Map App design Process for Merchiston Campus Public Screen

This is the detailed design process

For the outline of design process please refer to the headline

Goals & Objectives

Produce and evaluate a design – not to implement one for a student-centred, or visitor-centred application to be installed on the large, interactive, public screen at Merchiston.

Application should be

- Kept functionally quite simple.
- Make use of other devices that people could be expected to have with them
- Focus on information, communication, entertainment or other types of activity.
- Undertake some understanding, envisionment, design and evaluation activities for chosen application.
- Produce a report of work in which clearly justify the methods and approaches designer have taken.

DESIGNING AND EVALUATING FOR THE APPLICATION RUNING ON THE INTERACTIVE PUBLIC SCREEN

Indoor Navigation – A 3D Map Navigation design process

Contents

1. EXECUTIVE SUMMARY

The main purpose of this report is to justify the methods and approaches I have taken on the design process of 3D Map Navigation App.The methods and approaches used in the four key processes–understanding, environment, design and evaluation –in designing interactive systems will be used in this design process, the relationship between the methods used in the four processes and scenario-based design, as well as ethical issues will also be taken into consideration.

2. UNDERSTANDING

2.1Brainstorming

In order to generate plenty of App concepts to explore the idea, brainstorming method was used at the first stage of understanding, The biggest advantage of brainstorming is the high amount of generated ideas(Tricider.com 2012). The ideas of App concepts can also be used as a suitable prompt answer for the closed and specific question during the interview(David Benyon, 2010, p161).

A large number of application ideas were finished up in a small three members group (one female, who is from School of Arts & Creative Industries, the other two male are from school of computing).The group brainstormed ideas like which application running on the screen will be useful. The ideas such as Job App, Shopping information App, News App, Weather App, Discount App, Rent App, Social network App, Map App, Picture share App and Notice App were generated. These ideas would be used as an prompt for the interviewees to answer the specific question 'If you need an App running on the screen, which one would you prefer?' in the next step of understanding.

2.2 Semi-structured Interviews

Semi-structured interview was used as the main method to acquire the data due to its advantage and the contexts in which activities happen. The semi-structured interview is flexible and it is easy to be controlled by the interviewer. It is easily accepted by participants because people are more likely to chat rather than to fill out a form in the public place. Considering the ethical issue, participants must be informed of what is happening and grant their permission in advance, this could lead to an conscious feedback that might be not participants' real feeling in a formal interview. However, the informal interview which similar to chatting can make the interviewer easy to get the participants' unconscious complain or comment about the product.

Obviously, this method is more demanding for the interviewer, for instance, people tend to give positive comments if the interviewer said the App is designed by his or her school, hence the interviewer need know how to avoid these problems and try to make interviewee feel in the bar to chat with friends or complain to close friends. So interviewer needs to be well trained in this situation.

- ***Aims of the Informal Semi-structured Interview***

1. Collecting user stories to abstract it to generate conceptual scenarios，it will be used to generating ideas and specifying requirements.

2. Collecting user information to crate and develop persona

3. Finding the best App in the numbers of Apps concept from group brainstorming.

4. Probing for in-depth requirements of the final App to develop.

- ***Participants, Place and Time***

Students（numbers）:

- Twelve students from different country with different culture are interviewed face-to-face, Including: China(4), Saudi Arabia(3), United kingdom(2),Thailand(1), Czech Republic (1), Hong Kong(1)

- ***Visitors（numbers）:***

Study abroad consultant (1) Face-to-face interview

Human resources professional (1) Skype interview

2) Place：Merchiston hall，Library，Jack cc


3) Time：During Monday to Friday, 10 minutes/ Per person

- ***Questions***

- Do you know the wall？How many times have you used the public screen？ How long every time you use it？

- Is it attractive to you? Why? Why not?

- Do you know the main function of the screen? Please list the App on the screen which you use frequently every time you use it.

- If you need an App running on the screen, which one would you prefer? (Closed and Specific questions--Choose answer from the Brainstorm concept)

- Tell me some good things and bad things about the Apps on the Digital Wall.

2.3 Workplace Studies

the Observing Activities in Situation method was used to generate the requirements. .

A public screen, the Digital Wall is located near the entrance of Merchiston campus, in the middle of the entrance and campus reception. The Digital Wall is a new facility intended to be a resource for staff, students and University visitors, it is the most advanced public multi-touch wall in the UK. The wall uses an optical system called Diffuse Illumination which can simultaneously detect an unlimited number of touches. It uses 4 HD projectors to give the wall a massive better than 4k resolution (4320×1920) which makes everything sharp. The wall is in its early stages so there is not a lot of applications and functionality. Currently it has a series of informative sites, documents and multimedia. Some of the developments of apps are constraint due to some technical and data protection (Digital wall introduction, 2012, FAQ).

Considering the feature of the Digital Wall such as it is used in public context and easy to observe, the Observing Activities in Situation method was used to generate the requirements. . In addition, the shortcoming of interview is the other reason that leads to the utilization of Observing Activities in Situation. ‘ In the interview, some activity is intrinsically difficult to describe in words and an interviewee describe the ‘official’ procedure rather than how something is actually done in practice. They might be embarrassed to admit to some difficulty they are having, or may just tell the designer something to get rid of them ’(David Benyon, 2010, p165). So Observing Activities coupled with semi-structured interview was used to get round these problems. Furthermore, participants can show their comments more clearly when operating the App on the Digital Wall.

In view of the ethical issue, I observed people firstly about twenty meters far from the Digital Wall, for the people who used the screen below 20 second and then leave, I ignored it and then wait for the other one, if people continue use the screen above 20 second, I would go to his or her side and request the permission to go on observing

and ask some question after obtaining their permission. People tend to be kind in campus when talk something like design something and they always feel more enthusiastic when I told them their idea would be involved in decisions which affect the final design. The data I get from the workplace studies can be used to definite the personas, usage stories and scenarios.


There is not signpost that shows the way to School of Computing office in the corner of C floor, two students found it was hard to find the A17 which under the Jack cc

3.4 Data from the understanding

It is essential for designer to develops a clear and thorough understanding of the 'PACT'(people who will be involved with the product or system, the activities that are the focus of the design, the contexts in which those activities take place and the implications for the design of technologie) to generate the requirements for the system that is to be designed(David Benyon, 2010, p146).The table below shows the data that base on the PACT analysis from the different interviewees' stories

Question	**Answers（number）**
Do you know the Digital Wall?	No（3） Yes（11）
How many times have you used for the Digital Wall?	1 times（3） 2--3 times（3） above 3 times（ 2）
How long every time you use it?	0--2 mins(4) 2—5 mins(2) Above 5 mins(2)
Is it attractive to you? Why? Why not?	Yes(2) I saw people play with it/ The game is interesting No(6) I do not need its help/ It's location is not attractive/ I think it's a display wall at first/ I do not know the what does it provide before I though it/Maybe the gray color is not attractive/ I feel shy when lots of people

	behind me when I use it.
Do you know the main function of the screen?	Yes(4) No (4) (only know the game, BBC, University website)
Please list the App on the screen which you use every time you use it.	Game(6) University website(5) BBC(4)
Tell me some good things and bad things about the Apps on the Digital Wall.	Good: Easy to operate/interesting/fast/ Many people can use it at the same time/ Killing the boring time during waiting for someone Bad: Not very helpful for me now/ Privacy issues
If you need an App running on the screen, which one would you prefer?	Map App (4) News App(3) Job App(3) Weather App(2) Rent App(1) Social network(1)

It can be seen from the table that 21 percent of people never use the screen before, one people even do not know where the public screen is. Most people have used the screen before but they do not use it for a long time (for most under two minutes). Lots of people just touch it for one or two times then leave. From these feedbacks, we can see that the function the Digital Wall provides is not attractive, people prefer more practical Apps such as Map App, News App, Job App, Weather App and so on. Now the most popular App on the Wall is Game App which is followed by the University Website and BBC Website.

