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C1: Introduction to HCI

Computer Science & Cognitive Psychology (contributed to??, example)

202401 Question 1-You want to build a mobile app for SPM/STPM fresh graduate students. This mobile app is aimed to help those students to find information about program offerings across various universities and colleges. Answer the following questions based on this scenario.

202401q1a)The study of Human Computer Interaction (HCI) involved multiple disciplines. Explain how the Computer Science and Cognitive Psychology fields contributed to HCI design of this mobile app. Your explanation shall include providing an example for each of the fields.(5 +5 marks)

202406 Question 1-You want to build a meal ordering website for TARUMT café. This website is aimed at helping students order their meals before they are sold out. Students can order their desired meals a few hours before their break time and pay via online banking, e-wallet, or debit/credit card. Answer the following questions based on this scenario.

202406q1a)The study of Human Computer Interaction (HCI) involves multiple disciplines. Explain how the Computer Science and Cognitive Psychology fields contributed to HCI design of this website. Your explanation shall include an example for each of the fields.(5+ 5 marks)

Contribution of computer science to HCI design of this mobile app/ website

technical foundation: ensure that the app runs with an efficient backend to increase efficiency of finding a school they want to apply | order their desired meals especially during peak times when many students may order at once

data management: a well-structured database enables fast and accurate data access across various universities and colleges | allowing students to see meal availability in real-time.

security: protect user privacy through authentication and encryption to prevent student's personal data from being used maliciously by others | financial data of students is safe during online payments

Eg.: Designers of this app used computer science knowledge to design an optimized search function and database to provide students with fast, reliable search results | website that can handle many students ordering at the same time without crashing.

Contribution of cognitive psychology to HCI design of this mobile app/ website

user mental models: structures the app based on how users naturally think and categorize information so student can easily find the information | making it easy for students to find and order meals.

cognitive load: simplifies design to reduce confusion of user | helping users navigate and order meals quickly.

attention: appropriately highlight important information that requires attention | such as label food ingredients of meal to prevent students from allergies

Eg.: Frontend developer of this app can use cognitive psychology to design a good user interface that is intuitive and user-friendly. For example, using appropriate color schemes, simple design, reasonable user interaction, and consistent overall app | website design.

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effect to students/developer if GOOD/BAD usability design

202401q1b)Explain with ONE (1) example of effect to the students, and ONE (1) example of effect to the app developer if this app has a GOOD usability design.(5+ 5 marks)

202406q1b)Explain with ONE (1) example of effect to the students, and ONE (1) example of effect to the website developer if this website has a BAD usability design.(5 +5 marks)

If this app has a GOOD usability design like a simple browsing process, clear instruction within system and well-designed help center that provide efficient support,

students can access it without obstacles and complete their expected tasks without seeking external help, which minimizes their frustration and increases their productivity in finding their dream school.

Then, this app developer can minimize student learning curve in using this app, get positive feedback and referrals, gain money and more users with less marketing effort

If the website has a BAD usability design like a complex ordering process, unclear instruction within system and inconsistent design,

students may face problems in using the website then causing their unnecessary anxiety, lose patience to order or abandon the website.

Then, this website developer may face negative reviews, higher maintenance costs for frequent updates, and difficulty retaining or attracting new users.

C2: User Analysis & Task Analysis

purpose Persona/ Scenario during analysis stage

202401q1c)Explain the purpose of using Persona during the analysis stage of this app development. (5 marks) [Total: 25 marks]

202406q1c)Explain the purpose of using Scenario during the analysis stage of this web development. (5 marks) [Total: 25 marks]

Purpose of using Persona:

Personas clarify the target audience's age, background, and skills,

ensuring that the app meets students' specific needs in finding their dream school.

They influence design choices, making sure the app's features align with the actual needs of students, such as offering a simple interface for quick access.

Personas help developers understand user goals, such as how to find the right university program.

Personas also help developers validate assumptions, ensuring the app matches real user behaviors and provides good usability.

Purpose of using Scenario

is to understand how users will interact with the website in real-world situations,

help the web developers visualize the context, goals, and tasks that users will perform,

identify user needs and pain points,

predict potential usability issues and

enhance overall user experience by anticipating user behavior.

