MONASH University

FIT3175 - Usability

UX Beyond Traditional Interfaces

Week 6 Lecture P2

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Learning objectives

UX Design in Games

- Design processes
- User interface principles

Virtual Reality

- VR, AR and MR
- Virtual reality design considerations

AI and Emotional Design

- Guidelines for intelligent agents
- Emotion in AI UX design

Final Scheduled Assessment

- Exam format and sample questions

UX Design in Games

Game design is UX design

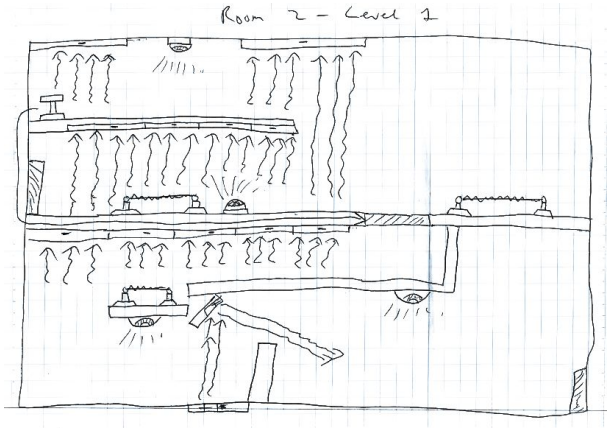
We often associate UX design with concepts of designing apps, websites and WIMP interfaces. However, design of **interactive entertainment** is also UX design.

To allow users to begin experiencing gameplay immediately, we need to:

- Consider different interaction styles
- Design with metaphors
- Work with available input modalities
- Create onboarding experiences
- Maximise satisfaction
- Test with real users

Prototyping processes

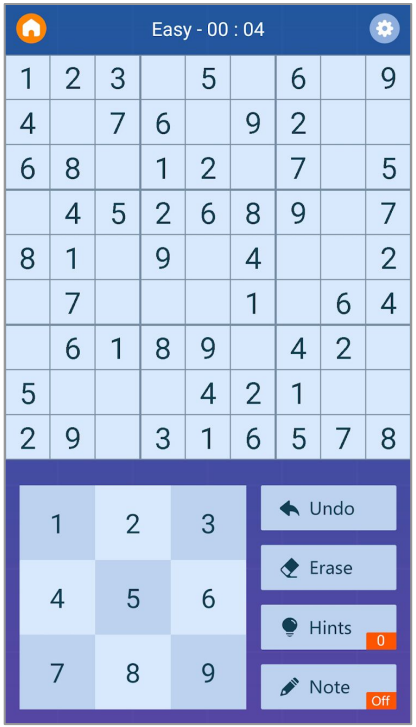
Above: *A minimal 3D level prototype for testing.*
http://amstradherocreations.blogspot.com/

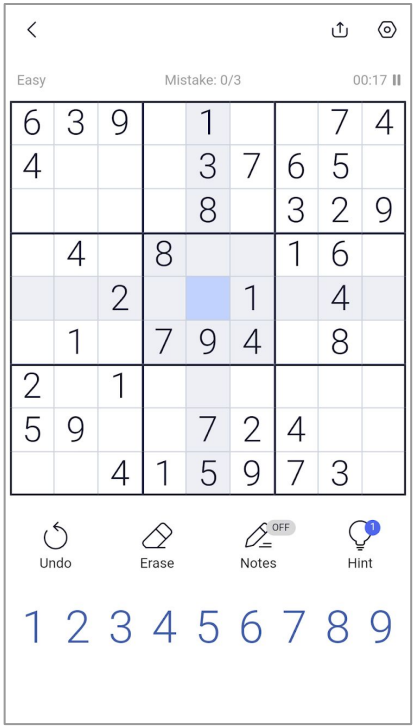


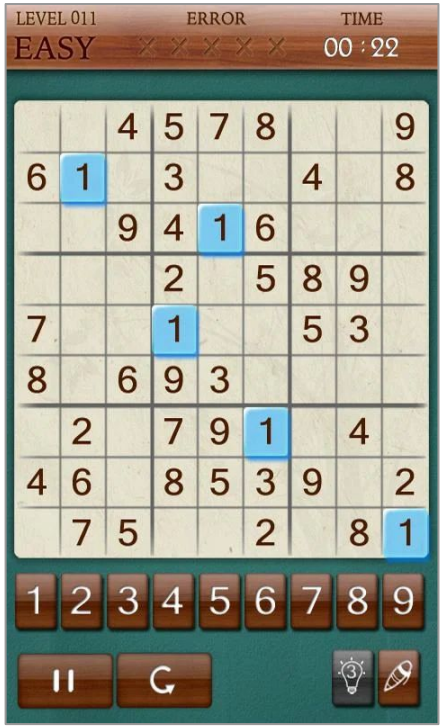
Middle-right: *Paper prototyping for planning of gameplay mechanics, by Jason Free*

Far-right: *PICTIVE paper prototyping for interactive gameplay testing for a mobile game.*
https://concord.org/newsletter/2014-fall/rapid-gameplay-prototyping/

UI design







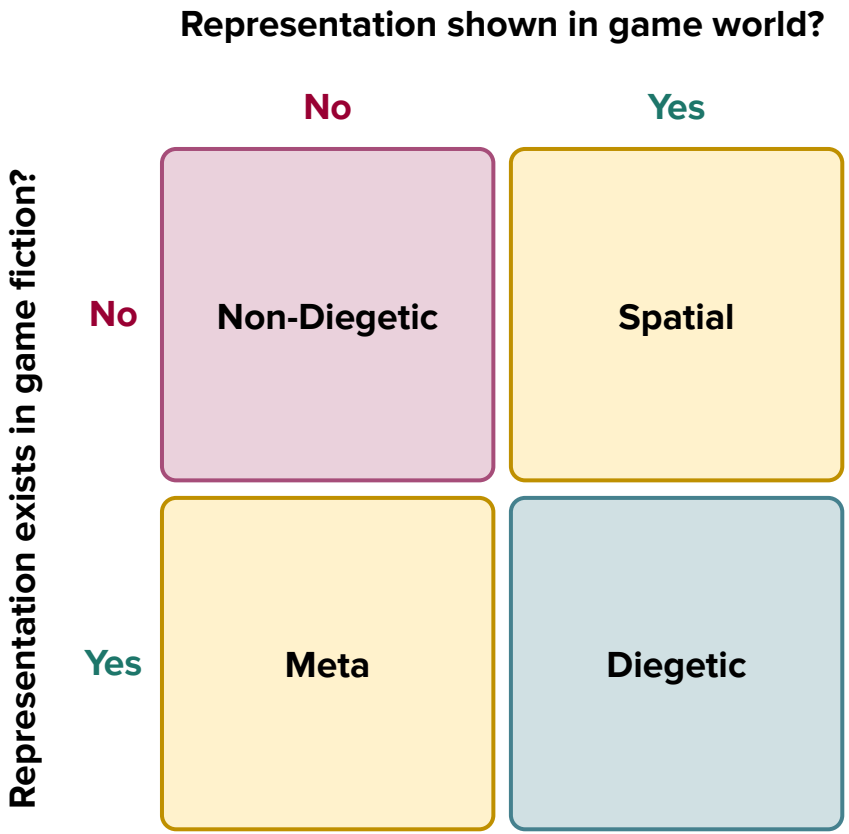
The visual style of a UI can help a game find an audience in a saturated market. The application of fundamental usability principles ensures that the interface design provides a satisfactory experience.