From the workplace study, I found that the screen is located at waiting area, people who waiting for their friends usually look back to see whether these friend is coming when using the screen. But the think the Digital Wall is a good way for them to kill the boring time during waiting for their friends. However, the gray desk top of the Digital Wall and the location of it lead to the Digital Wall is not catchy for people to notice it. Even though people notice it they do not know what it can provide before they touch it.

Different people with different interest would prefer different App as the data shows above, so I focus on the problem that most of people have experienced. From the interview, I found many experienced the story that they can not find the room they want to go to especially as a new students at the beginning of the semester (two pictures showed below is the two example that the campus layout confuse the student) and from the other interviewee most of them think Map App is a practical application.

3.5 Analysis of similar products

The other activity of understanding–Analysis of similar products– was undertaken after deciding to design the Map App to generate the requirements. Analysis of similar products that have been produced to research what people do now and what they would like to is a useful way since it can help the designer to see the product

being used in situ and to consider the design solutions that others have proposed. This might highlight good and poor solutions for particular design problems (David Benyon, 2010, p203).

The Google Map was researched because it might have a similar structure to the Map App running on the Digital Wall. Sketches as an envisionment technique was used to collect the requirements because it can show ideas and thought quickly.

The interview was undertaken with the sketches and some questions showed below to gather requirements

Comparing with the sketch that describes the main function of Google Map, please answer:

- What are the functions that the new Map App must have?
- What are the qualities that the system must have? (Factors in acceptability, sales, usage）or （Aspect of design including: image, aesthetics,usability performance, maintainability, security, cultural acceptability and legal restrictions）(David Benyon, 2010, p149).

Then a conceptual scenario for the Map App was abstracted from gathering the details of stories from the participants as follows.

Searching and being guided to the destination
People with any degree of basic Google search skills will be able to search the destination via the Map App on the Digital Wall and be guided to the destination.

3.6 Requirements

Requirements

The requirements which is a prioritized list of issues(from Must have to Should have to Could have)are shown below:

Functional（what the system must do）:

- Map searching（destination searching）
- Suggested routes
- Current location(GPS)
- Auto complete searching
- Routes in every floor
- Distance and time to destination
- Lists of all main destinations and phone numbers

Non-functional（quality that the system must have）

- Striking and Attractive
- Sensitive and Accurate
- 3D display
- Signpost: turn right, turn left
- Transmit the route to the phone
- Special route for disabled
- Elegant and simple interface, easy to read and to use
- The route is updated in season
- Intuitive and visualized 3D model
- Voice input for disabled
- Multiple languages
- High quality definition and contrast
- Easy to remember

Additional requirement could emerge latter during some design is done with the aid of scenarios and prototype.

4. A FIRST DESIGN AND EVALUATION

Through understanding process a wide range of requirements were gathered, then eight scenarios constituted the final scenario corpus was generated. In the first design stage two personas were developed to explore the various needs of people with different background and lifestyles, then two concrete scenarios are generated from abstract scenarios by fixing certain design constraints and by adding specific design decisions and technologies. PACT analysis also plays an important role in developing the concrete scenarios.

Objective analysis method was used in this step to explore the in-depth understanding of the system. Eventually, a low-fi prototype wireframe were generated for the evaluation. The discount evaluation approach was used in this stage to evaluate the prototype and finally the problems of the design and suggested solutions were developed for the next step of design.

4.1 Scenario Corpus

The corpus of scenarios covers all the main functions of the system, it will be used to generate ideas and discuss the details of functionality. Eventually, eleven scenarios constituted the scenario corpus that was used in the project:

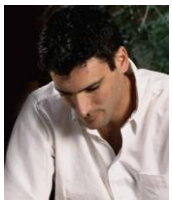
Scenario Corpus

- Been attracted by the Digital Wall when have direction question(similar to Information at the airport)
- Search the destination with the search box
- Click the address lists to find the destination
- 3D routes imitate people to show the way to destination(make people have the Sense of direction)
- Mobile Phone navigation
- Disabled uses voice input to find the destination
- People from abroad using their first language to search
- People without cell phone want a navigation

4.2 Persona and Concrete Scenario

Persona

Two personas were developed to explore the various needs of people with differing background and aspirations. These are shown in the table below.

		
Name	Alex Evan	Carina Lau
Age & gender	28，Male	32，Female
Marital status	Single	Married
Location	Edinburgh	Beijing
Education level	Master	Bachelor

Income	£1000 per month(part time)	£1500 per month
Profession	Student (full time) Customer Assistant at Sainsbury's (part time)	Overseas study consultant(full time) in EIC Group
Responsibilities	He is a Msc student of Computer School, Merchiston Campus, Edinburgh Napier University. His major is Information Systems Development. He also works with Sainsbury's as a Customer Assistant and he is responsible for helping customers	She is in charge of overseas study consultant, She is also responsible for the investigation of the University in UK and cooperate issues between the company and the University
Work life	He has three classes a week, the classroom is fixed. Sometime he needs to ask some questions to the tutor. He takes part in some workshop hold in Merchison and the Classroom is unfixed In his part job he is responsible for helping customers - perhaps taking customers to a product they can't find, or explaining how they can get the best from a special offer. He is also in charge of supporting warehouse staff with deliveries, fill promotion ends and merchandising units as well as ensuring that the aisles are tidy and clear.	Her working language is Chinese (70%) and English(30%), Her time schedule is tight and she is always under high stress. She has a very good memory and she like finish work quickly. Carina usually goes to the reception of the Universities firstly and then goes to the international office directly. Her job includes interviewing the representatives of the Universities and collecting lots of Universities materials for the company
Goals & Motivations	Alex desire an App which can help him find the classroom or the tutor’s room quickly and the App can give him a sense of direction would be better.	She usually gets lost in the big campus in UK even though she has got the direction from the reception, e.g., the first floor in her country means the second floor in UK. So she is always late for the meeting. Carina thinks the Apps should be attractive and easy to use, having different version for

		visitors from different country would be better.
Personality	Fun loving, cheerful in nature.	Rational and strict with her work
A typical activities	Poor memory A little tempered and wants to do things quickly and efficiently He is technology-savvy and easy to accept new gadgets.	A very good memory Poor sense of direction She attaches great importance to her health
Accessibility issues	vision auditory physical	Carina has a slight myopia.
Computer experience	He is an expert in computer programming software He is proficient in office software, he tends to learn software fast，he has a two year old PC laptop with wireless broadband at home. he downloads music from the internet.	She is familiar with general office software, Google search and email. She hates the software which is not stable and safe. Carina has a pc at home and usually uses it to play music and watch movie.
Mobile experience	He's a smart phone enthusiast, he just buy a new iphone 4S, his last phone is HTC desire with Android system.	She has a simple Nokia phone and she has use it for five years, Carina does not like cell phone with multiple function system such as Windows phones system because she is worried about the Mobile phone viruses
Social life	He usually hang out with his friend at the weekend and he also chatswith his friend on Facebook and Twitter.	Outside work, Carina socializes in city bars with colleagues from work and also keeps up with old contacts from school and university.
Values and attitudes	Alex does not want to spend lot of money in his daily life because he is a student and do not have lot of money. He has spend lots of money on new technology so he do not want to spend more money on the other things	She like tools that can improve her efficiency such as high quality voice recorder. Carina would like to pay the money on things that can improve her daily life quality.

