Tips for answering the 1ST question in FOA:

- User:
- Environment:
- Task:
- Issue:
- Solution:

Design Issues

Visual:

- The lights on personal assistant devices are ambiguous which cannot provide informative feedback to the users. For instance, the user might not be able to identify whether the personal assistant devices are on or off as they cannot see the light clearly during a bright environment. Therefore, the users might feel frustrated as they often need to check and switch on and off them to make sure they are in the correct mode. Not only that, there are too many colors of status lights on the personal assistant devices for example green light to indicate the Siri is listening, red color is indicating the Homepod is resetting and etc. This might make it hard for novice users and elderly to memorize all the meaning of the status light. They have to spend more time on learning how to use the homepad to turn their short term memory to long term memory by rehearsing the steps many times.

Hearing/Audio:

- The volume for the podcast listing from the Apple Homepod Mini and Google Home Mini are not loud and clear enough. Humans are only capable of hearing frequencies from 20Hz to 15kHz. If the users are doing their own things such as cooking in the kitchen and the homepod is being put in the living room, the personal assistant devices might not be able to receive the input command accurately and cause the user to input over and over again which decreases the usability.

Haptic:

Movement: Fitt Laws

Solution

Provide feedback by using sounds but the sounds of the information must be short and simple . It will be used only for reminding purposes such as playing another podcast when the previous podcast is finished playing. As the user might move from one place to another place, he/she might not be able to check the status light on the homepad frequently to get the latest feedback. The sound can be utilized as an informative feedback to the user so that they know which podcast will be played next. But the limitation is, the sounds as a feedback cannot be used too frequently as it might annoy and distract the users.

Problems (Physical and cognitive capabilities):

- Lack of visual feedbacks (don't has buttons and touch screen features to let user to choose and click to execute their commands)
- Hard to detect and interpret the voice command due to the distance issue (out of 7m) and the environment (noisy) -- someone is cooking, watching tv, talk around
- Hard for novice users and elderly to learn (need to rehearsal many times for turning their STM to LTM)
- Language issue (only accepting English), some people don't know how to speak in english or the pronunciation is inaccurate
- The contrast of the color (identifiable in dark environment but could not convey information well in light environment [daytime])
- Visibility not good

Solutions (Principle, Guidelines, Limitation):

- Audio feedback (tells descriptive things such as podcast episodes)
- The audio must be simple and easy for understand
- Cannot use audio feedback too often as it will be annoying and distracting the user.
- Different unique jingles to indicate different state (easy to memorize and identify)

Guideline to answer HCI midterm

Problems:

1. Identify the **topic** carefully
2. Based on the **visual**, **audio**, **haptic** and **movement**, **attention**, **perception** and **memory(STM and LTM),** think of the problems that might occur.
3. Based on the physical and cognitive capabilities,can focus on
    - **Task** to be performed
    - **User** (e.g. user types)
    - **Environment** and **context**
    - **PACT**
4. Give the example and describe according to the physical and cognitive capability you choose. If you have the suitable HCI keywords (e.g. mental model,metaphor, recognition, chunking, etc), put it inside as an assistance.

Solutions:

1. Based on the physical and cognitive capability you choose, select a suitable **principle**, **guideline** to come up with a solution.
2. If necessary, write out the **limitations** also.

Tips for answering the 2ND question in FOA:

Evaluation

- **Formative evaluation** *aka* qualitative user testing (happen during the design stage):
    - Notes : The number of participants is limited (if involved real user) i.e. 2 - 5
    - In order to design the good user experience of the [product], we can obtain user feedback by using paper prototype or low fidelity prototype (quicker to create) with the potential user.
    - Furthermore, we will revise the low-fi prototype continuously, as well as invite potential users to perform the usability test in the lab
    - Validate the design by using *Nielsen Heuristic evaluation* as a checklist because it is fast and cheaper (no need involved real users). Two ways to carry out:
        - Can hire UI expert to evaluate the design
        - Without hiring any expert (can evaluate by yourself as you are a designer also, you know how to use principle to validate and evaluate the design or design team)

Notes : Formative evaluation could be done by using *Heuristic evaluation, cognitive walkthroughs, thinking aloud*

- **Summative evaluation** *aka* quantitative user testing (happen at the last stage already):
    - The evaluation performed with the finished product, [the websites]. It is mostly done by real users.
    - Should involve more user (15-20) to evaluate the usability of the [product]
    - Sample answer from sir:
        - The potential users will evaluate the websites only, only participate at the last stages, not the early stages,
        - Measure usability (defined as effectiveness, efficiency, and satisfaction) of the complete product.
            - Completeness / Success rate
            - Task time
        - Can be done in the lab or actual environment (field studies)
        - Hire UI expert to do the expert review by using Nielsen Heuristic Evaluation to know the strengths and weaknesses of your product
        - I prefer to have both evaluation techniques
        - **Advantages**: can help to evaluate the design against quantitative goals or competitor's products, to establish a usability benchmark
        - **Disadvantages** : more expensive and time consuming compared to the formative evaluation

Usability measurement

Process + usability metrics + conclusion

- Effectiveness:
  - How many people involved
    - Tested items will be distributed to the 20 randomly selected users to complete the task. Observe how many actions or steps that participants took in performing the task as more action = more effort

  - **Accuracy**
    - Counting the number of errors the participants make when attempting to complete the task (i.e filling up the online form)
    - I.e Accuracy can be measured by the number of spelling mistakes
    - Give example based on scenario: *Minimum entry requirements for the program of 'Software Engineering' (user gather Minimum entry requirements from website vs Minimum entry requirements , %), do they get the correct MER or not*

  - **Completeness**
    - Completion rate is calculated by assigning '1' if the participant manage to complete the task (i.e. fill up the form) successfully and '0' if he/she does not

  - Calculation of the **effectiveness**
    - Effectiveness of the tasks given (i.e. filling up the entire online form) could be measured by the number of tasks completed successfully divided by the total task given to the user then multiplied with 100 percent to know the percentage.