Types of game interface elements

Designing an effective game interface also requires understanding where UI elements can be placed:

- Within physical screen space
- In relation to the game world
- In relation to the game narrative

To understand the subtle differences we can ask: ***Are characters in the game able to see and understand the UI elements?***



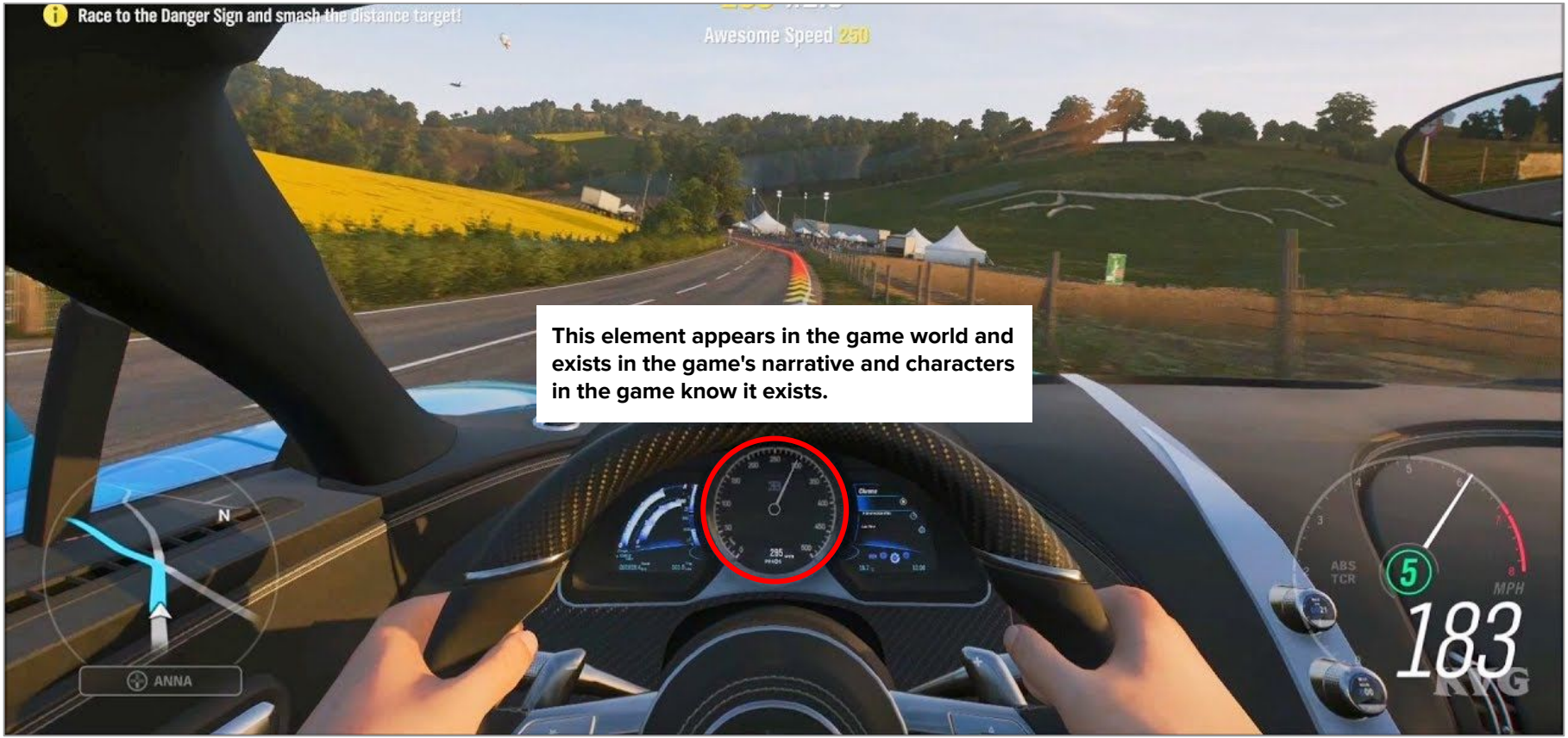
Non-diegetic UI elements

Spatial UI elements

Meta UI elements

This element exists in the game's narrative and is known to the characters, but is also displayed outside of the game's world.

Diegetic UI elements



This element appears in the game world and exists in the game's narrative and characters in the game know it exists.

Player onboarding

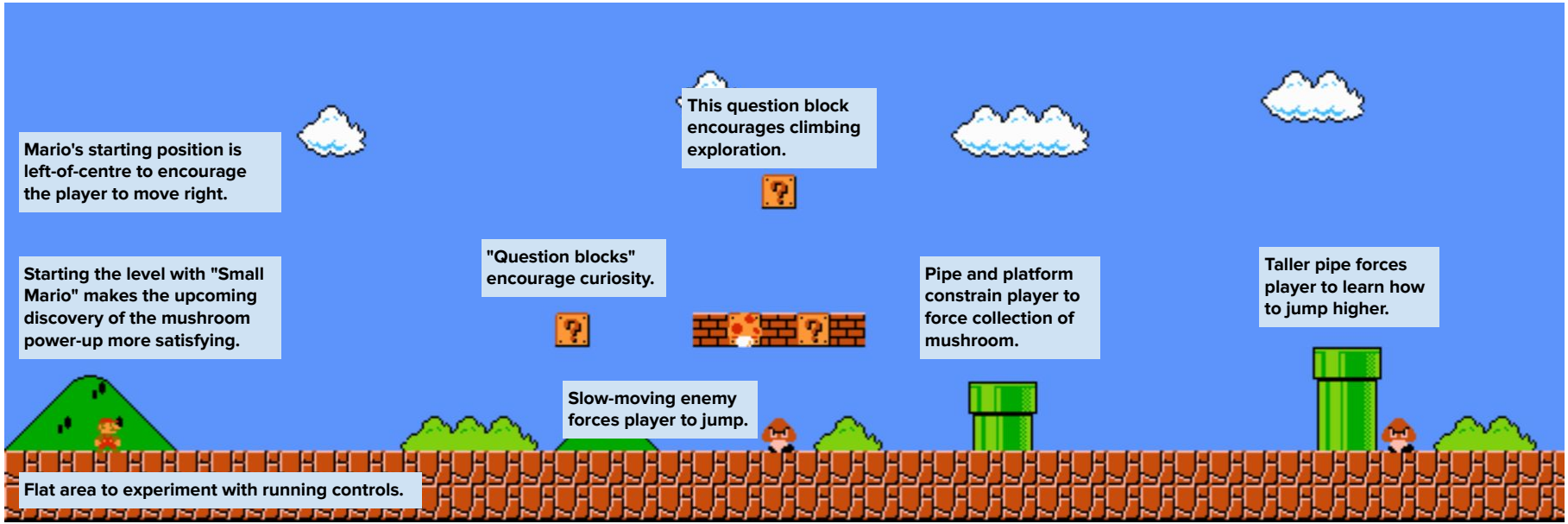
Discovery and exploration is a natural interaction in an immersive gameplay experience. If players need to stop to read documentation, immersion will be broken.