Scenario(Alex)

1. Alex is a full time Master student who study in Merchiston Campus in Edinburgh Napier University. He also works in Sainsbury's as a part-time employee. It is the end of his first semester, Alex made a appointment with his tutor Dr. Jim Green to discuss some problems in his assignment last week. In order not to be late Alex arrives at campus fifteen minutes in advance. He comes into the hall. 'Jim Green's room is at……Oh I forgot it ' Alex realizes that he wrote down the room number on a little pieces of paper when the tutor telling him his room number on the lecture last week but he forgot where the paper is now! Alex wants to seek help from his Iphone 4S to look up the tutor's room on the University's website. He suddenly thinks of the news of the installation of a new application on the Digital Wall. 'Maybe I can try out the new App. ' Alex think.
2. Alex arrives at the wall and makes the selection of Map App[1], the interface of the Map App is similar to the Google map he usually use before[2]. He tries to enter his tutor's first name to check whether the Map application has the auto-complete search function like Google map[3]. Lots of names are listed with profession and room number[4]. He finds the tutor's full name and room number through Dr Jim's profession --information system which is Alex's major. Alex clicks the Jim Green and the App shows the destination and route of how he can go to his tutor's room from the wall spot[5]. Alex enlarge and shrink the Map App screen with his hands and fingers to view the routes, the map is a 2D map, there are signs like 'going to floor D ' show the route is from one floor to the other floor. Finally he understands the general direction.
3. Alex finds a button says ' Would like to indoor map navigation? ' on the destination icon. He selects 'yes' and the routes is transmit to his Iphone [6].
4. Then Alex uses the 2D indoor navigation on his Iphone to find the room [7]. When he arrive at the stairs the App points out 'go to D floor by elevator or stairs'. After Alex arriving at D floor, the distance indication shows 'Distance 128m of 130m" then he knows the room is nearby and finally Alex find the room on the left of his hand.

1. How the Map App is activated is not considered here. People can click the text link directly. For disabled people speech input is the other way to activate the App.
2. Note that how to search the destination is not determined here, beside the search method, clicking the list dictionary is the other way to find the destination.
3. Consider how to search by the disabled people
4. An issue here is how the search result be display on the interface, use auto-complete drop down list or on the side of the interface like Google?
5. There are two way to show the routes including 2D map and 3D map, both of the way will be test to determine which is better in the evaluation step.
6. Note that take the situation that people without a cell phone into consideration. Using public cell phone device or using print function?
7. Considering the special route for disabled people

Scenario(Carina)

1. Carina is a overseas study consultant in EIC Group. Her primary job is investigating the UK University and promoting the cooperation between EIC Group and the UK University. Recently she has visited lots of Scotland University in Glasgow, Dundee, Aberdeen and so on. The last stop of her visit in this month

is the University in Edinburgh. Carina feels a little tired but she has to insist on working because she is strict with her job. Carina decides to visit Edinburgh Napier University because she wants to investigate some Engineer major hold in Merchiston campus.

2. Carina enters the entrance of Merchiston Campus. According to Carina's experience, the first things she needs to do is going to the reception and asking the international office she wants to visit directly. The reception is not far away from the entrance so she finds it easily. Unfortunately, there are two students in the queen to ask information and there might be some problem with the first student. Carina has been waiting for five minutes and the student's problem has not been solved. Carina feels anxious because she thinks she could be late for the meeting. She looks around, there is a flash come into her sight---a Chinese character'校园地图'（means 'Campus Map', Figure 3）with a flash animation slides slowly[1]. ' that may be useful. ' Carina thought. Then she goes to the wall.

3. She clicks the '校园地图' and the system enters into a Chinese version of Campus Map. ' That is amazing. I can use Chinese software on the other side of the earth.' Carina is shocked by the considerate App. She clicks the list[2] and click 'I' because she wants to go to the international office. Then she finds the international office link and she clicks the link. After that the 3D map is shown on the screen and the route is shown in the map too[3] Carina views the 3D map using her figure to walk though the route [4] then she has a general idea about where the international office is. She sees a button pointing out ' Would you like to use the navigation device?' [5] she selects 'yes.' six seconds later the system shows 'the map has been transmit to the navigation device, please use it and give it back after use' Then Carina pick up the navigation device.

4. According the 3D map route on the navigation device[6], Carina compares the objects along the route to the virtual space in 3D map, finally she finds the international office. Then the interface of the navigation device shows 'place return the device before you leave the campus.' So after the meeting Carina return the navigation device to the return spot[7].

1. How the slider change to attract people(e.g. similar to changing page in PPT?) need to be consider.
2. Note that here is using click the address dictionary list to find the destination, the other way is search directly.
3. Here the App is using the 3D map, the 2D map need to be test in the evaluation stage too.
4. The gesture to walk through the map need to be considered. Refer to gesture pattern of using tablet or smart phone.
5. Take the way to transmit the Map App into consideration
6. The navigation method used on the cell phone need to be consider too(3D navigation or 2D navigation?)
7. Consider how to remind people who forget to return the device.

4.3 Objective analysis

Identifying the activities, actions and objects within the scenarios can help the designer to establish the high-level functional requirements and to acquire a more in-depth understanding of the system. The Objective analysis also gives an indication of

how often particular activities and actions could be carried out, it also provides how many objects require being present on the screen at the same time (David Benyon, 2010, p129). An object/action analysis of the scenario corpus is a good way of doing conceptual design.

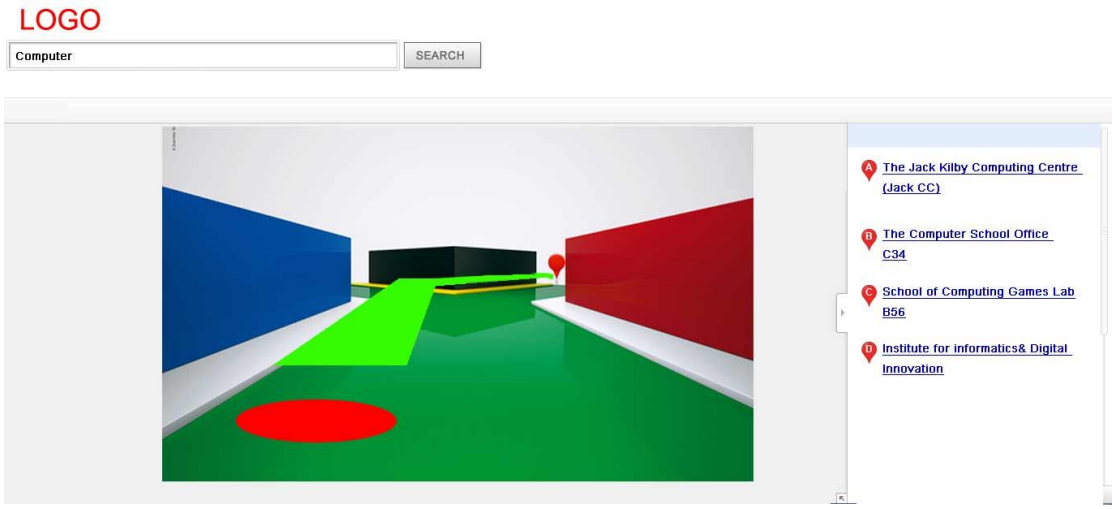
ACTION	OBJECT
Be attracted	Multi-language slider
Move（up, down, left, right, zoom in, zoom out）	3D or 2D Map
Click(7)	Map text link Address Auto complete address Search button Digital keyboard Home button Finish button
Speech input(5)	Active the speech search Key words Search order Determine the search result Transmission
Transmit	Map route app or pictures
Go to(Reduce)	Destination(From whole distance to zero)