- Efficiency (time/effort required in which user need to put in in order achieve the goal):
  - How you calculate the efficiency
    - Using stopwatch to observe and record the (i.e filling up an online form) task time *[end time-start time]* in seconds or minutes [before and after the release of improved version/ TWO different devices]
    - Do a task time comparison (if shorter means the improved version is better; otherwise not)
  - How many user will need to be involved
    - E.g 20 users will be involved as in the *summative test*, we should have more user in order to get a high confidence interval on the results

- Satisfaction (User's physical, cognitive and emotional responses that result from the use of a system, product or service meet the user's needs and expectations)
    - **Task level satisfaction** (after each task is completed)
        - After users attempt a task (irrespective of whether they manage to achieve its goal or not), they should immediately be given a questionnaire so as to measure how difficult that task was. Typically consisting of up to 5 questions, these post-task questionnaires often take the form of Likert scale ratings and their goal is to provide insight into task difficulty as seen from the participants' perspective.

    - **Test level satisfaction** (after whole/overall task/session)
        - Test Level Satisfaction is measured by giving a formalized questionnaire to each test participant at the end of the test session. This serves to measure their impression of the overall ease of use of the system being tested. For this purpose, the following questionnaires can be used (ranked in ascending order by number of questions):
        - Most difficult to measure and collect data, we can only obtain the data from the interview, questionnaire rating from the user. Effectiveness and efficiency can affect the user satisfaction, the user either satisfied or frustrated. If effectiveness = yes and efficiency = yes, then user satisfaction is achieved.

PYQ DEC 2020 (B)

Question:

You are the Interaction Designer in Pandaro, a music and podcast streaming company. Currently, you are assigned to a project of integrating podcast streaming service into personal assistant devices, like Apple HomePod Mini (Figure 1) and Google Home Mini (Figure 2). Analyze **TWO (2)** potential design issues/problems that need to be identified before the interaction design, and discuss your design solutions for **ONE (1)** of your potential design issues/problems.

**Modification on hardware is not allowed.*

(30 marks)

Figure 1. Left: Apple HomePod mini (*Source: newsbeezer.com*).

Figure 2. Google Home Mini *(Source: Slash Gear)*

Two Potential Design Issues/Problems:

Based on the situation above, there are two potential design problems that need to be identified before the interaction design. Firstly, the personal assistant devices such as Apple Homepod Mini and Google Home Mini are lack of control buttons due to the devices only allow users use voice to input command and operate the system , the design of personal assistant devices is unfriendly to novices and elderly users, because people are more used to operating a system with buttons and touch screen features, and we seldom see a system that operates with voice inputs,so novice and elderly users do not know what command they need to say, for example, to trigger the personal assistant devices they need to say "Hey google" but novice users and elderly people may not know, and they may immediately tell the personal assistant devices what to do, so the personal assistant devices will not execute their order, in fact the personal assistant device provide many useful function but there all not visible to the users, so the visibility of the personal assistant device is bad. Other than that, personal assistant device has a limited range of receiving users voice input, according to google search the voice input range of personal assistant device is 7 meters, so when users want to activate or switch off the personal assistant device out of the range of 7 meters, they personal assistant device may not able to catch the users voice accurately. Lastly, sometimes the environment of the users will be very noisy, such as when someone is cooking, someone is watching tv or there is a group of people talking. So the personal assistant device may receive the wrong voice input or even cannot receive any voice input, due to this the efficiency and effective of the personal assistant device will be decrease since the users need to input again and again when the personal assistant device cannot receive voice input in a noisy environment which is very time consuming and there is a chance that the personal assistant device perform the command wrong so the completeness and accuracy of users goals are not secured. As a result, the users may feel frustrated because they need time for learning the system and sometimes the users goals are not accurate.

The first potential design problem is that the voice over command feature might be hard for users to learn and use. For novice users, they are not quite familiar with the command provided by the services. Hence, they will need to memorize the commands like “Hey, Siri”, “volume up”, “volume down”, “mute” and so on.This will require the novice user's effort to memorize the commands and make use of the voice over command. Moreover, the user's memorability of the voice over commands is also dependent on the usage frequency of the product. Novice users have to use the command multiple times in order to memorize the command and change those memories of command from Short Term Memory into Long Term Memory. Besides that, the user might also encounter problems using the command with their inaccurate pronunciation of english. Considering the social context, each country has different english slangs and pronunciation. Hence, for user’s that are not American or British people, most of them are not using the standard english pronunciation, thus the product could not detect their command and they will need to repeat many times in order to use the voice over command feature. For example, in korean’s alphabet, there is no consonant “v” in korean language, thus they could not pronounce “v”, hence they use the pronunciation of “b” to pronounce “v”. So this will lead to a problem when koreans wanted to say “volume up”, they might pronounce as “bolume up”. Hence the personal assistance might not capture the command. Additionally, as for the users with disability to speak, they cannot use the voice over command hence they couldn't use the product (assuming the product doesn't have buttons to use the product)

The first potential design issue that we have to consider is the lack of visual feedback for grabbing the user’s attention. The Apple HomePod Mini and Google Home Mini are just speakers with no way to display graphical user interfaces itself unless connected to an external smart device. This however can cause the lack of visual feedback to users. Both devices have coloured lights as visuals, we can utilize the colours for our design but nothing else beyond that. One thing to note is that Google’s Home Mini’s Lights are smaller compared to Apple’s, it can be quite hard to see from afar. However these lights do have an issue when it comes to the environment they are in If the device is in a dark environment, the lights and colours are clearly visible and identifiable because of the high contrast with the dark environment. But when it comes to bright environments, the lights and colours are quite difficult to tell especially from afar because it does not cotrass well with the light environment. Hence we also cannot use text as a form of visual indicator. This can be a problem when it comes to telling the users very descriptive things, which also limits the information we can convey within the constraints of these lights.