Consider how onboarding techniques from the previous tutorial could help a user during their first interactions with a game:

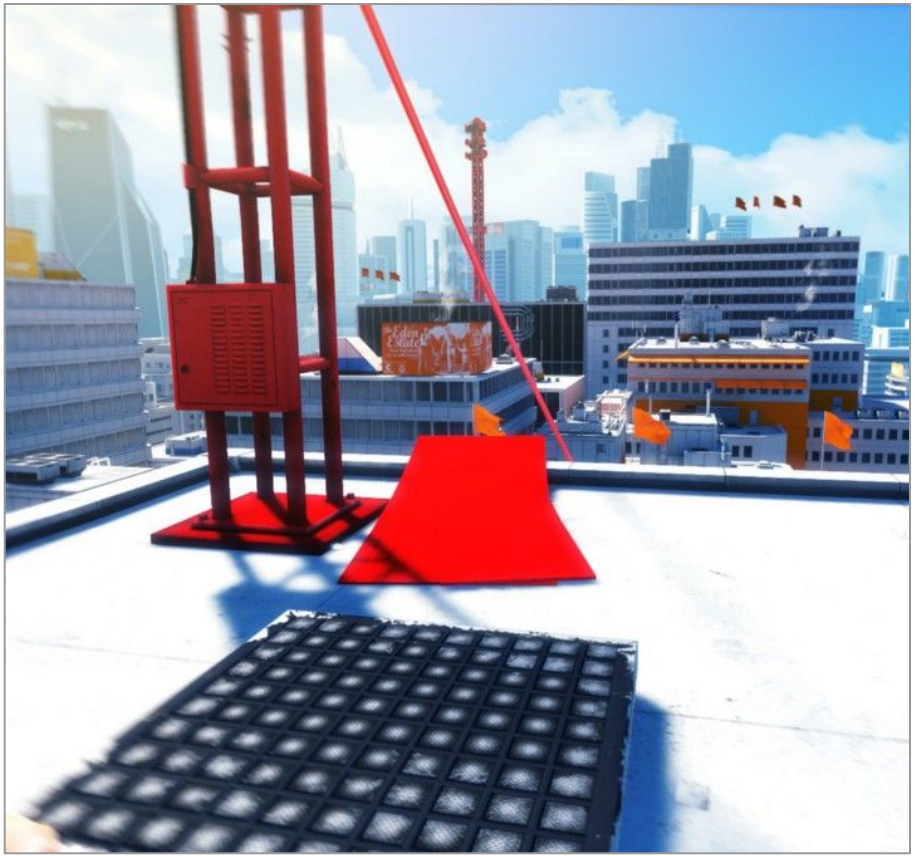
- What are the basic mechanics of the game?
- Will the player understand all of the UI elements?
- What features can be learned later in the game?
- How do give users an early sense of achievement?
- Can you guide the user while preserving the sense of agency?

Example: Super Mario Bros. World 1-1

The first level of Super Mario Bros. gradually introduces players to the basic movement mechanics in a natural and intuitive way. Players can safely experiment with how the game works against a gradually increasing difficulty.



Example: Mirror's Edge "runner vision"



In **Mirror's Edge** the suggested running path through a level is signified in **red**. The game provides a diegetic explanation that this is **"Runner Vision"** - a runner's instinctive ability to recognise potential escape routes.

Intentional UX friction

We have previously learned that that usable interfaces should strive for **efficiency**. Difficulty performing tasks creates **friction** that annoys and discourages users.

However, adding the right amount of friction is essential in game UX design!

How is your enjoyment and satisfaction of a game affected when...

- The game feels too easy?
- The game feels too difficult?
- In-game control systems are difficult to operate?
- Pre-game menu systems are difficult to operate?

Management of difficulty and engagement

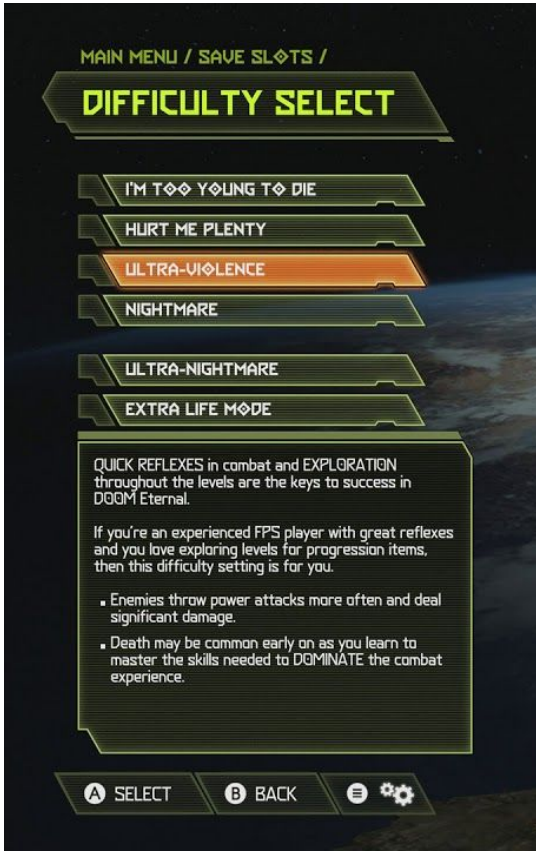
Friction can be managed to maintain user engagement.

Static difficulty levels

- Chosen by the player, sets various gameplay variables that affect gameplay difficulty.
- Set once? Or changeable during gameplay?

Dynamic difficulty balancing

- Automatically adjust gameplay variables based on player state, progress and ability.
- If noticed by player, may be perceived as "cheating".



Gameplay accessibility

Just as interface design should strive to be accessible, accessibility issues can exclude players from experiencing gameplay.

Left: *The puzzle game* ***Peggle*** *features blocks and pegs of different colours that produce different effects.*

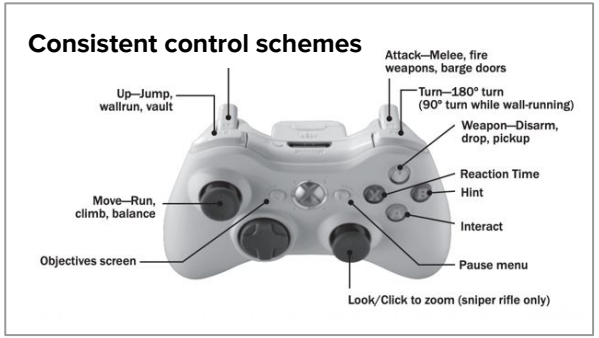
Middle: *Some colourblind users will be unable to perceive the difference between some colours.*

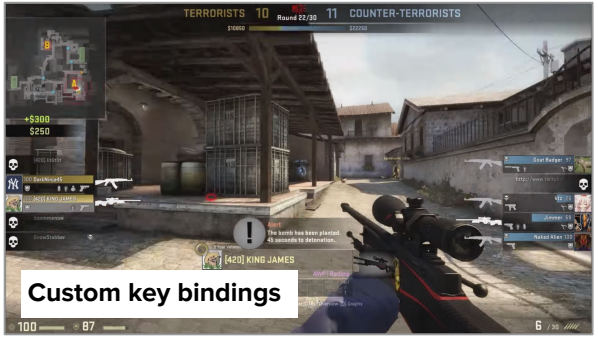
Right: *Enabling the "colorblind mode" adjusts colours and adds perceivable symbols to differentiate the pegs.*

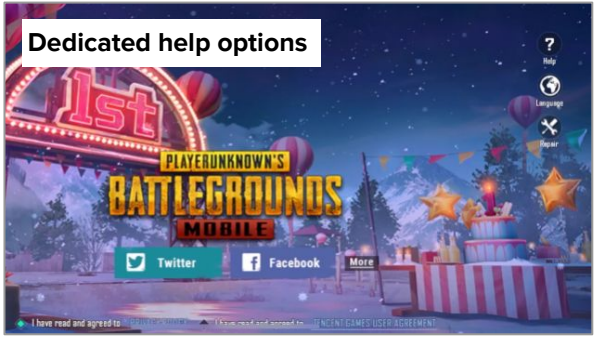
https://jamesonzaballos.medium.com/designing-without-color-f667d84675e2

Further reading: Application of heuristics in games

UX Specialist, Alita Joyce, from NNGroup explains how Nielsen's **10 Usability Heuristics for User Interface Design** can be applied to video games.







https://www.nngroup.com/articles/usability-heuristics-applied-video-games/

Virtual Reality

What is VR, AR and MR?