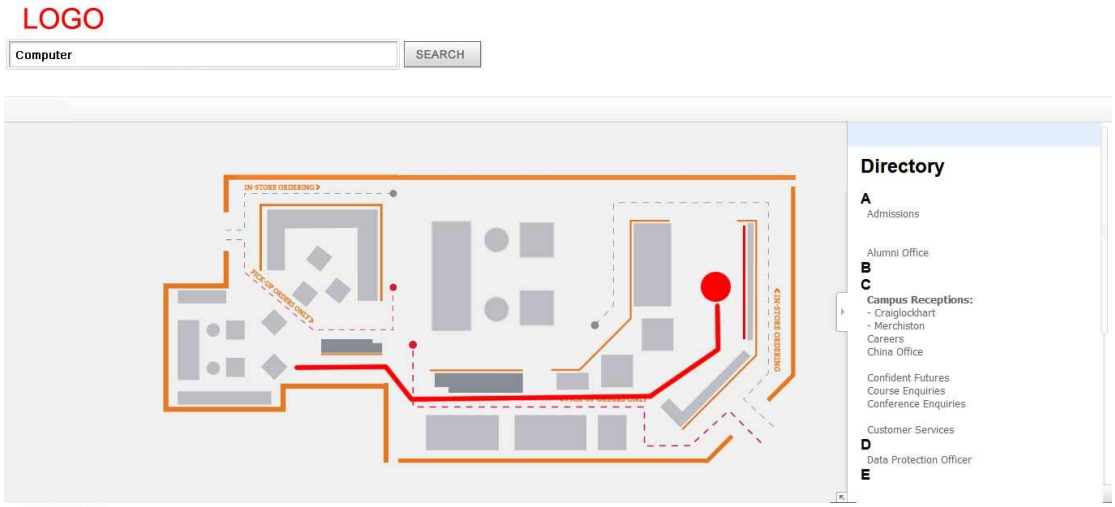
4.4 Lo-fi prototypes

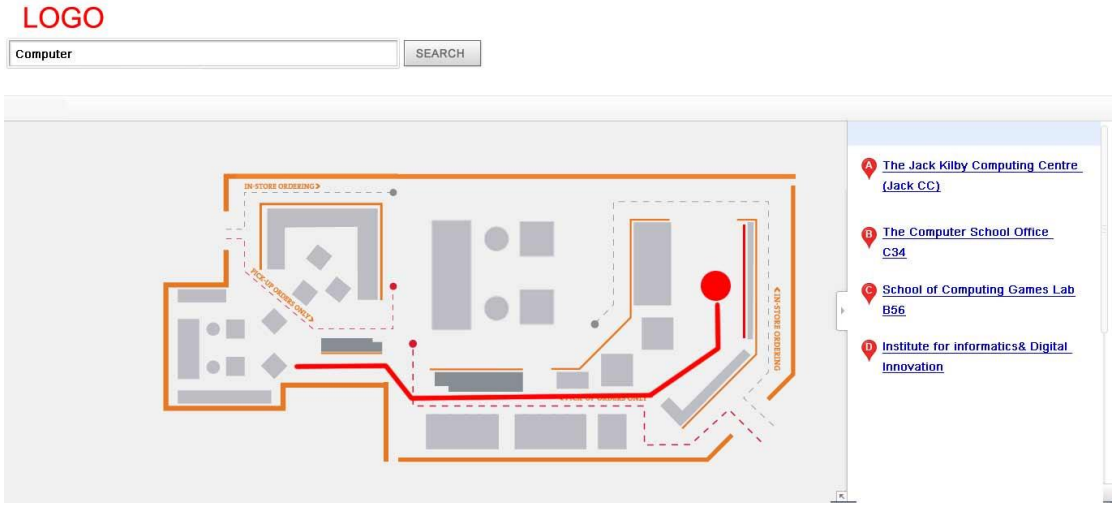
A Lo-fi prototype—wireframe of the Map App was produced in this stages. Lo-fi prototypes are an essential part of participatory design, people can evaluate ideas through engaging with prototyped design ideas and even they can directly involved in prototype design(David Benyon, 2010, p191). Lo-fi prototypes also have the following features: They are more focused on the broad underlying design ideas – such as content, form and structure, the 'tone' of the design, key functionality requirements and navigational structure. They are designed to be produced quickly, and thrown away as quickly. They can capture very early design thinking and should aid, not hinder, the process of generating and evaluating many possible design solutions (David Benyon, 2010, p187).

Considering this is the first stage of design，the main purpose in this step is to

explore the better design concept and gather the in-depth requirement if a design concept is determined, so I used the lo-fi prototype to envision my ideas. Compared to the hi-fi prototype, the lo-fi prototype will not cost me lots of time to produce it. It provides more function and content than the sketch so it is more clearly and easily to be understood by the participant who will evaluate the design. The Lo-fi prototype--wireframe of the App is shown in–2nd evaluation (Please refer to the design picture)







4.5 Evaluating the prototype

4.5-1Aim of the evaluation

- Testing alternative design concepts and finding which solution is better (e.g. use 2D Map or 3D Map?)
- Exploring the in-depth function and requirement after determine the final solution.
- Deleting useless function through the evaluation and exploring more potential useful function
- Finding the problem of the existing design
- Searching the design language of the Map App

4.5-2 Scenarios for the evaluation

Scenarios are an essential part of prototyping and envisionment. They provide a way of working through a design idea so that the key issues stand out (David Benyon, 2010, p55). They are helpful aids to understanding activities and help avoid having people imagine (or reconstruct) situations in the abstract(David Benyon, 2010, p153). They are helpful in generating and testing ideas, in documenting and communicating ideas to others(David Benyon, 2010, p64). So all the participants were given a concrete scenario as a task to work through during the evaluation stage.

4.5-3 Methods：

The Heuristic evaluation was skipped over in this stage because the main purpose of this step was to determine the better solution of the design. It will be used in the next step of design after more details are designed.

The main method I used in the evaluation in this stage is “Lost our lease, going-out-of-business-sale usability testing.”(Steve Krug, 2006, p135) which is the extension of Jakob Nielsen(1993)’s Discount usability engineering.