Design Solutions:

Although there might be problems from this design, but there is still a solution for elderly to use this device to assist their lifestyle. This assistant device should be implemented with customization and additional features that can be downloaded which are developed by other developers, in other words to widen their cooperation with other companies to enhance its usability. For example, for the first time usage of the device, there can be a customization with help facilities for the users to make their own commands, and the help facilities can give instructions on how to customize by guiding along the way. Then the device can able to create its own algorithm to suit the users' commands. By talking to the device as much as possible to let the device to be more understanding to the way that the users speak. The users should also be able to customize the device's system by connecting it to the official site to download the other software built by other developers with their own functions and features respectively to enhance the usability, for example, software features that specially for the elderly which the way the device talk can be more humanized, so the elderly can be more comfortable and understand how the device works along the way.

Since the devices are speakers we can make use of audio feedback to capture the user's attention. We can play audio cues to grab attention. We could use some verbal audio to tell users about descriptive things like song names and podcast episodes. But the words we used must be short, simple and easy for users to understand. It is also important to not to use too many words as users have a very limited short term memory, and since there are no Graphical user interfaces, users will have to be expected to memorize some of that. Another method we can use for audio cues are sound effects(SFX). A human hearing range is around 20Hz to 15kHz, but this range deteriorates with age and health conditions so we should avoid using SFX that is close to that limit. We could also consider playing unique jingles for unique system states so it is easier to identify and memorize. There is one thing we do have to consider about using audio feedback is to not use it too often or it will be annoying and distracting to the user. We should only use audio feedback in the appropriate situations, like when a podcast episode is finished and another episode is about to be auto played.

Question 2

Linda is a new programmer working in TAR UC Communication and Information Center. Her job is to improve the TAR UC website so that users are able to find bachelor degree programmes information more effectively and efficiently. She requested assistance from you to give her some advice on how to evaluate the existing user interface of the website.

a) One of the methods that involve **experts** to evaluate the user interface is Nielsen's Ten Heuristic rules. Choose any **FIVE (5)** heuristic rules, discuss if TAR UC web page fulfilled the rules. Explain and provide examples to support your answer. (30 marks)

Note: You may include screenshot of the web pages.

b) Based on the scenario given above, suggest suitable metrics to measure Linda's *effectiveness* and *efficiency* improvement goals. (20 marks)

[Total: 50 marks]

Question 2

a)

b)

To measure the effectiveness and efficiency, we will randomly select 20 users to perform the task of finding bachelor degree programmes information. To begin with, effectiveness can be defined as completeness and accuracy in which users achieve the goal. In order to calculate the **accuracy**, we can measure the percentage of the bachelor degree information users get versus correct bachelor degree information (%) to know whether they are getting the correct information about the degree. Afterwards, we can measure the **completeness** by assigning "1" if the participants manage to perform the task which finds the bachelor degree information successfully and "0" if he/she does not. The calculation of the **effectiveness** can be measured by the number of tasks (find degree information) completed successfully divided by the total number of tasks performed by the participants then multiplied with 100 to find out the percentage of the effectiveness.

Next, **efficiency** can be defined as the time and efforts in which users need to put in in order to achieve the goal. For example, we can use stopwatch to observe and record down the task time which is the time taken by the participants to complete the task (finding bachelor degree information) either in seconds or minutes. If the TARC website has been improved or redesigned in the future, we can do a task time comparison for the old and improved version. If the time

taken to find the bachelor degree information task in the improved version is shorter than the old version, it means that the improved version is more efficient compared to the old version.

PYQ OCT 2020 (Entertainment features on the car- car stereo)

Question 1

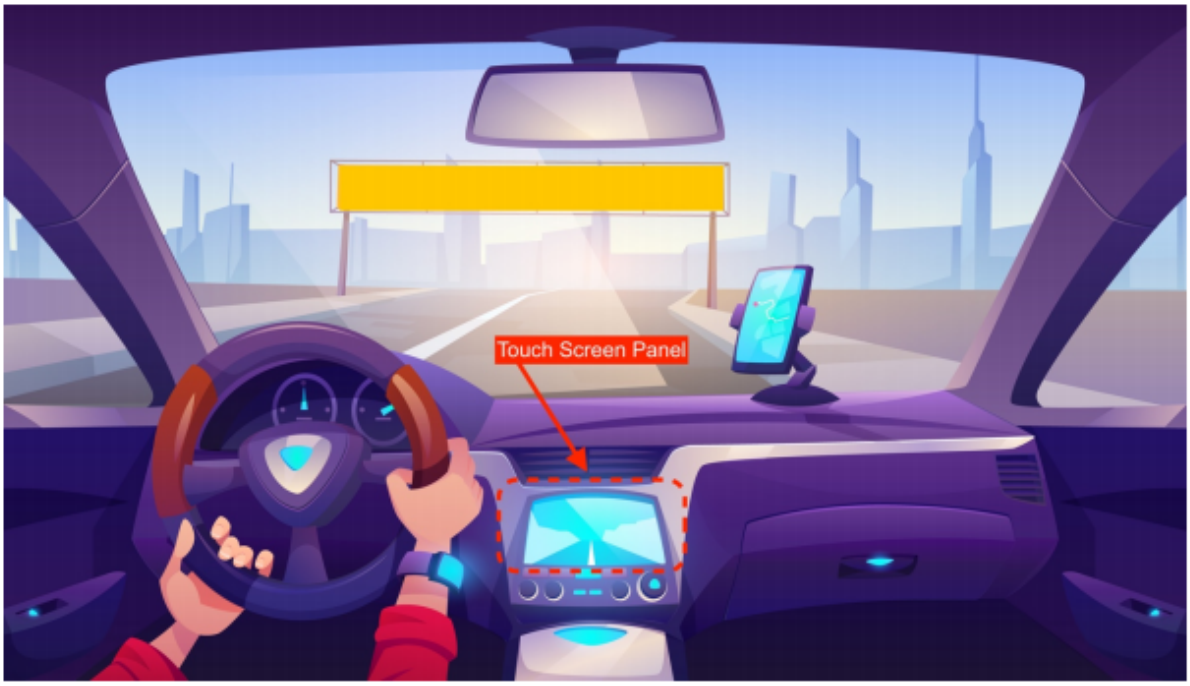

Image 1: Car interior and the touch screen.
(Image: Designed by vectorpouch / Freepik)