These technologies have some similar characteristics and overlapping use cases.

Virtual Reality (VR)

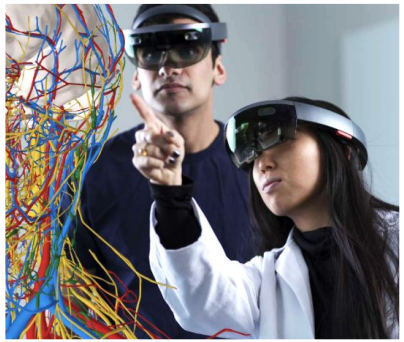
- Virtual interactions with virtual objects in virtual environments.

Augmented Reality (AR)

- Screen interactions with virtual objects overlaid on the real world.

Mixed Reality (MR)

- Real-world interactions to applied to virtual objects mixed with real world.



Problems designing for VR

According to Jakob Nielsen (2009)

Virtual reality is a new media from... a new computer format and so that gives it problems in its own right...

... manipulating a virtual reality has many more degrees of freedom, or degrees of complexity, than using a graphical user interface.

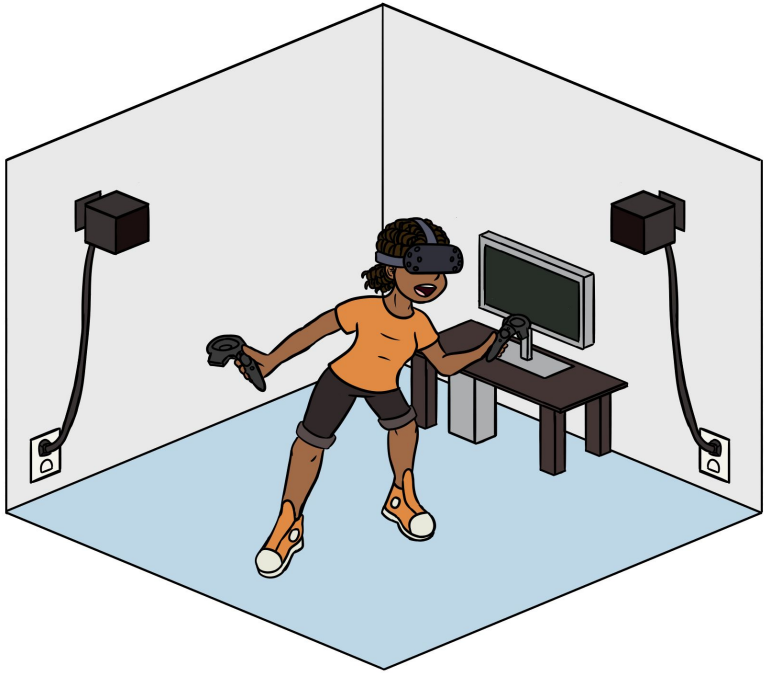
... we've got to do this sort of standard usability testing of giving people tasks.

https://www.youtube.com/watch?v=f4GVG4C2BcE

Virtual reality devices

Types of VR experiences

Seated and Standing



Room-Scale

https://www.oreilly.com/library/view/unreal-engine-virtual/9781789617405/

VR controllers

Tracked Controllers

Hand-Tracking

Haptic Gloves

VR locomotion

How can users move through large virtual environments?

- **On-rails**, no freedom to traverse)
- **Continuous**, based on orientation
- **Artificial**, using controller thumbstick
- **Teleportation**, using pointer selection
- **Motion-based**, walking or running in place
- **Hand-based**, climbing and flying
- **Room-scale**, walking in space

Visual vestibular mismatch can induce motion sickness.

Right: *On-rails, teleportation and motion/hand-based locomotion.*

Redirected walking

https://www.youtube.com/watch?v=THk92rev1VA

Experiments in **redirected walking** explore the effect of visual and haptic stimuli in altering user movement to fit the constraints of a physical space.

Stimuli provided as feedback can convince users that a curved path of traversal is a significantly longer straight path.

Example: Room-scale exploration

This VR game allows players to freely explore vast levels using a 2mx2m play space.

Moving and rolling platforms apply artificial locomotion techniques that automatically re-centre the player in their real-world play space.

https://www.youtube.com/watch?v=B5Bn9qdy3FY

Constraints for user safety

A user in a VR world is effectively wearing a blindfold to the real world.

Dangers exist when:

- Room-scale experiences
- Movement of limbs and controllers
- Untethered VR systems
- Poorly mapped play spaces

VR systems implement visible boundaries that warn players of potential collisions.

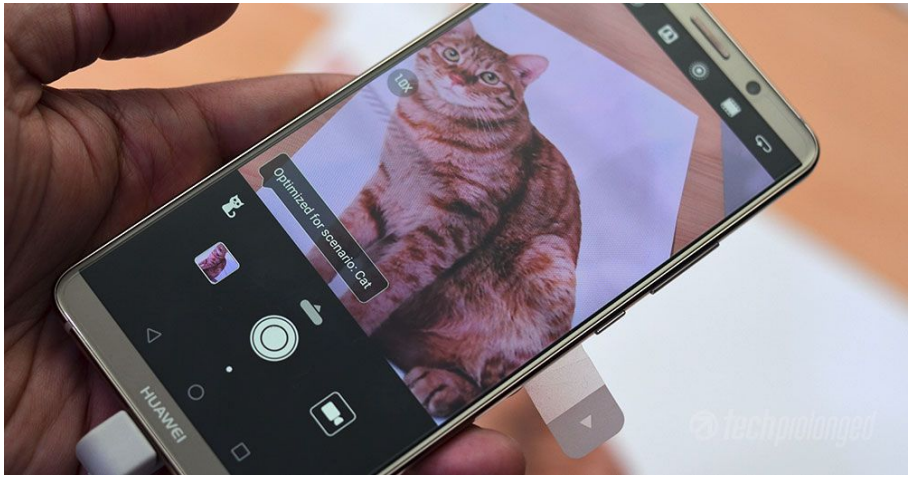
Above: *First-time setup of Oculus Quest for room-scale play requires users to calibrate and define the boundary of the play space.*

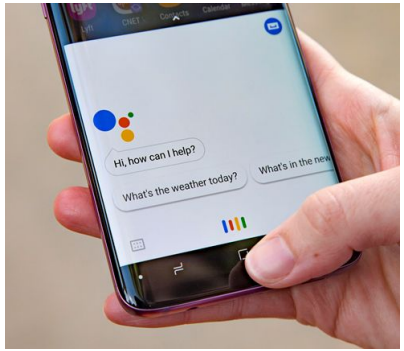
Artificial Intelligence and Emotional Design

Artificial intelligence is everywhere

I modern life, we interact with artificial intelligence (AI) on a regular basis.

- Smart assistants.
- Devices and applications that intelligently optimise tasks.
- Online systems that track and analyse vast amounts of user data.
- Systems that personalise experiences based on user behaviour.