The reasons I choose this approach is that it is easy to recruit the participant (Almost anyone can facilitate a usability test), it will not cost me lots of time and the first three users are very likely to encounter nearly all of the most significant problems (Nielsen, J., 2000)

3 participants were test in the jack cc during the working days, the evaluations took around 15 minutes each. The wireframes of the Map App were prints as a paper prototype to assist the test. The process of the test is described as follow:

After telling the participants the Scenarios, Get the user to give his or her initial response to the site. Sit beside him and note down his or her comments. Set the user a task. Ask them to talk out loud as they do it. Note their comments. After the session, interview them about their impressions and note down their comments. Fixed the problem to Improve the design and evaluate again until three times evaluation was finished up.

4.5-4 Questions

The questions used for evaluation is as follows:

Sample questions *during* the session:

- What is this? Tell me what you have seen? How do you know that?
- How about this list, logo location or the button?
- Why you did not notice it?
- What do you want to do?
- What were you expecting to happen?
- Why you did not notice it?
- What is the system telling you?
- Why has the system done that?
- What are you doing now?

Sample questions *after* the session:

- What was the best/worst thing about the prototype?
- What most needs changing?
- How easy were the tasks?
- How realistic were the tasks?
- Did giving a commentary distract you?

4.6

4.6 Outcome of the Evaluation

Problems or Alternatives need to test	Suggested Solution or Comments
Digital Wall	
The effect of the Multi-language to attract user.	People like this idea, especially the two international student, they tend to be attract by the text written by their first language intuitively.
The list of address dictionary	It is a useful function to find the destination, but people need to drag the Vertical scroll bar to find the address, by contrast, people prefer enter into the address and find it directly. In order to make the App simple, this function finally is eliminated.
The search result on the left(right) side of the screen	Since there are not lots of address information in one campus which will be display on the screen, this function ultimately is eliminated
Special function for disabled	The special route and speech input function need to be add on the App.
Distance Indication	People prefer the distance indication function, it is helpful for them to know how far the destination is from the location.
Time spent to the destination	Because the campus is not very big, people will not spend long time to arrive to the destination, so this function is ignored.
How to distinguish the different floor?	Considering this issue---people prefer the 3D Map App which can provide them a visualized view about the map.
Simulate the human being to show people the way	3D Map App is a good way to give people a sense of direction, the direction of starting point need to be set up as a direction reference
3D objects reference	People can refer to the 3D objects reference and compare it to the real scene. But the 3D objects need to be updated since the real scene could be changed. The unmatched virtual space will confuse the user.

Cell Phone navigation	
Transmission method	Finally transmit to the use's cell phone is selected instead of the public navigation phone. Because people who have smart phone can receive the navigation App and people who use the traditional cell phone can receive route pictures. Using public navigation phone will make the service be complicate.
Personal privacy problem	People enter the phone number to make sure the navigation app will not transmit to other phones nearby.
2D or 3D	Similar to the Digital Wall screen, the 3D application is selected.

5. A SECOND DESIGN AND EVALUATION

In the second round of design and evaluation, the design is improved according to the suggestion and comment from the last round of the evaluation, the scenarios was also developed for the evaluation in this step. The interaction pattern and the design language were adapted in this stage to explore more detailed interface of the system.

5.1 Improved Scenario

The part of scenario which is improved along with the improved design is as follow:

……

After searching the route Alex want to browse the 3D map, Alex finds that there is an animation demo showing how to use hand to view the 3D map: enlarge with two hands to forward in the map, shrink to move backward, turn left with left hand and turn right with right hand. Alex uses his hand to enlarge and shrink the map to walk through the map. Then he has a general idea of the destination location.

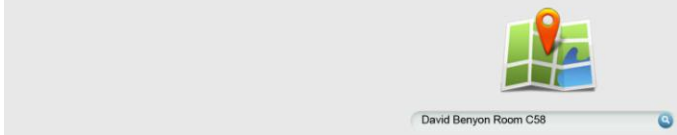
He finds a dialog box on the interface says ' Would you like to transmit the route to your cell phone? ' Alex clicks 'yes' and then a numeric keyboard appears, he enters his cell phone number and the Map App is transmit to his phone automatically. After finishing the transmission, Alex goes to the destination with the 3D map navigation on his Iphone……

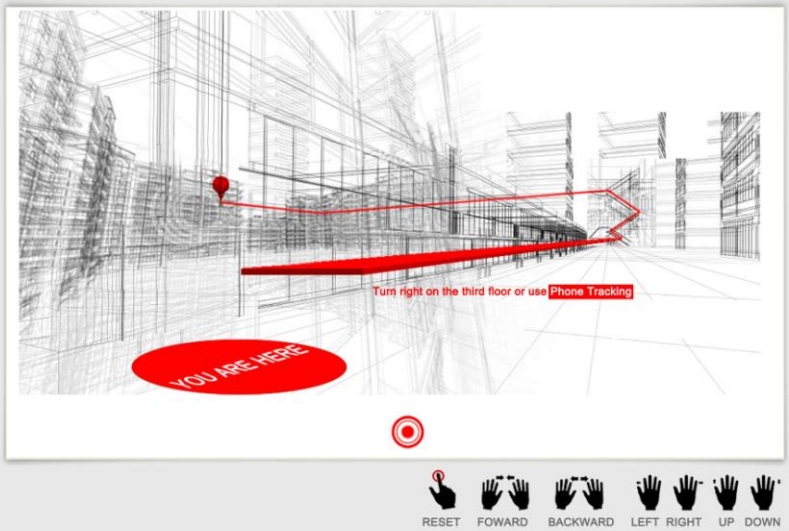
5.2 Hi-fi prototypes

Hi-fi prototype was used in this stage，the design concept was visualized in Photoshop, then the interface pictures were input to html to mock-up the interactive effect.

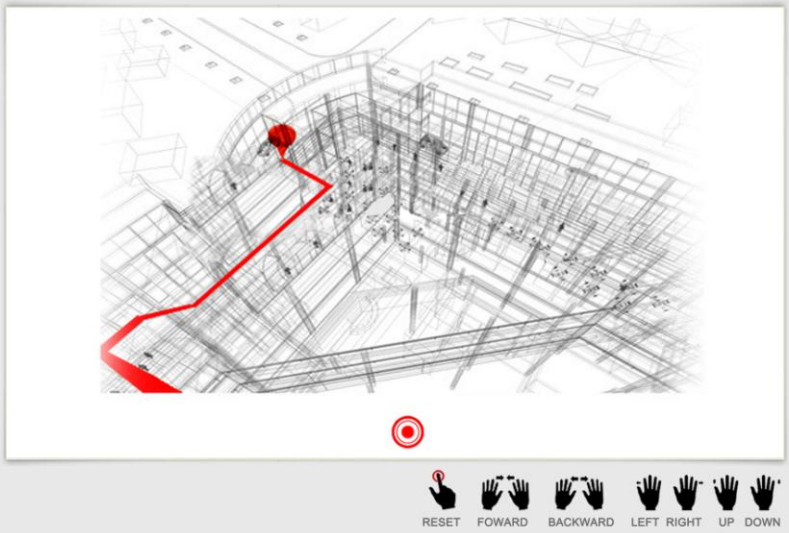
Hi-fi prototype was used in this step because it is useful for detailed evaluation of the main design elements (content, visuals, interactivity, functionality and media), which can make the idea convincing. The other reason is that the App is not so complicated and it is easy to draw the interface. After the improve design and the application of the interaction patterns as well as design language, it is necessary to produce a hi-fi prototype to do in-depth evaluation such as usability test of the interface. The Hi-fi prototype of the App is shown in–3rd evaluation (Please refer to the design picture)

Design Description: Enter the keyword, relevant destination will appear.

