial Iteration
- AE2 (end of course) – Report and Demonstrator Video

See the individual assessed exercises descriptions for details on what should be submitted.

Note that AE1 and AE2 share the same submission template. AE2 should include the contents of AE1 for completion sake, but the AE1 content does not contribute to the AE2 page limit/marking, it is purely there to give markers an overview of the background of your project.

## 6. Marking

AE1 is worth 10%; AE2 is worth 30%. This means that combined, coursework constitutes 40% of your overall Mobile HCI grade.

Deltas will not be requested by default. If you have concerns about how team work was distributed or feel like your relative contribution was unfair, please contact the course coordinators. We'd prefer you **raise any potential issues early on**, rather than after submission, so we can try to rectify those issues.

**Note:** if you attempt to do the MHCI project solo (i.e. you do not join a group and do not submit as part of a group) then you will receive an 8 secondary band penalty (i.e. an A1 would go to a C1). The level of ambition necessary requires a significant amount of work that only a team can feasibly achieve.