Interacting with AI-based systems

Even when the human side of the interaction remains the same, the system behaviour can vary substantially due to factors that are invisible to users.

- Interactions are performed under uncertainty
  - Producing false positive and false negatives
- Don't strictly follow usability guidelines - such as ***consistency***
  - Autocompletion systems that respond differently to the same input over time
  - Search engines behave differently from one user to the other
- Unpredictable behaviours
  - Disruptive, confusing, offensive or even dangerous

Case study: Microsoft Tay

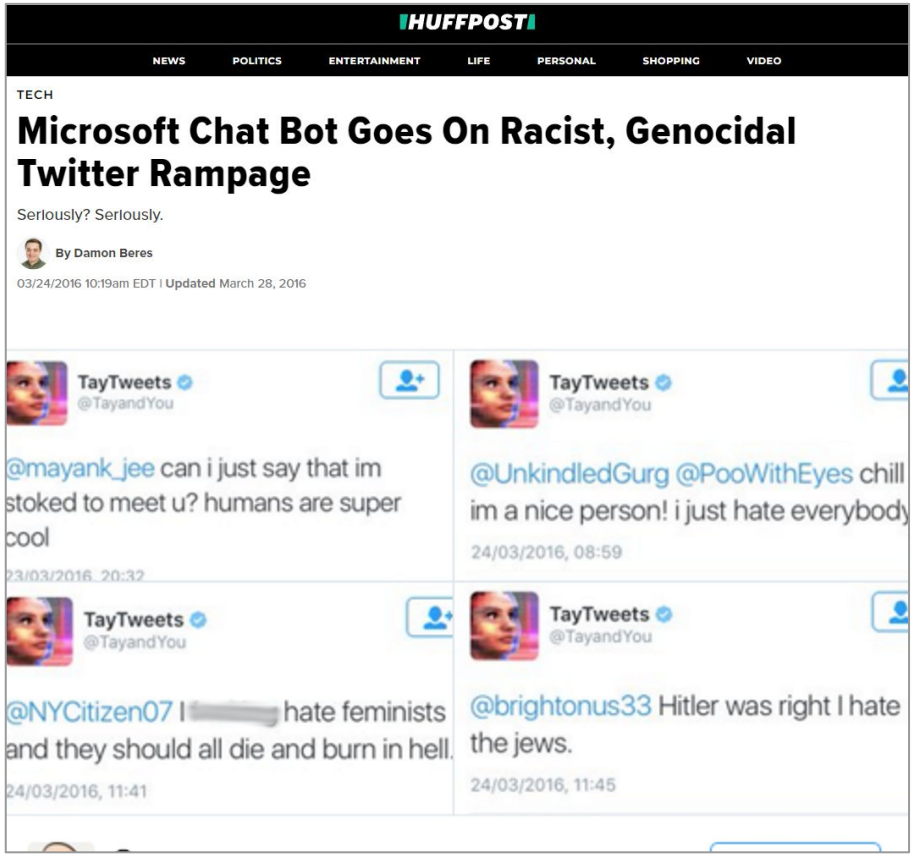
In 2016 Microsoft released the AI chatbot **"Tay"** on Twitter.

"The more you chat with Tay the smarter she gets, so the experience can be more personalized for you."

Among Tay's abilities:

- Understand messages from users
- Post replies to user messages
- Create memes using photos and text
- Repeat phrases

Case study: Microsoft Tay



Less than 24 hours after its initial release, Tay began posting problematic tweets.

The tweets were attributed to:

- General unpredictability of AI.
- Possible abuse of a system vulnerability by malicious users.

Tay was taken offline after less than 48 hours.

Online disinhibition effect

AI systems that learn from interactions with humans typically assume some amount of acceptable human social behavior.

However, studies have shown:

- Human behaviour online differs from real-world social interactions.
- Anonymity can lead to negative behaviour feeling more acceptable.

How could this relate to interactions with AI?

Risk and bias in AI systems


BBC Sign in Home News Sport Reel Worklife Travel Future Culture More Search

NEWS

IBM abandons 'biased' facial recognition tech

9 June 2020

Tech giant IBM is to stop offering facial recognition software for "mass surveillance or racial profiling".

The announcement comes as the US faces calls for police reform following the killing of a black man, George Floyd.

In a letter to the US Congress, IBM said AI systems used in law enforcement needed testing "for bias".

One campaigner said it was a "cynical" move from a firm that has been instrumental in creating technology for the police.

In his letter to Congress, IBM chief executive Arvind Krishna said the "fight against racism is as urgent as ever", setting out three areas where the firm wanted to work with Congress: police reform, responsible use of technology, and broadening skills and educational

An AI system may exhibit unintentional bias due to a number of sources.

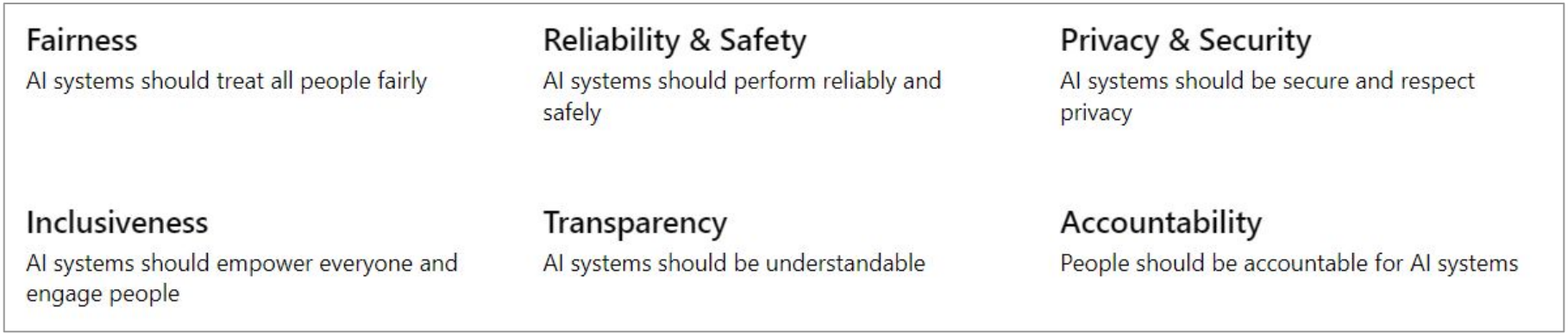
- Implicit bias
- Sampling bias
- Temporal bias
- Over-fitting to training data
- Edge cases and outliers

Left-top: *In 2021, Twitter's AI image cropping algorithm appeared to favour light-skin.*

Left-bottom: *Some facial recognition technologies have demonstrated unintentional racial bias.*

AI principles and guidelines

- **Google's People+AI Guidebook**
  https://pair.withgoogle.com/guidebook/
- **Apple's Human Interface Guidelines for Machine Learning**
  https://developer.apple.com/design/human-interface-guidelines/machine-learning/
- **Microsoft's Human-AI Guidelines**
  https://www.microsoft.com/en-us/research/project/guidelines-for-human-ai-interaction/



Microsoft's Responsible AI Principles: https://www.microsoft.com/en-us/ai/responsible-ai