202406q1extends:

Purpose of Using Persona

helps the development team identify the target audience by representing typical TAR UMT students.

guides feature choices, ensuring that important elements, such as a simple ordering process, align with students' busy schedules.

create a website that resonates with their interests and needs, enhancing user engagement by recognize users' Persona

serves as a basis for usability testing, which validates design decisions, confirming that the choices made are in line with real student behaviors and preferences,

ensuring that the feedback collected reflects actual user experiences and contributes to a more effective app.

Purpose of Using Scenario

describe how xxx interact with the website in real-life situations, making it easier to understand xxx behavior.

outline what students want to achieve, like quickly ordering a meal before class.

reveal potential issues students may face, allowing developers to address them early on.

helps create a smooth and logical workflow for users.

help improve overall satisfaction with the website by anticipating student behavior.

Purpose of Using Environment

explains where and how students will use the website, like on campus or in the café.

It considers physical factors like screen sizes and noise levels to ensure the design works well in different conditions.

knows the social context(influences) helps predict how interactions with friends might affect website usage.

help to make better design decisions to suits for user intended environment

ensure the website meets the practical needs of students in their specific contexts.

Purpose of Using Task

identify what users want to accomplish, such as choosing a meal and paying for it online.

break down the actions required to complete each task, helping to create a user-friendly interface.

reveals essential functionalities that must be included to support users effectively.

allows for the creation of specific testing scenarios to evaluate user interactions.

designers can create a website that helps students complete their orders quickly and easily.

HTA

202310q1c

c)   Explain the purpose of using **Hierarchical Task Analysis (HTA)** during the analysis stage of this app development.
(5 marks)
[Total: 25 marks]

simplifies complex tasks into smaller steps, making them easier to understand.

helps identify what users need to do, ensuring the software meets their requirements.

informs design decisions, leading to user-friendly interfaces.

reveals potential usability problems, helping to create a better user experience.

helps create training materials and documentation, making it easier for users to learn the software.

C3: Users: Physical Capabilities

Fitts' Law (example

202401q2b) Explain with an example for the Fitts' Law based on Figure 1 above. (5 marks)

> ***Fitts' Law: predicts the time it takes for a user to move to a target, such as a button or link. The larger and closer an interactive element is, the easier and faster it is for users to click on it.**
>
> Based on figure1 above, buttons(Why Choose Us, Programmes, Collaboration Partners,...) is large and located in the center of the screen. This makes it easier and quicker for users to click on, as it follows Fitts' Law—being both large and prominent显眼, it reduces the time and effort required to interact with it.
>
> ***Extend:** the xx at xxx such as "a," "b," "c," and "d" are placed at the ? of the screen and have large icons. Since they are closer to where the thumb rests when holding a phone, and the icons are large enough, they are easy and fast to click, making navigation more efficient.