You are the Interaction Designer in Froton, an automotive company. Currently you are assigned to a project of "Froton Multimedia Entertainment Centre" (FMEC). This project is about providing entertainment to the driver in the car, such as playing songs and videos from smart phone or car system internal storage. You need to design the user interface (UI) for this FMEC system. The system UI will be presented via the touch screen panel as shown in Image 1. Write a short essay on **THREE (3)** potential design issues/problems that need to be identified before designing the UI, and discuss your design solutions for **EACH** of the potential design issues/problems. (60 marks)

3 potential design issue

The first potential issue that we have to consider is the **lack of audio control features** for inputting the command such as selecting the next songs or videos to be played in the system. This is because the user will face difficulties to input the command that they want by touch on the screen using the touch screen panel or through the smartphone while they are driving on the road. This action could distract the user badly and place them in a dangerous situation. Moreover, there is also a lack of audio feedback for the user. After the user has selected the button to play the next song/video without looking at the touch screen panel, the visual feedback will be provided with the word "Next song will play soon" displayed on the screen but the user might not noticed their command has been received by the system or not when they are focussing on driving. If they do so, they have to focus on the touch screen panel and the road back and forth which is very insecure.

Next, the potential issue includes **the sensitivity of the system's touch screen panel**. Haptic can provide important feedback about what users have done in a touch screen system. Thus, if the sensitivity of the touch screen panel is low, they might be confused as the system didn't give the feedback to the user or the feedback effect is small until the user cannot recognize to indicate the task is completed or not. Not only that, if the user has palmar hyperhidrosis, their hands will sweat a lot and cause the touch screen to become not responsive thus the system might not be able to receive the command accurately. Consequently, the users will feel frustrated as they have to input over and over again until the system receives their command correctly.

Third, the potential issue also includes **the size and placement of the buttons for volume control or other important adjustments are too far away in the touch screen panel.** According to the Fitts Law, the distance and size of the buttons can affect the accomplish time carried out by the users. By doing that, the users will need to spend more time to reach the desired place to click on the button in the touch screen panel. Therefore, they have to spend more effort to look into the touch screen panel carefully whenever they want to select the instructions buttons to trigger the particular function which is very time consuming. The small size of buttons are unfriendly to the "fat-finger" user as they might hit multiple buttons at once which is not their intent to do so.

2 solutions

To solve the first potential issue, we can make use of **audio control** to help users in inputting by using the voice command. For example, we can integrate voice control assistants such as Siri or Google Assistant into this FMEC system. So that when users are focusing on driving, they still can select the next song or video they want to be played by using the voice commands such as “Hey Siri, play next episode”, “Hey Siri, show my playlists”, etc. Moreover, the **audio feedback** will also be provided in the system. For example, we could use some verbal audio to tell the users about the descriptive things such as song or video name to be played next. But the words we use must be short and simple enough for user understanding. One thing we need to take into consideration is we cannot use the audio feedback too often as it will annoy and distract the user. We should only use audio in appropriate situations such as when a song or video is finished and the next song/video is about to be auto played and provide an option for users to turn off the sound feedback.

To solve the second design issue, we can make use of a **wet finger tracking technology** to let the user use the touch screen panel effectively even with a sweaty, wet hand. The system is able to receive the command accurately with this technology. Next, we can also apply the Sheirdelman Golden rules which is **supporting internal locus of control** by having a touch sensitivity control on this system so that the user can adjust the sensitivity based on their preference. By doing this, the user will feel that they are incharge this system and this system is currently under their control.

Next, since the touch screen panel is displayed in a Graphical User Interface way, we should make use of the principal **Fitts Law (short distance and big size can result in short reach time)** which make the buttons bigger but is appropriate to the touch screen panel and places the buttons of volume control or other important adjustments close enough to save their time to reach the buttons that they want and can avoid slip happen. We can also make use of the **Gestalt Law of proximity** which places the similar function of the buttons to be grouped closed together in a space so that they will be perceived together by the user and won’t confuse the user. The button should be displayed with the image along with the functionality name to promote

recognition to the user rather than recall from the memory. This is because humans are better at remembering visual
cues rather than words/sentences thus this can **reduce the memory load** of the user. It can also **increase the visibility of this system** so that the user will clearly know what to perform in order to achieve their goals effectively and efficiently.

Sample Answer from Sir :

Contextual inquiry→ issue 1, set location

- Who are the user ? Drivers who are the Senior citizen , body movements not so agile and responsive compared with younger generations (hands and legs)
- Environment ? Driving at day time at the highway alone,
- Task ? Input location for GPS, key in the location name, search for the coordinates, and set the direction with the touchscreen or button interface
- Issues ? Hands need to be placed at the car steering , two hands, but he need to hold the car steering with one hand, another hand need to input the details, eyes must look the front mirror but he need to look at the GPS screen also, distracting his driving activity, can be dangerous.

- Solutions
- Voice recognition systems allow the driver to speak out the locations and the systems will search for it
- Reduce the need to input the details, so the driver can concentrate on their driving's
- The systems also can have some preset location, commonly accessed locations by category such as petrol, hospitals, restaurant, mall, to reduce the need of the drivers to input the complete place name
- The systems should allow the user to search and save the location for future reference, no need to input the address again.