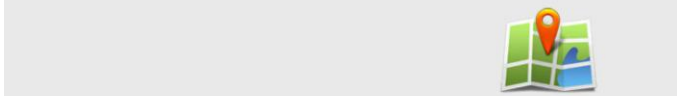




Design Description: 3D wireframe and track line provide clear concept of destination



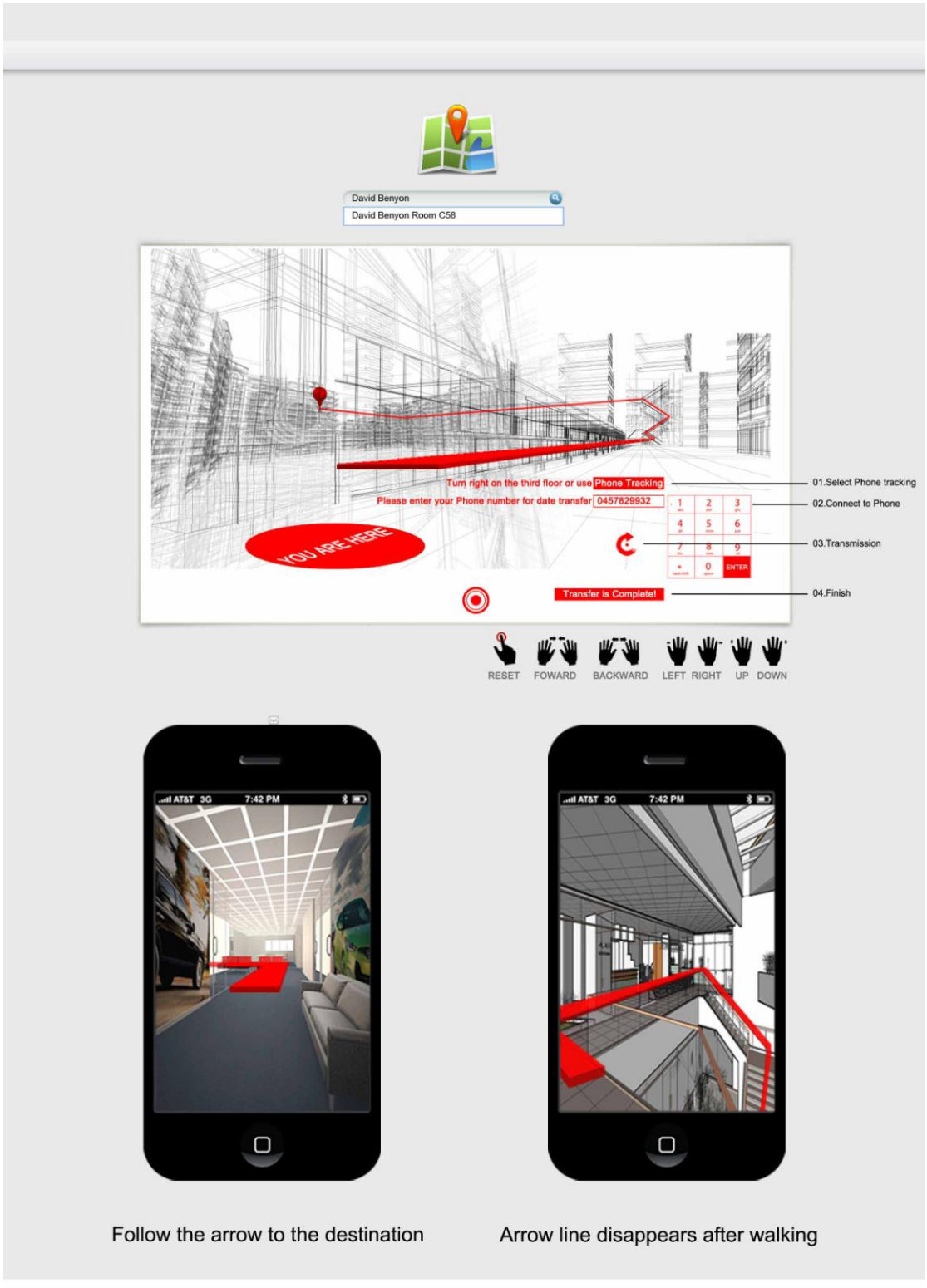
Design Description: This is especially useful for underground space like JACK CC underground



Design Description: Zoom out and Zoom in , Change angle to understand the trace.

Design Description: The use of different language is a good way to attract people especially for international students

Map icon is from http://findicons.com/search/map Pictures is from http://www.shutterstock.com/



Interaction patterns

Interaction patterns were adopted in this design process. The gesture patterns for interacting with multi-touch displays (Wobbrock *et al*., 2009) was used as a guide to design people's gesture of walking through the 3D Map. The interface design of search function refers to the UI patterns (Anders Toxboe, 2012)

Patterns build up into the complex interactions of menus and mice that we are familiar with: patterns of layout of menus, of the highlighting when the mouse rolls over an item, flashing when an item is selected and so on. It has the rich description

and examples that go with design guidelines. (David Benyon, 2010, p217). Designers use the design patterns to understand the existing mature design function. It will save lots of designer' time to consider the interactive style, the designer can focus their more time on the whole system design.

5.3 Design language

The design language produced consists of a set of standard patterns of interaction and all the physical attributes of a design – the colors, shapes, icons and so on. A 'design language' defines the key elements of the design and some principles and rules for putting them together. A consistent design language means that people need learn only a limited number of design elements and then they can cope with a large variety of different situations (David Benyon, 2010, p71, p215).

Here the Napier university color(red, black, gray and write) and graph were used in the interface design, the style of the App is simple, academic, modern and peaceful. I try to use the small number of the button and try to make the user use the small number of click to finish a task in the interface design. The search method is similar to Google to make sure that the user does not need long time to understand how to use it.

The use of design language in this step can make the design similar to the final product and it is useful for the evaluation in this round to get the feedback from the user.

5.4 Evaluations

5.5-1 Aim of the Evaluation

5.5-2 Evaluation methods

The "Lost our lease, going-out-of-business-sale usability testing." was used in this stage again considering its advantage. In addition, Heuristic evaluation was used as an expert evaluation, which will be coupled with Participant-based evaluation to test the final design. I use the list of high-level design principles (David Benyon, 2010, p71, p89) as a guide for the usability test. The over view of the principles I used is as follows:

1 Visibility 2 Consistency 3 Familiarity 4 Affordance 5 Navigation 6 Control

7 Feedback 8 Recovery 9 Constraints 10 Flexibility 11 Style 12 Conviviality

5.5 Outcome of the Evaluation

Problems or alternatives need to test	Suggested Solution

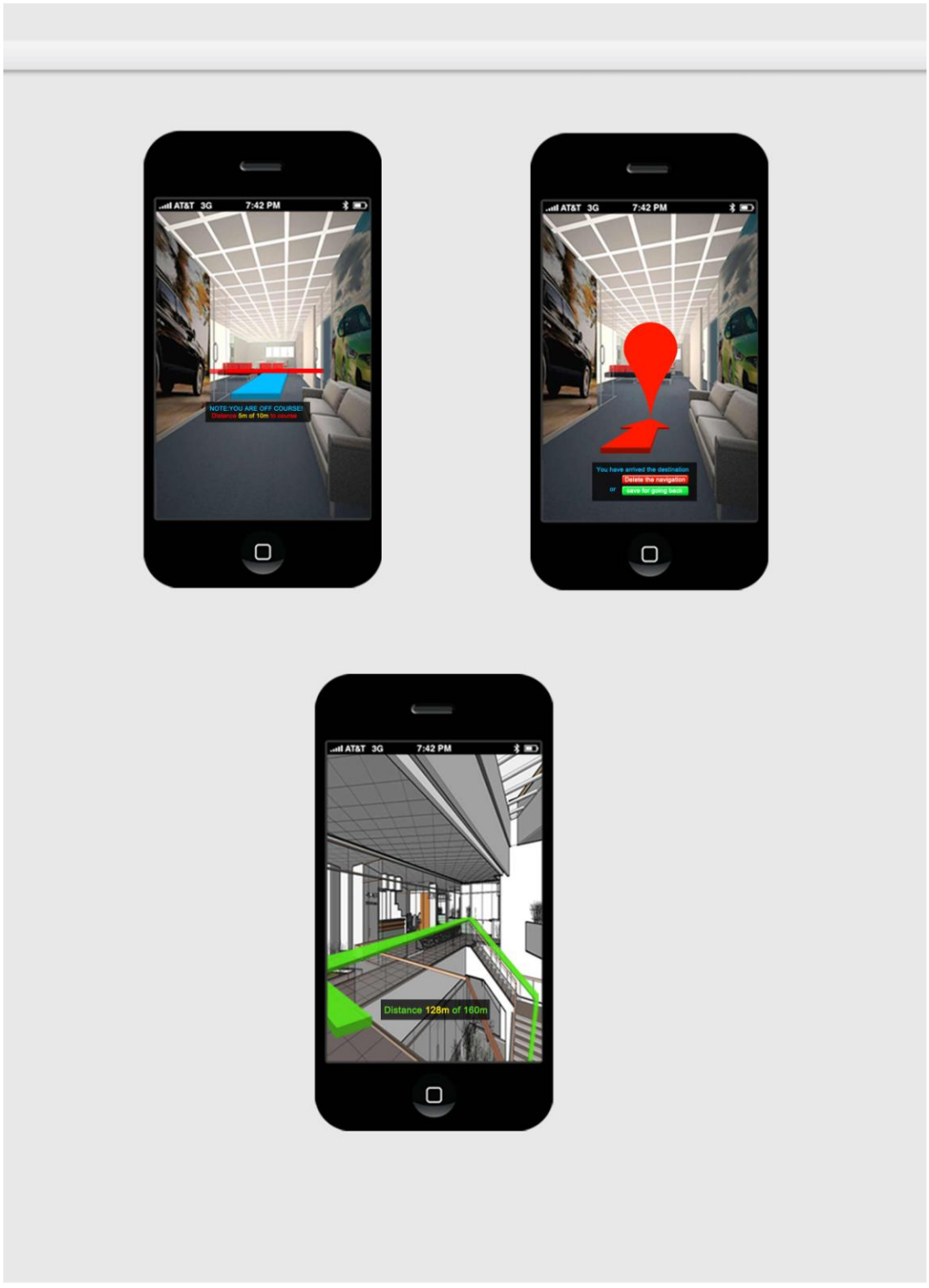
Digital Wall	
People do not know the first page is a Map App, they think it is a Search engine.	Put the ‘ you are here ‘Initial map page under the search box to make people realize this is a Map search App
The initial prompt message in the Search box is not easy to understand	Change ‘please enter the relevant information’ to ‘ please enter the keyword of destination ’
The Reset(home) button is not easy to understand	Change the icon to a home icon
The button of ‘Phone tracing’ is not like a button, people do not know it is clickable	Resign the button and use the 3D icon
There is not a direction of ‘ you are here ’ people do not have a clear sense of direction	Draw a arrow to indicate the initial direction
The specification of how to use the hand to view the screen is not necessary and it makes the interface Chaos.	Use flash animation to show how to use it and disappear after the demo
The link of Public space such as WC	People do not think it is necessary, if they want to know the information, they can enter it to the search box.
Cell Phone navigation	
Transmit time need to be shown to the user	Add the transmit Progress bar to the interface
Distance Indication	Distance Indication also need to be shown on the Cell Phone navigation
How to deal with the app on the cell phone after arriving at the destination?	Set up two choice to the user:1. Delete the app 2. Select the return button.
How to deal with the issue that people deviate from the route	Use color different from the route color to inform people who deviate from the route and indicate the distance of going back to the correct route

6. FINAL DESIGN, EVALUATION AND FUTURE

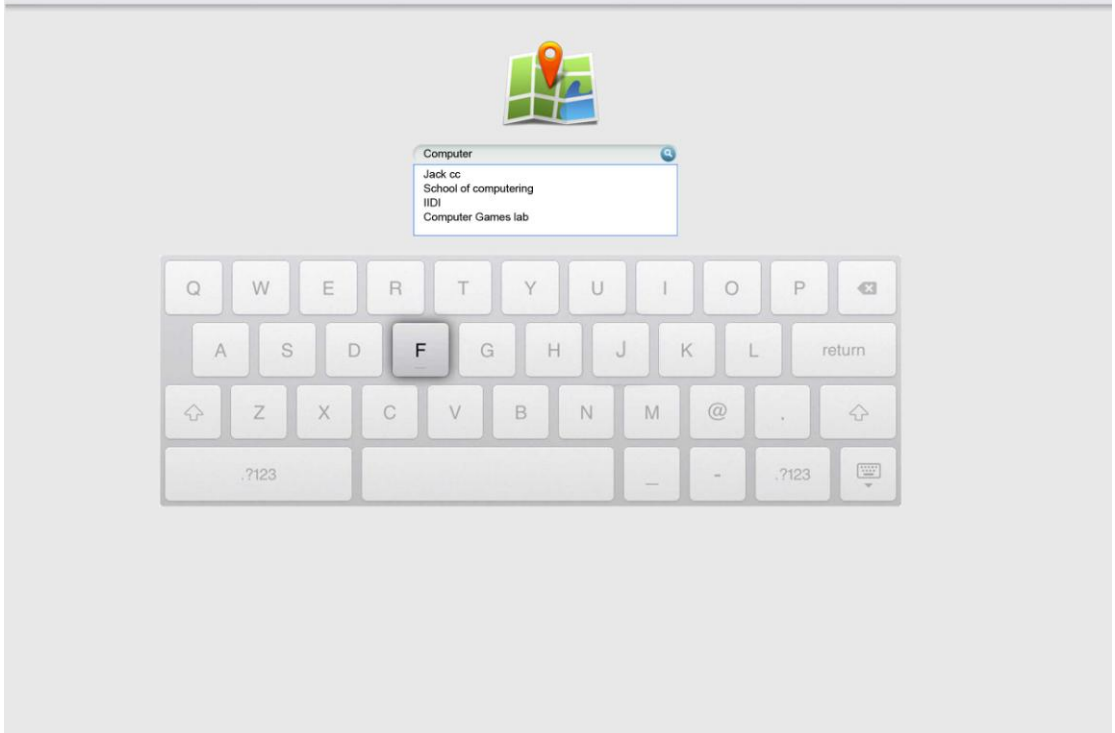
In the last round of the design process questionnaire method was used in evaluation of the improved final prototype. The data was analyzed and illustrated by the bar chart. The future work and the whole design analysis were also demonstrated in this section.