C4: Users: Cognitive Capabilities

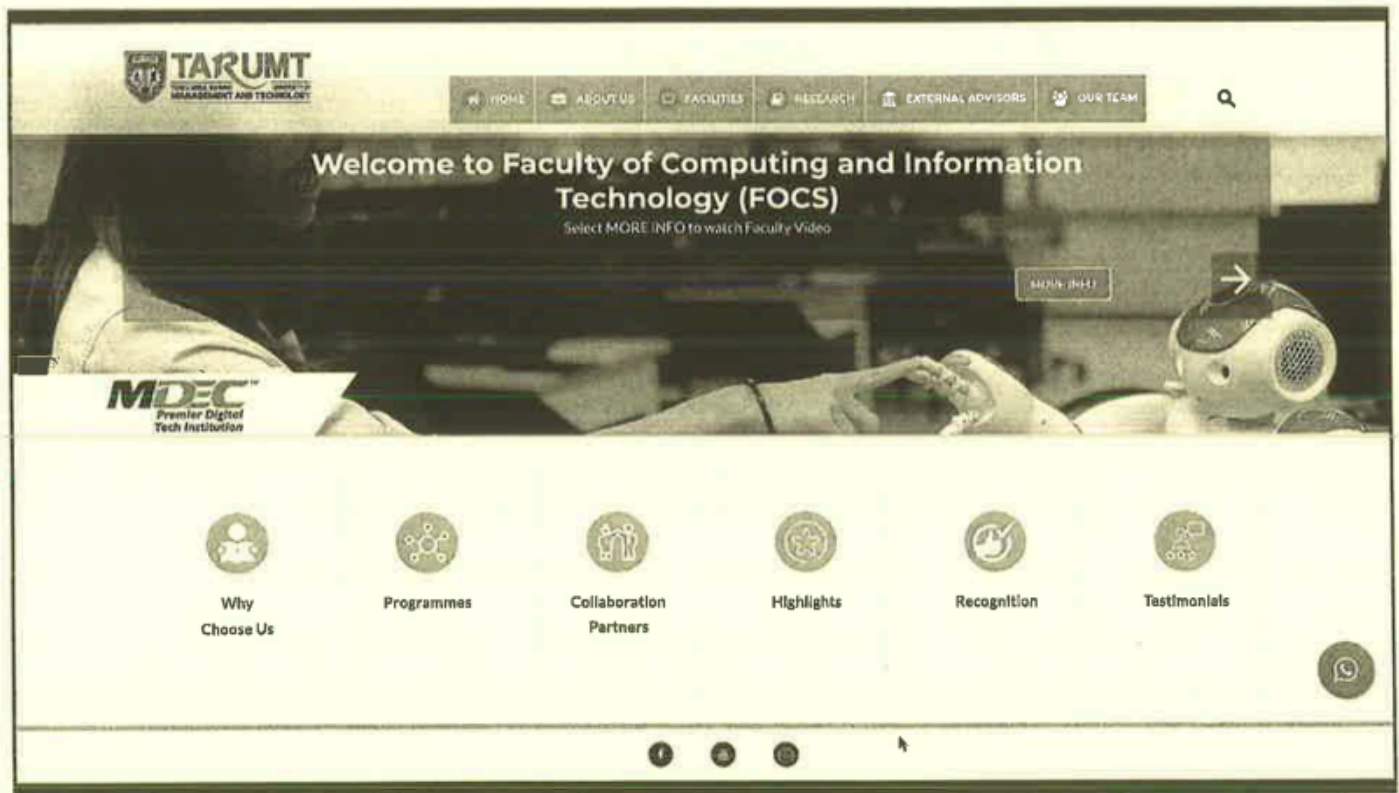## Gestalt law of Proximity (example

202401q2:

Question 2

Welcome to Faculty of Computing and Information Technology (FOCS)
Select MORE INFO to watch Faculty Video

Why Choose Us   Programmes   Collaboration Partners   Highlights   Recognition   Testimonials

Figure 1: The desktop version of the FOCS website. *(source : https://www.tarc.edu.my/focs/)*

202401q2a) Explain with an example for the Gestalt law of "Proximity" based on Figure 1 above. (5 marks)

> ****Gestalt Law of Proximity: states that objects which are close to each other tend to be perceived as related.**
>
> Based on figure1 above,items like "Home," "About Us" ,.. are placed close together in the top navigation bar. This grouping signals to users that they belong related and serve similar purposes (navigation).
>
> It helps users understand these are related options for site navigation without needing explicit explanations.
>
> ***Extend:** xxx xx like "x," "y," and "z" are grouped under one section in the xxx menu. The proximity of these options helps users recognize that these items are related to xxxx management. This reduces cognitive load and makes navigating the app easier.