Contextual inquiry→ issue 2, play song

- Who are the user ? Drivers who are the Senior citizen , body movements not so agile and responsive compared with younger generations (hands and legs)
- Environment ? Driving at day time at the highway alone,
- Task ? Listen to current radio station, he wish to change or switch to another radio station channel with the touchscreen or button interface
- Issues ? Hands need to be placed at the car steering , two hands, but he need to hold the car steering with one hand, another hand need to input the details, eyes must look the front mirror but he need to look at the audio screen also, distracting his driving activity, can be dangerous.

- Solutions
- These is a common task performed by the user no matter young or old drivers,
- We can used red route to make sure these is the common function accessed by all the users at all the times
- Thus we can placed the button to switch radio channels at the car steering , thus the drivers can perform the required task without any interruption, the driver can hold both hands on the car steering and look the front mirror, no distraction from the current driving activity.

Contextual inquiry→ issue 2, play song

- Who are the user ? Driver who are the Senior citizen , body movements not so agile and responsive compared with younger generations (hands and legs)
- Environment ? Driving at day time at the highway alone,
- Task ? Change to another song, play another song in the CD, press next button, or adjust the volume of the song with the touchscreen or button interface
- Issues ? Hands need to be placed at the car steering , two hands, but he need to hold the car steering with one hand, another hand need to input the details, eyes must look the front mirror but he need to look at the audio screen also, distracting his driving activity, can be dangerous.

- Solutions
- These is a common task performed by the user no matter young or old drivers,
- We can used red route to make sure these is the common function accessed by all the users at all the times
- Thus we can placed the button to switch the song channels at the car steering , thus the drivers can perform the required task without any interruption, the driver can hold both hands on the car steering and look the front mirror, no distraction from the current driving activity.

Contextual inquiry→ issue 3, display &audio

- Who are the user ? Drivers who are Senior citizen , eye sight problems, need to wear spectacles or glasses due to the glaring issues, hearing problems
- Environment ? Driving at day time or night time at the highway alone,
- Task ? Following the location direction at the GPS screen, need to look at the screen and listen to the audio instructions with the touchscreen or button interface
- Issues ? The driver need to look at the screen and able to listen to the audio instruction clearly while driving, the sun light or the car light from the others car can caused a glare, affecting the visibility of the screen, the surrounding noise can interfere the drivers ability to listen to the audio instructions

- Solutions
- Allow the user to customized the screen brightness and contrast
- It will be better if the systems can automatically adjust the screen brightness and contrast according to the situations
- We can placed the button to adjust the volume channels at the car steering , thus the drivers can perform the required task without any interruption, the driver can hold both hands on the car steering and look the front mirror, no distraction from the current driving activity.

Contextual inquiry→ issue 4, passenger

- Who are the user ? Passengers (younger generation/older generation)
- Environment ? Passenger who site behinds the car seat,
- Task ? Asist the drivers to set locations or adjust the car volume, or play another song, switching radio channels with the touchscreen or button interface
- Issues ? Sit behind, too far away physical distance, button not reachable, need to move their body to in front, can be distracting the drivers, if senior citizen could not move their body easily as their body is not so agile compared with younger generations, some more need to released the seat belts, dangerous if accident happens
- Solutions
- Provide a remote control for the passenger to perform the required task without the need to move their body, released their seat belts
- They can used the remote control to perform the required task such as change the song, switch radio channels,

Contextual inquiry→ issue 5, play song

- Who are the user ? Drivers who are the Senior citizen who get used to the old radio systems that use tuning button only, no touch screen
- Environment ? Driving at day time at the highway alone,
- Task ? Listen to current radio station, he wish to change or switch to another radio station channel with the touchscreen or button interface
- Issues ? Hands need to be placed at the car steering , two hands, but he need to hold the car steering with one hand, another hand need to input the details on the touch screen, they are not familiar with the menu interface, touch screen not responsive, they need time and practice to be competent and familiar with the new interface
- Solutions
- Provide them an alternative interface the mimic the tuning button they already familiar with.

Q2 a)

- Formative evaluation
  - Evaluation done during the design phase. It can be done by the design team or by involving real users (2-5). From the early stage until the evaluation stage, the users or expert are involved at the beginning of the design stage from paper prototype to high fidelity prototype,
  - We can use a paper prototype or low fidelity prototype with the potential users STPM students, we will design these low fidelity prototype for them and obtained their feedback , continuously revised the prototype, we can invite the students to perform a usability test in the lab.
  - We can also present these low fidelity prototype to the UI experts for evaluation also, the expert will used the UI design heuristics as a checklist to validate our design.
  - Advantages and disadvantages.

Q2 a)

- Summative Evaluation – happen at the last stage already
  - Evaluation performed with finished product, the websites. It is mostly done by real users, the students, the students will evaluate the websites only, only participate at the last stages, not the early stages,
  - Can be done in the lab or actual environment (field studies)
  - The same case goes to UI expert also
  - I prefer to have both evaluation techniques
  - Advantages and disadvantages

Q2 b) choose two only

- Effectiveness : **Completeness** and **accuracy** with which **users achieve specified goals**.
  - Completeness: User able to get the info of Minimum Entry Requirement (MER) for the program of 'Software Engineering'. (success or fail, 1 or 0, Yes or No)
  - - Accuracy: MER for the program of 'Software Engineering' (user gather MER from website vs MER, %), do they get the correct MER or not
  - Data can be collected, we can observed from behind
- Efficiency: **Resources used in relation to the results achieved**. (Typical resources include time, human effort, costs and materials.) How much time, efforts needed to complete the required task finding MER
  - Total time spend on gathering MER info. OR -Steps gathering MER info: total click until MER info page..
  - Number or errors or mistake done.
  - Data can be collected , we used stop watch and we can observed the user from behind
- Satisfaction: User's physical, cognitive and **emotional responses** that result from the use of a system, product or service **meet the user's needs and expectations. Most difficult to measure and collect data, we can only obtain the data from the** interview, questionnaire rating from user. Effectiveness and efficiency can affect the user satisfaction, the user either satisfied or frustrated. If effectiveness = yes and efficiency = yes, then user satisfaction is achieved.