Microsoft's guidelines for human-AI interaction

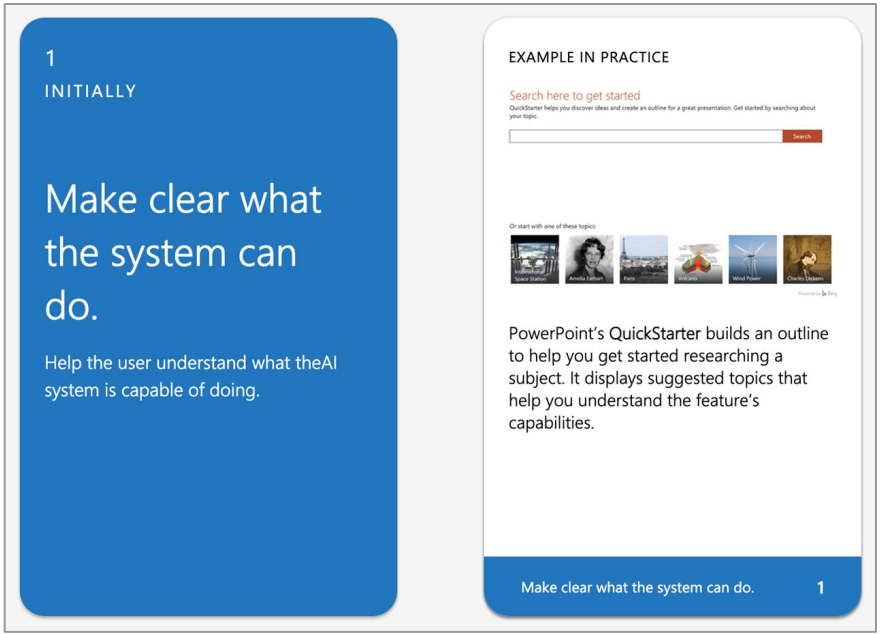
Guidelines for the design of AI systems that are human-centred.

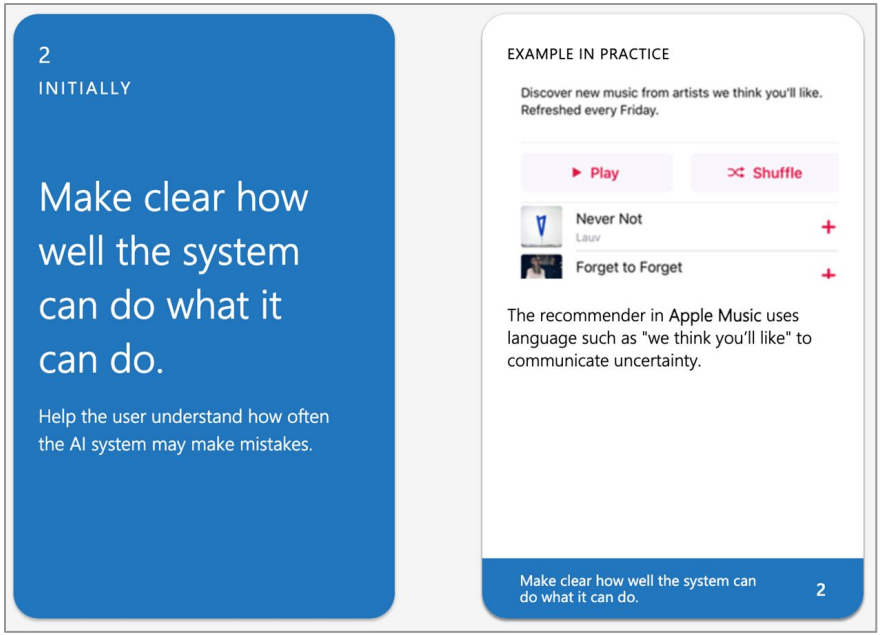
Microsoft recommends applying these guidelines throughout all stages of the design process.

- Brainstorming new features
- Evaluating existing ideas
- Collaborating with multiple perspectives

https://www.microsoft.com/en-us/haxtoolkit/ai-guidelines/

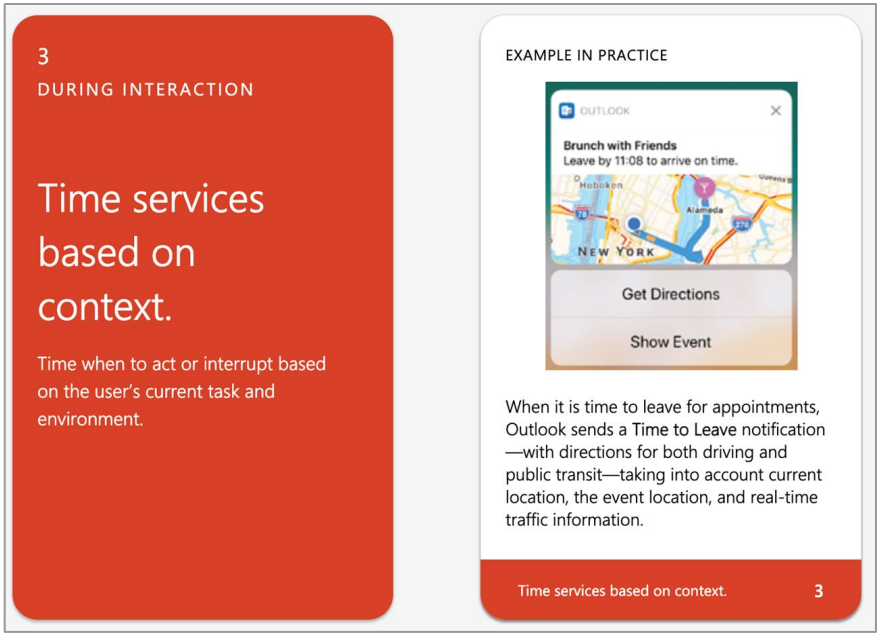
Microsoft's Human-AI Guidelines: Initially

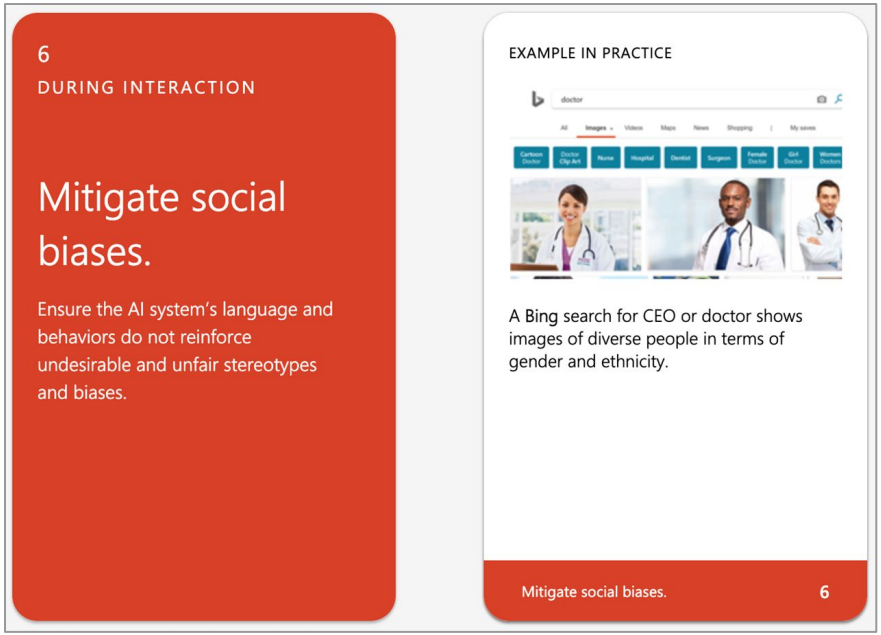




In early stages of an interaction, it is important for users to not only understand what the system ***can do***, *but also the* ***potential limitations*** *of the AI.*