Gestalt law of Similarity (example

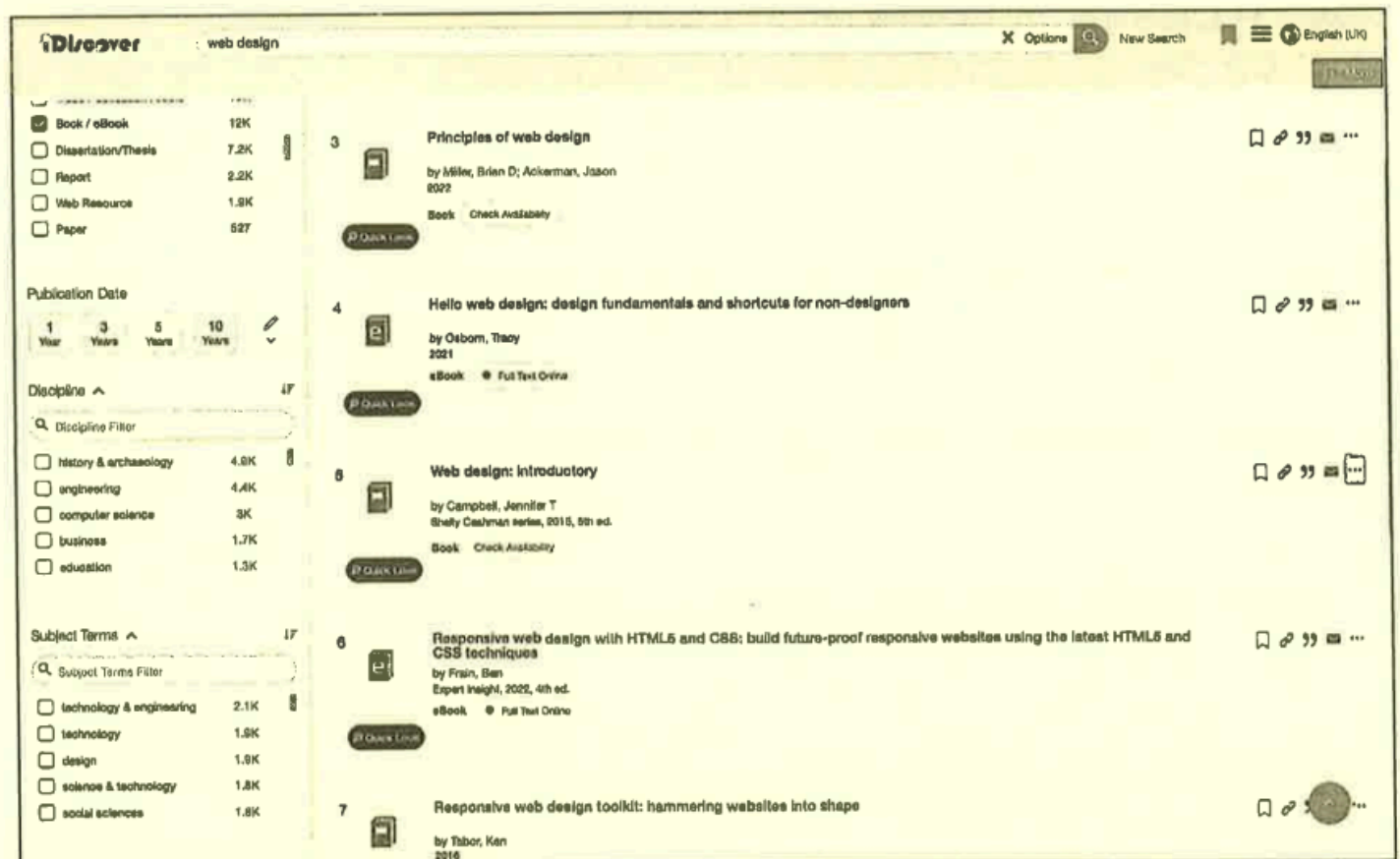Figure 1: The search result of iDiscover from TAR UMT library. *(source : https://library.tarc.edu.my)*

202406q2a) Explain with an example for the Gestalt law of "Similarity" based on Figure 1 above. (5 marks)

> **Gestalt Law of Similarity: states that elements that look similar are perceived as part of a group.**
>
> In Figure 1, the filters are grouped under relevant filter titles such as "Publication Date" or "Subject Terms." Each filter option appears in a similar style, such as checkboxes or buttons, under its respective title.
>
> This visual consistency helps users quickly recognize that the filter options belong to the same category, making the selection process more intuitive and organized.

Metaphor (example

202401q2c)Explain with an example of using "Metaphor" based on the Figure 1 above. (5 marks)

> *Metaphor隐喻: Use familiar elements to describe unfamiliar concepts
>
> Based on figure1 above, many clickable buttons have related icons near them, so that users who are not proficient in computer concepts can have a simple idea of the page they will be redirected to before clicking each button.
>
> *Extend: Pencil Icon is often used to symbolize editing or writing, as the action of using a pencil to write or make changes is universally recognized. On e-commerce websites, a shopping cart icon is used to represent the selection and management of items for purchase, similar to how a shopping cart is used in a physical store.

Example overtaxing STM + solution

202401q2d)Explain with an <mark>example of using FOCS website could potentially overtaxing a user's short- term memory (STM)</mark>. Based on your given example, <mark>propose ONE (1) solution to help</mark> the User. (5 +5 marks) [Total: 25 marks]
202406q2b)Explain with an example of using this website could potentially overtaxing a user's short-term memory (STM) based on the Figure 1. Based on your given example, propose ONE (1) solution to help the users.(5+ 5 marks)

The FOCS website can overload a user's short-term memory if they visit multiple pages to gather information, such as details of programmes offered by FOCS to students. Users may find it hard to remember specific details about the programmes as they switch between pages.