The potential design issue is the **low sensitivity of the touchscreen**. To illustrate, haptic can provide important feedback to users about what they have done in a touch screen system. When the users tap or touch the interface (i.e button/ hyperlink) on the smartwatch screen, they expect it to respond immediately according to their command. However, the low sensitivity of the smartwatch touch screen is not responsive thus causing it to be not able to receive the command accurately. Consequently, the user feels frustrated and confused about the system state as they might tap the same command twice but eventually the system responds with a wrong action or even worse, it doesn't respond to the user command. This causes the smartwatch to be perceived as low quality and bad performance as the user cannot achieve their goal such as tapping on the contact to make a phone call or receive the phone call efficiently and effectively.

To solve the problem, we can **make use of capacitive touchscreen** for smartwatch as this type of touchscreen is more responsive than other touchscreen such as resistive touchscreen. By using capacitive touchscreen, after user taps or touch the interface of the smartwatch (i.e buttons / hyperlinks), user's finger will absorb the smartwatch electrostatic field thus it will identify the change in capacitance in a short time as a touch command and it will execute the command accurately without any errors. We could even **add vibration output to the capacitive touchscreen** at fixed frequency and output to provide haptic feedback. It can improve user

experience by providing informative feedback to the user as well as reduce errors. To illustrate, whenever the user taps on the buttons or hyperlinks on the touchscreen, it will vibrate and the user will be informed that the smartwatch has registered his/her touch command successfully thus making him/her feel relieved. Otherwise, if a user fails to tap a button/hyperlink on the touchscreen, it will not vibrate then the users will know what's going wrong and tap again to trigger the command such as receive phone call.

May 2021 (SmartWatch for kid)

Question 1

Problems:

The first potential issue is the **small screen/layout on the smartwatch** which causes the screen to be overwhelmed with the contents (i.e buttons, image, text, etc). Our target user is 5-8 years old kids which can be considered as novice users who are not familiar with the system as they are still developing their mental model. In most of the cases, the cluttered and complex layout on the smartwatch screen could lead to the kid's difficulty in choosing the right functionality (i.e button) in order to achieve their goal efficiency and effectively (i.e make phone calls and pick up phone calls). The kids, especially 5-6 years old, cannot focus their attention on the things that are relevant to what they are doing on a small and cluttered screen.

The second issue is the **noisy school environment** such as kids playing around at the class, chatting at the school canteen, etc. To illustrate, the threshold of hearing in kids is 0.125 - 20 kHz. Hence, it's hard to notice the sound feedback in a noisy environment and cause them to be distracted easily from surroundings noise and not being aware of the incoming calls from their parents and cause them eventually miss the call. Consequently, this causes unnecessary worries to their parents as they might think their kids are in danger. This also causes smartwatch design to fail to meet its objectives effectively which are to make and pick up the phone call.

Solutions:

To solve the first potential issue, we can avoid the complex functionality which limits the number of buttons on the screen. For example, we can apply the Red Routes and Fitts Law principle which decides the common functionality that will be accessed by the kids most of the time and only places one or two important buttons such as calling and texting options to avoid confusion to the kids. We can also customize the button to their parent's photo and related images/icons to indicate the functionality which can help in promoting recognition better than recall as humans are good at remembering visual cues compared to text. This is due to when the kids see their parent's photo or image, they will automatically know what to do next if they want to make a phone call as well as pick up the call. Hence, this solution will also improve the visibility of the smartwatch's function.

To solve the second potential issue, we can make use of blinking/flashing color on the smartwatch screen along with vibration output with fixed frequency and amplitude (i.e 500ms) for haptic feedback and to better capture user attention. We could use some monochromatic color scheme to inform users about the incoming calls as it allows a greater range of contrasting tones that can be used to draw user attention, create focus and support legibility in an open environment. Moreover, we can let the user customize the auto phone pick up time (i.e 1, 1.5 minutes, etc). For example, if there are incoming calls and the user isn't aware of it, the call will be automatically picked up after 1 minutes. After the phone has been picked up, the kids will be aware of it in a short while as the familiar sounds which are their parents' voice. This allows them to pick up and answer incoming calls successfully even in a noisy environment.

b) *Remember to add HTA if occur in FOA*

- The purpose of the HTA analysis is to understand the way users perform their current job with the existing system either in a computerized or manual system.
- By understanding how users perform the tasks, the system can be developed which matches with the user's mental model so that it is compatible with what the user already does thus reducing learning time.
- For an illustration, we can do a HTA analysis on important tasks such as making a phone call and picking up a phone call from somebody.
- By doing this, we can obtain extensive and detailed information about task activities (i.e make phone call and pick up call) which can be used for further analysis so that they can design the smartwatch which can reduce the number of steps in carrying out these tasks to enable the target user, kids to complete their task more efficiently and effectively.

HTA

0. Pick up phone call

1. Look at the smartwatch’s screen
2. See what people call you
3. Tap the “Answer” button
4. Answer incoming call
5. End current call

Question 2

a) You want to find out the usability between two different personal assistant devices (as shown in Figure 2). Investigate the suitable **evaluation metrics** in measuring **effectiveness** and **efficiency** based on a task of weather query to those devices. (30 marks)

Figure 2. Left: Google Home Mini *(Source: The Verge)*, Right: Apple HomePod mini *(Source:apple.com)*

Marks Criteria for Question 2 a)
Effectiveness metrics (20 marks) + efficiency metric (10 marks)= 30 marks

These 2 personal assistant devices will be distributed to the 20 randomly selected users to perform the task of weather query (i.e ask for weather information).