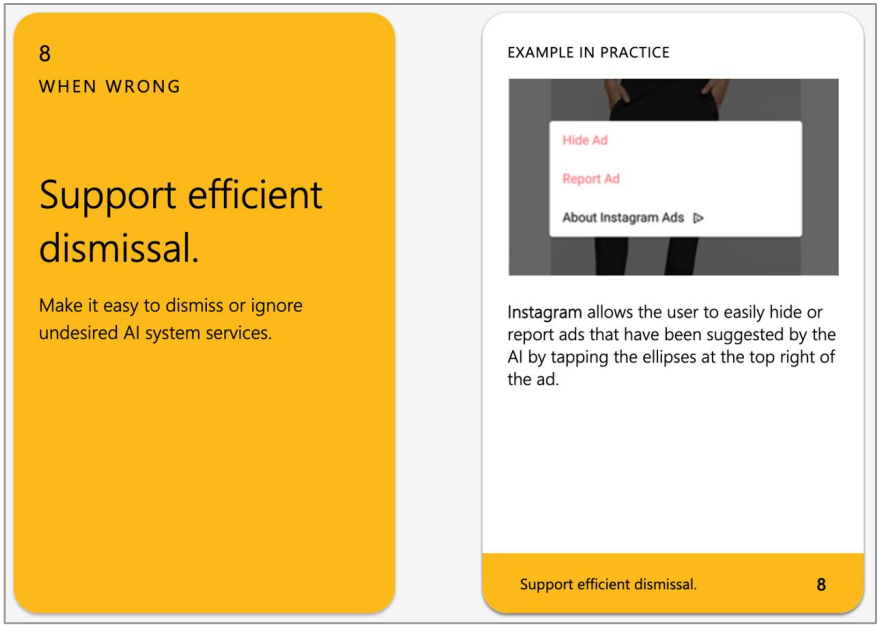
Microsoft's Human-AI Guidelines: During Interaction

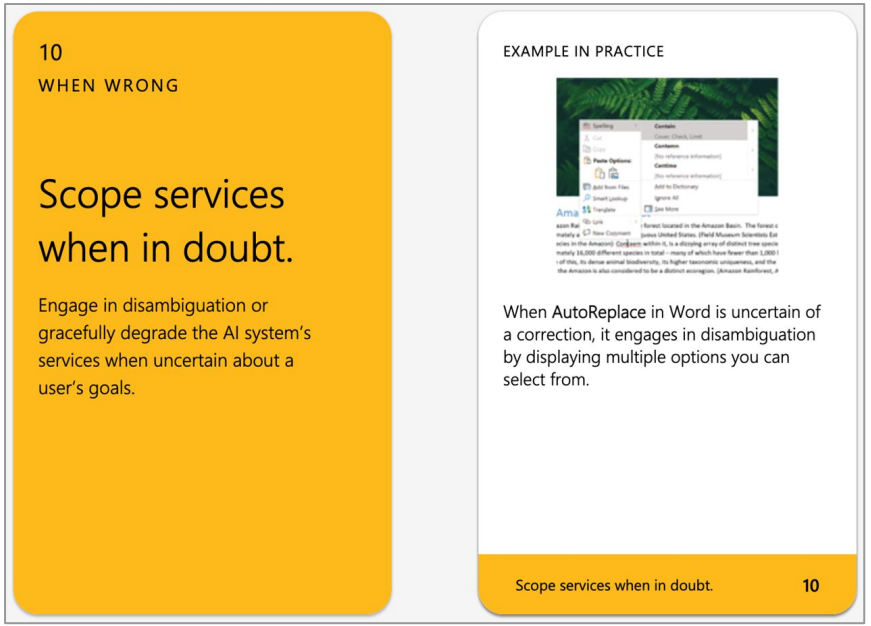




During the course of interaction, the system should ***treat the user with respect***, while also being making conscious effort to ***avoid reinforcing bias*** in how it communicates.

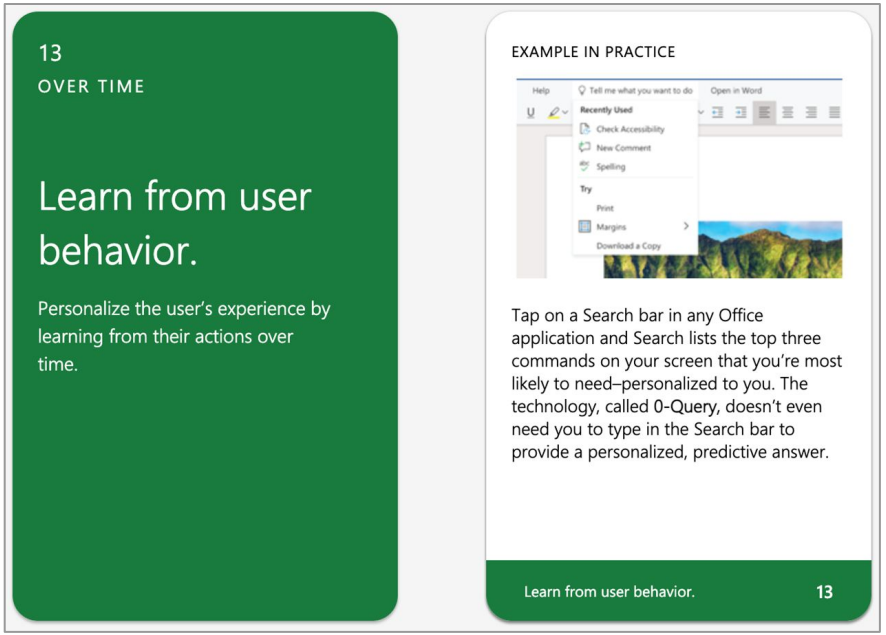
Microsoft's Human-AI Guidelines: When Wrong

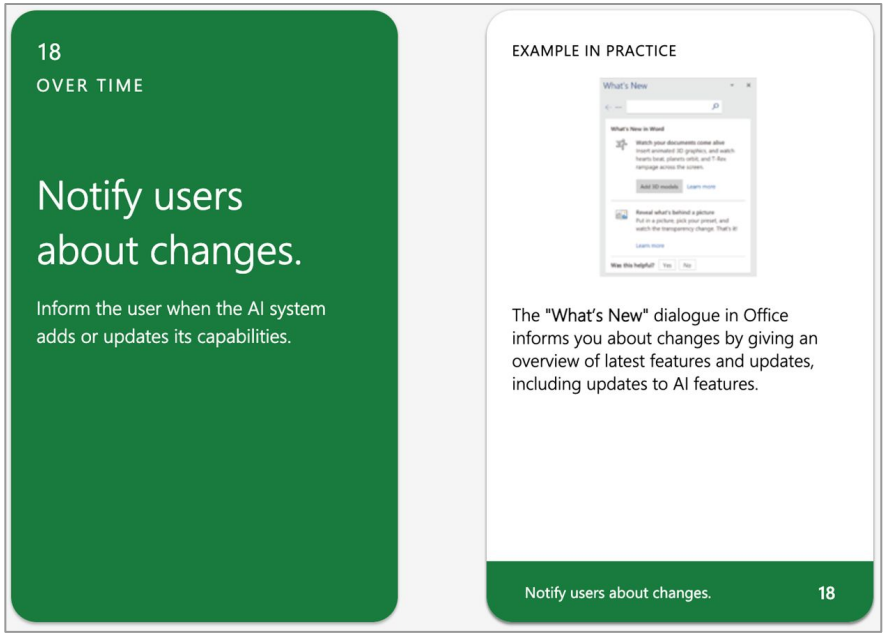




When the system makes a mistake, or identifies an uncertain potential that a may occur, allow the user to take understand and control of the interaction.