This constant need to recall information without reference can lead to confusion and frustration.

Proposed solution:

The FOCS website could add a "Recently Viewed" section, showing the last few pages visited, making it easier for users to revisit information.

A comparison tool could allow users to select multiple programmes to view side-by-side, highlighting similarities and differences.

These features would reduce cognitive load and improve user navigation.

In Figure 1, users might struggle to remember several details—such as book titles, authors, or relevant keywords—while browsing through multiple pages of search results. For example, if a user wants to compare multiple books or articles, they need to keep switching between different sections, which can overwhelm their STM and lead to frustration.

Solution: Implement a "Recently Viewed" or "Bookmark" feature, allowing users to save and revisit their search results easily without needing to remember them. This will reduce cognitive load and improve the user's ability to make comparisons and decisions.

C5: UI Design Guidelines & Principles

*Shneiderman's Eight Golden Rules (8)

Reason implement "Enable frequent users to use shortcuts" (example

202401q3b)Explain with ONE (1) reason why implementing "Enable frequent users to use shortcuts" is important in your mobile app. Give ONE (1) example with explanation of how you could apply the "Enable frequent users to use shortcuts" into your design.(5 +5 marks)

> Reason: to increase efficiency for frequent user, save their time and effort when using the mobile app
>
> Example: allows users to set custom star list for frequent buses, like clicking an unfill star beside the bus name can add it to star list and star change to filled after added for further quick access.

Reason implement "Support internal locus of control" (example

202406q3You want to build a fitness app for TAR UMT students. This mobile app is aimed at helping students to track their daily calorie intake. Users simply need to use their mobile phone camera to capture their meals, and the app will estimate the calories. Additionally, it provides exercise guidance videos for users to follow. Answer the following questions based on this scenario.

202406q3a)Explain with ONE (1) reason why implementing the design guideline of "Support internal locus of control" is important in your mobile app. Give ONE (1) example with explanation of how you could apply the "Support internal locus of control" into your design. (5 +5 marks)

> Supporting internal locus of control is important as it empowers users to feel in control of their actions and outcomes within the app, increasing their sense of ownership and motivation to engage.
>
> Example: Allow users to manually adjust calorie estimates after scanning meals, giving them control over their data and improving accuracy.

Reason implement design guideline of "Feedback" (example

202406q3b)Explain with ONE (1) reason why implementing the design guideline of "Feedback" is important in your mobile app. Give ONE (1) example with explanation of how you could apply the "Feedback" into your design.(5 +5 marks)

> Reason: Feedback informs users about their actions, reducing confusion and anxiety.
>
> Example: After scanning a meal successfully, display the estimated calories with a success notification, reassuring users their action was successful.

*Error Types(2)

Slip error (example

202406q2c)Explain with an example of Slip error based on the Figure 1.(5 marks)

> In Figure 1, the user might accidentally click the wrong button, like the "copy link" icon instead of the "cite" button, because they are close together and look similar. This error occurs when the user's action is unintended, even though they know what they want to do.

Mistake error (example

202406q2d)Explain with an example of Mistake error based on the Figure 1.(5 marks)[Total: 25 marks]

> In Figure 1, a user might incorrectly believe that the quote icon ("Cite") is for saving a resource, leading them to accidentally generate a citation instead of bookmarking the item. This happens because the user misunderstands the function of the icon.

Potential Slip + Solution

202401q3:You want to build a bus tracking mobile application for TAR UMT students. This mobile app is aimed at helping students to trace Rapid KL buses in real-time. Besides providing the bus schedule, it is also capable of reminding users when their bus is 1km away from their selected bus stop. Answer the following questions based on this scenario.

202401q3a)A slip is one type of error. Explain with ONE (1) potential example of slip. Based on your given example, propose ONE (1) solution to this error. (5 + 5 marks)

> Example of Slip: user might accidentally select the wrong bus when setting a reminder, such as tapping "Bus T250" instead of "Bus 250" due to similar naming or rushed action.
>
> Solution: Implement confirmation dialog before the user selects a bus that needs to set a reminder, prompt like: "Do you confirm to select the Bus T250 for a reminder?" to allow users to double-check their choice before proceeding.