Effectiveness is the completeness and accuracy with which users achieve their goal. In order to calculate the **arrucancy**, we can measure the percentage of users getting the weather either current or forecast weather from those 2 personal assistant devices versus real, correct weather information (%) to know if they are getting the correct weather information. Next, the measurement of the **completeness** can be calculated by assigning "1" if the participants manage to perform the task which asks for weather information through the personal assistant devices successfully and "0" if he/she does not. The calculation of the **effectiveness** of those 2 different personal assistant devices which are Google Home Mini and Apple Homepod Mini can be measured by the number of tasks completed successfully by the participants (asks for weather information) divided by the total task performed by the participants then multiplied with 100 percent to know the percentage of the effectiveness. Last, we can do a comparison with their effectiveness percentage to find out which devices are more effective.

Efficiency can be defined as the time and efforts in which users need to put in in order to achieve the goal. As an illustration, we can use stopwatch to observe and record the task time which is the time taken by the participants to complete the task (ask for weather information) either in seconds or minutes with 2 different personal assistant devices which are Google Home Mini and Apple Homepod Mini. After that, we can do a task time comparison to know which personal assistant devices take shorter time. In conclusion, the one which takes shorter time will be considered more efficient.

b) Between *Laboratory study* and *Field study,* which is the most suitable for your evaluation in the scenario given in Question 2 a)? Justify your answer. (10 marks)

c) IT programmers are encouraged to work from home during Covid-19 pandemic. Demonstrate with **TWO (2)** important factors on how they could make the working environment ergonomically correct. (10 marks)

b) In my opinion, I think that laboratory study is more suitable for the evaluation between these 2 personal assistant devices. This is because by conducting laboratory study, we can manipulate the factors such as environment noise, wifi performance, lighting, etc to determine if such manipulation generates a change in the usability measurement result for these 2 personal assistant devices. Besides, laboratory study allows us to select the suitable participants and place them in a condition which is more systematic. For field study, although it's advantage is the evaluation results can be more towards the real life context because it represents a variety of situations and environments that subjects experience in their natural habits, it might cause the problem of lack of control which makes it difficult to judge the generalizability of the evaluation. Hence, laboratory study can provide a more controlled environment for the tester to find out more precise and accurate evaluation results of these 2 personal assistant devices which can be used for further improvement on their UI design.

c)

The **equipment** such as tables and chairs selected by the IT programmer are one of the important factors to make the working environment become ergonomic. To illustrate, the seat should be padded for comfort but maintain a good posture to avoid repetitive strain injury (RSI) such as back and shoulder pain. Next, there should be enough space under the tables so that their legs can fit comfortably under the desk when sitting. The edge of the tables should be smooth and rounded to avoid getting unnecessary injury.

Next, **the quality of lighting** can affect programmer mood and well being. Note that poor lighting can cause eye strain, stress and fatigue. Therefore, adequate lighting should be provided such as natural light to improve mood and aid concentration on their work. Another thing to consider is the position of the light sources. We need to make sure that light sources don't cause glare on the monitor screen . The programmer should not sit back to a window or face the window as this will make reading a monitor difficult.

Sample Answer from sir:

Q1 a) choose any 2 only, each 10 marks

- Problem 1: small screen display on the smartwatch and "fat finger" of users make it difficult for the user to tap on the correct button **(10m)**
- Solution 1: design a bigger button on screen to catered the needs of the fat fingers user (bigger than finger). **(10m)**
- Problem 2: Pressing the side physical push button might not suitable to kids (5 to 8 years old) especially 5 to 6 years old , as they are still developing their psychomotor skill, they may not be able to perform the task effectively and efficiently here while wearing the watches, button may not easily reachable **(10m)**
- Solution 2: Interaction design with touch screen (button on screen) as an alternative option for the user. No need to remove the button on the smartwatches, we are not redesigning the hardware here. **(10m)**

Q1 a) choose any 2 only, each 10 marks

- Problem 3: Users limited knowledge on using digital gadget or don't know how to pick up or make call, the kids especially 5 to 6 years old still developing their cognitive skills , cannot perform the required task effectively and efficiently here. **(10m)**
- Solution 3: Using colour/image icon instead of text (parent photo, tap to call), auto pick up after certain time like 10 seconds **(10m)**
- Problem 4: school environment are noisy (at the school canteen) and the kids are not aware of incoming call from the parents did not able to pickup the calls. **(10m)**
- Solution 4 : blinking colour on screen, vibration, auto pick up incoming call. **(10m)**

Question 2 (Continued)