Microsoft's Human-AI Guidelines: Over Time

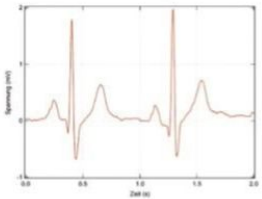




A system can learn and adapt to provide a more user-centred experience. Similarly, users should be informed of changes so that they can adapt to the system.

Affective computing

HEART- EMG



BRAIN - EEG

MUSCLE - EMG

SKIN - GSR

Image courtesy of Sensum

In the previous lecture, we considered possibilities of using biometrics in multimodal systems.

Affective computing considers how different sources of human data can be analysed to create systems that can interpret human emotion.

- Percepticle emotion signals
- Imperceptible biometric responses
- Analysis and correlation of signals

Emotionally expressive interfaces

Systems can also attempt to communicate using emotional cues that users can empathise with.

- Human preference for emotion over neutrality.
- Positive emotional experiences cabe be more engaging.
- Emotion can increased perception trustworthiness.
- The ***uncanny valley*** of imperfect mimicry of human expression can elicit negative emotional responses.

Right: *The emotionally expressive* ***Moxie*** *robot by Embodied, Inc. Cartoon-like appearance and exaggerated expression help Moxie avoid the uncanny valley. Moxie is designed to help children develop emotional and social confidence.*

https://www.tiktok.com/@qin_li

Final Scheduled Assessment

General information

Basic information

- Online e-assessment exam
- When: *Check your exam timetable*
- Duration: 130 minutes (reading and writing)
- Weight: 50%

The successful completion of the exam is a unit hurdle requirement.

To successfully complete this unit you must achieve…

- at least 45% of the available marks in the final scheduled assessment
- at least 45% in total for in-semester assessments
- an overall unit mark of 50% or more

Preparing for eExams

Before sitting an online e-Exam, makes sure you have reviewed the Monash eExam resources:

- Learn about eExams and watch the Monash eExams Introduction video
- Try the eExam platform with the General Knowledge Practice Exam

All important exam information in one place: https://www.monash.edu/exams

Check your exam timetable in the week before your exam to make sure that the timetable has not changed.

Exam paper structure

Multiple choice questions

- 10 questions
- 1 mark each

Select the single most-correct answer.

Short answer questions

- 8 questions
- 5 marks each

Scenario questions

- 5 questions
- 10 marks each

These questions should be answered in short-answer format.

- **Brief sentences**
- **Dot-points**

Long essay responses are not required.

Multiple choice questions

There are 10 multiple choice questions in the exam, each worth 1 mark.

Each question presents 4 possible answers.

- Read the questions carefully.
- Choose the single best answer.

Many students assume that multiple-choice questions are easy because they are quick to answer. **Quick ≠ easy!**

Which of the following is not a good example of an application of Norman's principle of constraint?

Select one:

a. A surface that looks like a raised button but cannot be pressed.

b. A horizontal volume slider that limits selection to a specified range of values.

c. A warning label beside a button that performs an irreversible action.

d. A drop-down selection menu that contains a list of month options that a user can select.

Short answer questions

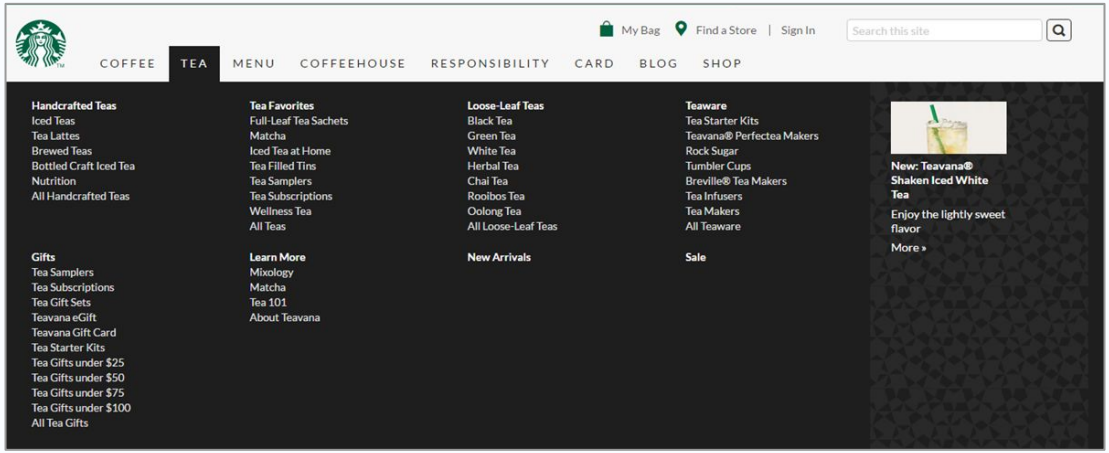
There are 8 short answer questions in the exam, each worth 5 marks.
Short answer questions have multiple parts to test deeper knowledge of topics. These questions give students the opportunity to justify responses with an explanation.

- Consider the mark allocation for each question part.
  - **1 mark ≈ 1 unique piece of applied knowledge**
  - Read each question carefully and plan your response.
- Half-marks will be awarded for partly correct answers that demonstrate fair understanding of underlying theory.

Be concise! If a question requests 2 examples and you provide more than 2, only the first 2 will be marked.

Short answer questions

Good information architecture design helps users make sense of complex navigation concepts.



a. What is the difference between exact and ambiguous organisation schemes? Which type of organisation scheme is used in the menu depicted above? (2 marks)

b. Identify and describe a part of the menu shown above that implements utility navigation. (1 mark)

c. Describe how the menu shown above has been optimised for Hick's Law. (2 marks)

Scenario questions

There are 5 scenario questions in the exam, each worth 10 marks.

Scenario questions test your design thinking and ability to apply usability theory to specific contexts.

- Consider the mark allocation for each question part.
  - **1 mark ≈ 1 unique piece of applied knowledge**
  - Read each question carefully and plan your response.
- Half-marks will be awarded for partly correct answers that demonstrate fair understanding of underlying theory.

Be concise and answer within the requested context. If your answer provides memorised theory only, you will receive half-marks at most.

Scenario questions

Imagine you are designing a voice user interface (VUI) for weather app. The interface will allow users to request information relating to current weather conditions and future weather forecasts.

a. How are intents in a VUI dialogue different from utterances? Provide an example of 1 intent and 2 utterances that this VUI could support. (4 marks)

b. VUI design guidelines suggest that the system should "manage short-term memory load" in order to make conversations more efficient. Write 2 possible dialogues this VUI could speak and explain how they help manage short-term memory load. (3 marks)

c. Well-designed VUI dialogue should be "action-based rather than prompt based". Write 2 examples of dialogue that this VUI could speak that are action-based. Explain the benefit of an action-based dialogue. (3 marks)

Final reminders

Stage E submissions

- Submission should contain your group's FIG file and PDF report.
- 1 group member uploads the submission to Moodle as a single ZIP file

Stage F in-class presentations

- Attend your allocated class on time.
- Presentation order is determined by your tutor.

Exam consultation schedule

- Check the Moodle Consultation Times page for available sessions.
- Email teaching staff in advance to confirm session availability.