C6: The Computer & Interaction Style

Interaction Style (example

Instructing- Issuing commands and selecting options.

Instructing involves users giving direct commands or selecting options to control a system. It's efficient for completing tasks quickly.

Example: In a banking app, users can transfer money by selecting the transfer option, entering details, and pressing "Send," allowing them to control the process efficiently.

Conversing - Interacting with a system like having a conversation.

Conversing allows users to interact with a system using natural language, like having a conversation. This interaction makes a system intuitive and easy to use.

Example: Using Siri, users ask "What's the weather today?" then Siri responds verbally about the weather today.

Manipulating - Interacting with objects in a virtual or physical space.

Manipulating involves interacting directly with objects in a system, often through gestures or tools, giving users a sense of control and immediate feedback.

Example: In Instagram, users can pinch to zoom, rotate, and adjust filters directly on their photos by using touch gestures before posting a story or post.

Exploring - Moving through a virtual environment

Exploring lets users navigate through a virtual environment to discover information or content. It's commonly used in games and virtual tours.

Example: In Google Earth VR, users explore 3D cities and landscapes by moving through the virtual environment, discovering new areas as they go.

202401q4b)Explain the interaction style with ONE (1) example for each of the follow:

(i)Conversing.(5 marks)

(ii)Manipulating.(5 marks)

(i) **Conversing**:

Conversing involves interacting with a system as if having a dialogue. An example is voice-controlled smart home devices like Google Home, where users issue commands or ask questions in natural language, and the device responds accordingly.

(ii) **Manipulating**:

Manipulating involves directly interacting with on-screen elements. For example, in graphic design software like Adobe Photoshop, users manipulate images by dragging and dropping layers, applying effects, and editing directly, providing a hands-on interaction experience.

C7: Prototyping

C8: Evaluation

Choose Lo-Fi / Hi-Fi during formative test

202401q4:

202401q4a)Among **Low-Fidelity (Lo-Fi) and High-Fidelity (Hi-Fi)** prototype, which one is suitable to be used during <mark>formative test</mark>? Explain your answer.(5 marks)

**formative evaluation: done during the design phase. can be done by the design team or by involving real users

**summative evaluation: performed with finished product. It is mostly done by external users.

> Low-Fidelity is more suitable for formative testing, it is more cost-effective, quick and less complex than High-Fidelity. Since formative test is an evaluation that mainly aims to identify strengths and weaknesses for design improvement, Lo-Fi enables efficient testing and iteration without heavy investment in detailed design.

C9: Evaluation(Expert Analysis)

Nielsen's Ten Heuristics (example

202406q4b)Explain the Nielsen's Ten Heuristics with ONE (1) example for each of the following:

(i)Visibility of system status.(5 marks)

Users should always be informed about what is happening in the system. For example, during an online exam, a progress bar can show how much time is left to complete the exam, helping students manage their time effectively.

(ii)Error Prevention.(5 marks)

Design should minimize the possibility of errors. For instance, the exam software could require students to confirm their answers before moving to the next question, reducing the chance of accidentally skipping questions or submitting incomplete answers.

Nielsen's Ten Heuristics(1994)

1 Visibility of system status

2 Match between system and the real world

3 User control and freedom

4 Consistency and standards

5 Error prevention

6 Recognition rather than recall

7 Flexibility and efficiency of use

8 Aesthetic and minimalist design

9 Help users recognize, diagnose, and recover from errors

10 Help and documentation

C10: Usability Measurements

Satisfaction refers to the overall comfort and acceptability of using a system or product.

Efficiency refers to the amount of effort (mental or physical) users need to put in to achieve their goals when using the app.
We can measure efficiency by considering **time to perform a particular task** such as measuring how long it takes users to access bus schedules and setting up notifications for bus arrivals. For example, we might track the time it takes to complete the task of setting a reminder for a bus that is 1 km away. If users take an average of 15 seconds to set the reminder, this shows the app's efficiency in task completion.
time taken on the first attempt such as measuring how long it takes a user to successfully trace a bus for the first time using the app. For example, record the time from when a user opens the app until they successfully receive a notification for their selected bus stop. If the average time for 20 students is 30 seconds, this indicates the initial efficiency of the app.
number of actions or steps taken such as count the number of taps or actions a user must complete to receive bus updates. For example, if it takes a user five taps to set up a reminder (open app > select bus route > set reminder), this indicates the efficiency of the user interface design. Fewer actions typically correlate with greater efficiency.