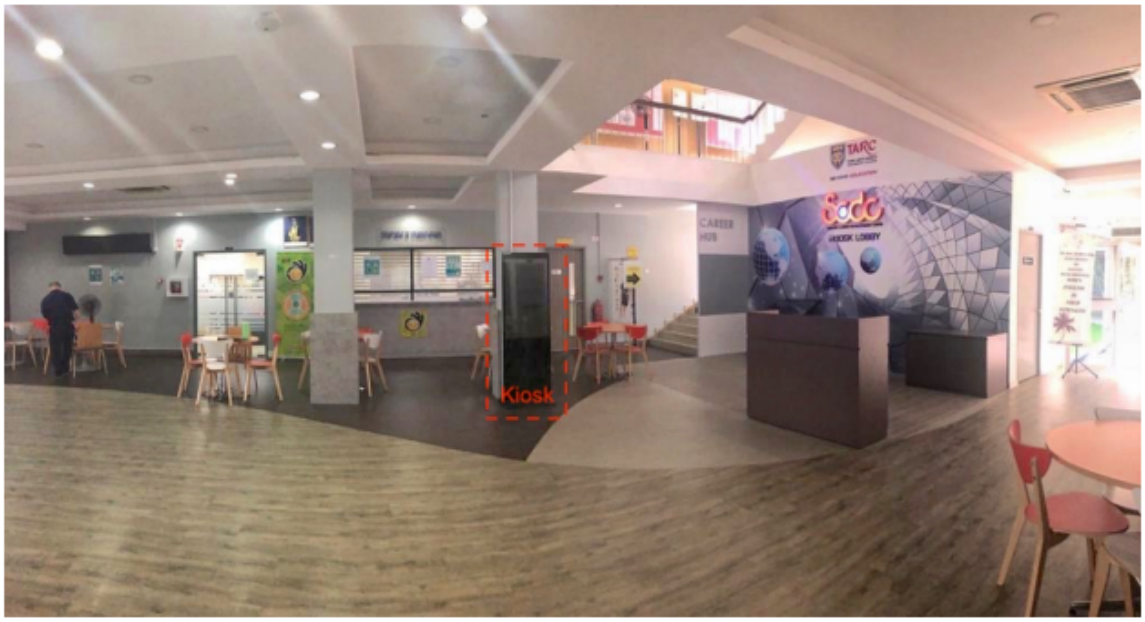

Image 2: Panoramic view of lobby area.

You are assigned to design kiosk digital content for the Department of Student Affair (DSA). DSA wants to help students in their Internship and job finding, so a kiosk is placed as shown in Images 1 & 2. This kiosk is equipped with built in mic, camera and touch screen. Write a short essay on **THREE (3)** potential design issues/problems that need to be identified before designing the kiosk content, and discuss your **ONE (1)** design solution for **EACH** of the potential design issues/problems.

(60 marks)

Oct 2020 (B)

Sample Answer :

User: Student who need to get an internship and job information

3 Potential design issues/problems:

1st problem

Environment: Public, noisy environment as the kiosk is being placed at the lobby area which full of students

Task: Listening to the internship guideline audio explanation played from kiosk

Issue: Users' attention is distracted easily and they hardly hear the explanation clearly because of the background noise, which is when other students are talking or discussing their homework and assignment while sitting at the table. This causes them to receive or interpret wrong important information from the kiosk and might cause them to lose the opportunity to apply and get an internship.

2rd problem

Environment: Daytime or night

Task: Pressing buttons on the kiosk's touch screen to obtain necessary internship information

Issue: Small screen displayed on the kiosk causes the "fat finger" users difficulty to click on the correct button to achieve their task. They might get frustrated as the kiosk always responds to their action wrongly which displays the unrelated information to them and wastes their time which could cause the kiosk to be perceived as low quality.

3rd problem

Environment: Daytime or night (morning or night class session)

Task: Read the content from the kiosk screen

Issue: The text is unreadable as the size of the text is too small when displayed on the screen. Not only that, there is insufficient contrast between the foreground and the background (text) which affects the visibility of the screen and causes user difficulty in perceiving and interpreting the information coming from the kiosk. Consequently, the users cannot get the job

information accurately and on time and might cause them to miss looking at the internship application period thus making them lose the opportunity to get the job.

3 Design solutions:

Solution for 1st problem

Since the environment is noisy, we could provide the user the choice to adjust the volume of sound from the kiosk. However, sometimes the environment is too loud until the user cannot hear or even volume up the sound. In this case, we could provide users with a noise cancelling headset to listen to the kiosk audio to filter out the background noise along with a simple yet informative interface design for the kiosk content without cluttering it to attract user attention and be easy for them to remember. Furthermore, we could use color to highlight the important or special content/notes (i.e application periods) to make it stand out from the rest of the text content as color enhances an individual's visual memory such as red or yellow. One thing to be considered, we should make sure there is sufficient contrast between the text and its background to ensure the text is readable.

Solution for 2rd problem

We could design a bigger button on the kiosk's screen to cater the needs of the fat fingers user. Hence, the size of the button is big enough for them to be clicked and tapped via touch screen and can avoid slip error to happen *(correct intention but wrong action)*. Moreover, we can make use of the Red Routes and Fitts Law principle to decide which buttons has the highest frequency accessed by the student to achieve their goal thus can limit the number of buttons on the kiosk screen which only place the important buttons such as "View Job details" and "Back" button on the screen or increase the clickable area around the buttons for a few pixels. This could increase the visibility of the button function in which users will be able to know what to do according to their goal that was established earlier.

Solution for 3rd problem

The kiosk should allow users to customize the screen brightness and contrast between foreground and background (text). It could be even better if the kiosk can adjust the brightness and contrast according to the environment (daytime or night) automatically to make the screen clearer to be read. In addition, the kiosk should provide the functionality of changing the text size at the kiosk settings so that they can adjust the text based on their preferences while reading the content that is displayed from the kiosk.

Question 2

Question:

You are assigned to help TARUC students in their application of leave or absence. You plan to transform the current form (Appendix A) into online form (website) to ease the application process.

a) Briefly explains your formative test during your development. (10 marks)

Marks Criteria
ONE formative test with justification/explanation = 10 marks

b) **Effectiveness** and **Efficiency** are the usability goals of this website form design. Briefly explain how you **measure** them during your summative test. (30 marks)

Marks Criteria
Measurement of Effectiveness with justification/explanation = 20 marks Measurement of Efficiency with justification/explanation= 10 marks

Efficiency **(8m)**

To measure the efficiency, record the time taken for user to complete a leave or absence application website form. To further measure compare the efficiency, use the same user to complete the old version leave of absence application (as shown in appendix A) in the same environment, the time taken to complete will be recorded. After that, we can compare the result of the website form and the old version form. If the time taken of website form is shorter than the old version form, this mean that the website form is more efficient than the old version.

Things can be add on:

- How many user to be involved
    - E.g 20 users will be involved as in the summative test, we should have more user in order to get a high confidence interval on the results