Effectiveness refers to the accuracy and completeness with which users can achieve their goals.
We can measure effectiveness by considering **accuracy** such as measuring the number of errors in users' interactions with the app. For example, if users frequently miss selecting the correct bus route or receive notifications for the wrong bus, this indicates issues with accuracy. We could calculate the number of incorrect notifications received per 100 notifications sent. If out of 100 notifications, 10 are incorrect, the error rate would be 10%.
completeness rate such as evaluate the percentage of users who successfully complete the task of setting reminders and receiving notifications. For instance, if 80 out of 100 users successfully set a reminder for their bus arrival and received the correct notification, the completeness rate would be 80%. This measure indicates how effectively the app helps users achieve their goal.

Measure Satisfaction (example

202401q3c)Explain with an example of how you could measure the Satisfaction of this mobile application. (5 marks)[Total: 25 marks]

Net Promoter Score (NPS): After using the app for a week, students can be surveyed with the question: "On a scale from 0 to 10, how likely are you to recommend this app to a fellow student?" This helps determine how many users feel positively enough about the app to promote it. For example, if 70 out of 100 surveyed students give a score of 9 or 10, and only 5 give a score of 6 or lower, the NPS would be calculated as 65 (70% - 5%).

Using the Software Usability Measurement Inventory (SUMI) questionnaire can provide structured feedback on user satisfaction across various dimensions. Questions related to Affect, Efficiency, Helpfulness, Control, and Learnability will help measure how students feel about using the app. For instance, students may respond to statements like "I feel confident using this app" or "The app meets my needs for tracking buses." Analyzing their responses can provide an overall satisfaction score.

202406q3c)Explain with an example of how you could measure the Satisfaction of this mobile app. (5 marks)[Total: 25 marks]

Net Promoter Score (NPS):

After using the app for two hours, users can be surveyed with a simple question: "On a scale from 0 to 10, how likely are you to recommend this app to a friend?" Users who respond with a score of 9 or 10 are considered "promoters," while those who give a score of 6 or below are "detractors."

By calculating the percentage of promoters minus the percentage of detractors, we obtain the NPS, which provides a clear indication of user satisfaction. For example, if out of 100 surveyed users, 60 are promoters and 10 are detractors, the NPS would be 50 (60% - 10%).

Software Usability Measurement Inventory (SUMI) questionnaire:

can provide a structured way to assess user satisfaction. This standardized 50-item questionnaire covers five sub-scales: Affect, Efficiency, Helpfulness, Control, and Learnability. For instance, questions could include "I feel comfortable using this app" or "The app helps me achieve my fitness goals." Users' responses can be analyzed to generate an overall satisfaction score.

Qualitative testing vs quantitative testing (earlier prototyping

202406q4a)"Qualitative testing is more suitable at the earlier stages of prototyping compared to quantitative testing". Explain your answer.(5 marks)

Qualitative testing is more suitable during early prototyping because it needs less human resources than quantitative testing which is lower cost and can focus on gathering detailed insights into user behaviors, emotions, and pain points.

It helps designers identify usability issues and make significant design improvements before moving on to more quantitative measures. Early prototypes are often rough, so user feedback is valuable for refining the overall concept.

C11: Ergonomics, Health & Safety

Ergonomic - lighting & temperature

202401q4c)Discuss how your faculty could make the tutorial room more ergonomic for students, considering lighting and temperature factors.(5+5 marks) [Total: 25 marks]

202406q4c)Discuss how your university could make the examination hall more ergonomic for students during their examinations, considering lighting and temperature factors. (5 +5 marks) [Total: 25 marks]

Lighting:

Use glare-free and uniform lighting to enhance visibility of exam materials.

Install emergency lighting for student safety in case of power failure.

Allow students to modify light intensity to suit their needs.

Temperature:

Use smart thermostats to maintain a comfortable temperature, ideally around 20-22°C, which is conducive to concentration of students.

Use fans or purifiers for better air circulation.

Enhance insulation of the hall to maintain a consistent temperature, preventing the hall from becoming too hot or too cold during exams