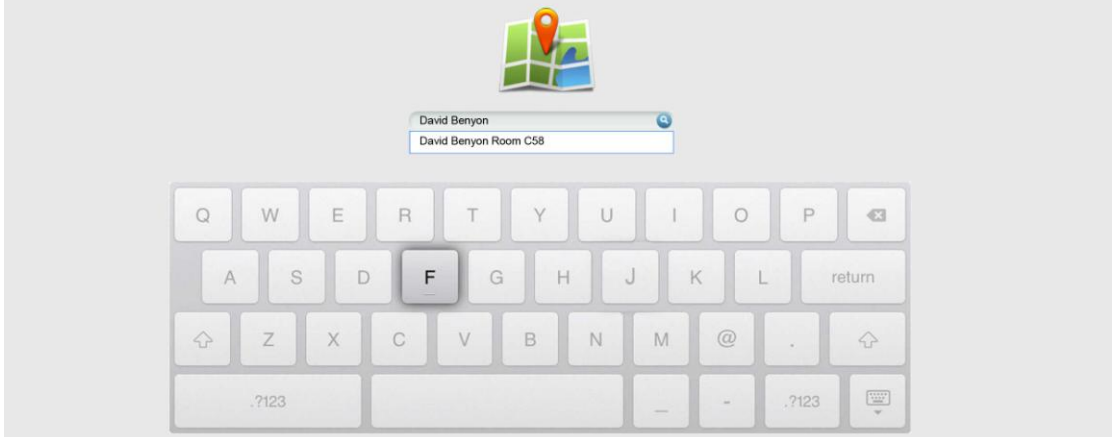
6.1Final Design

The design was improved in according with the feedback from the second round evaluation. The final prototype of the App is shown in–4th evaluation (Please refer to the design picture)

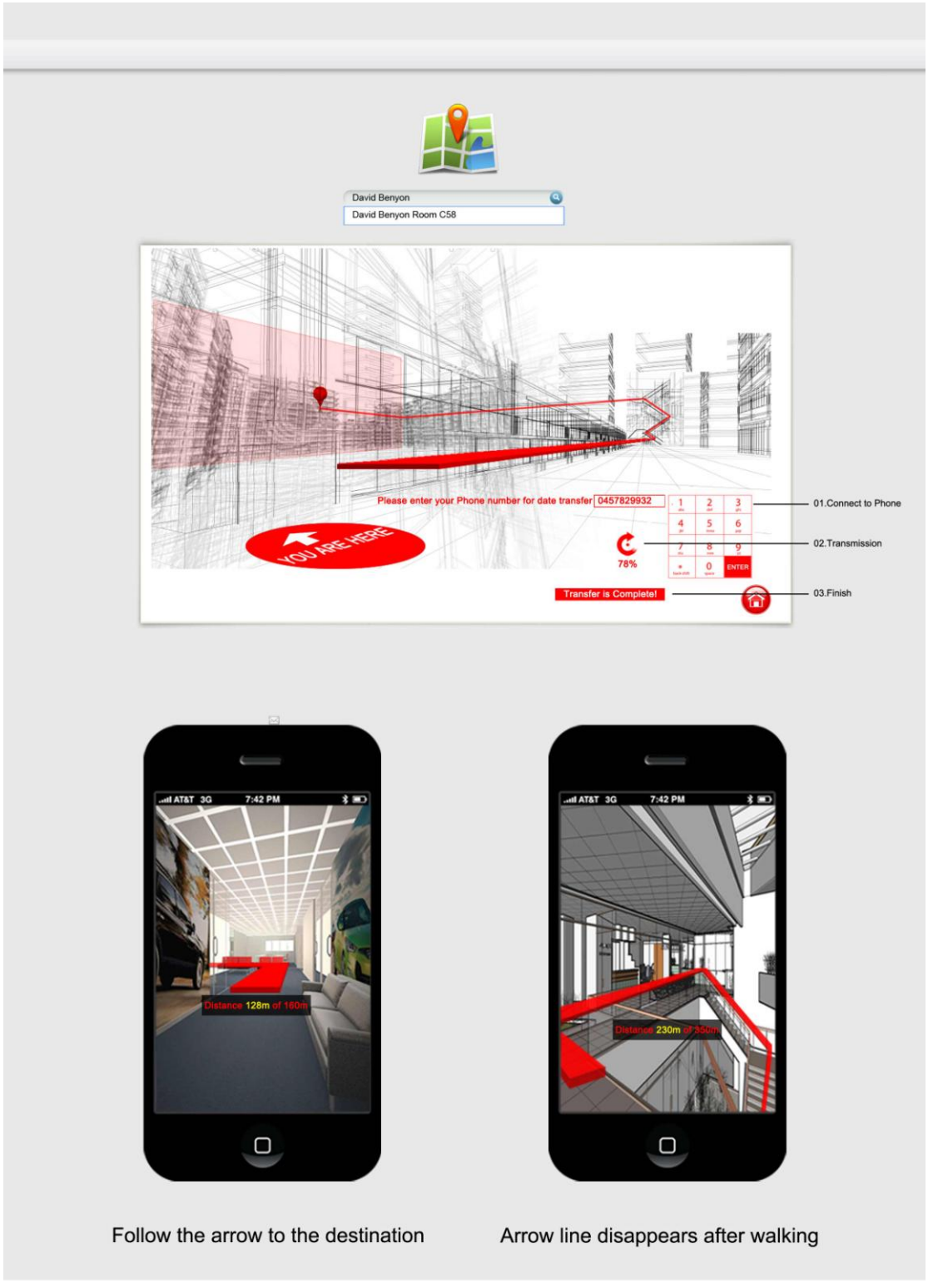



Please enter the destination or keyword
YOU ARE HERE


Computer
Jack cc
School of computering
IIDI
Computer Games lab
Q W E R T Y U I O P
A S D F G H J K L return
Z X C V B N M @ .
.?123
_ - .?123


David Benyon
David Benyon Room C58
Q W E R T Y U I O P
A S D F G H J K L return
Z X C V B N M @ .
.?123
_ - .?123


David Benyon Room C58
C
B
Turn right on the third floor C, then refer to the guidepost.
or you can use
Indoor Navigation
YOU ARE HERE



Follow the arrow to the destination

Arrow line disappears after walking

6.2 Evaluation

6.2-1Aims of the Evaluation

Collect the data to analyze the final design.

6.2-2 Methods of Evaluation

Questionnaires were used in the final step of evaluation. It is one way of streamlining the understanding process if a large number of people are to be surveyed and resources are not available to interview them individually. It is a way to obtain requirements information at a distance. Questionnaires are ideally suited to gathering a large amount of quantifiable data(David Benyon, 2010, p156).

There are lots of situations similar to the Digital Wall in Merchiston such as big touch screen in the library in other University and information digital wall in the museum. Because I have got the concrete scenarios and html hi-fi prototype, it is easy for me to send the questionnaires, the scenarios and html hi-fi prototype e-version to participants even though they are not available for the interview.

6.2-3 Questions

Perceptions of system design are often collected through rating scales, known as Likert scales (Likert, 1932). The Likert scale is the most common of a number of methods for eliciting opinion. People are asked to indicate their agreement with a statement using a five-point scale as follows(David Benyon, 2010, p157):

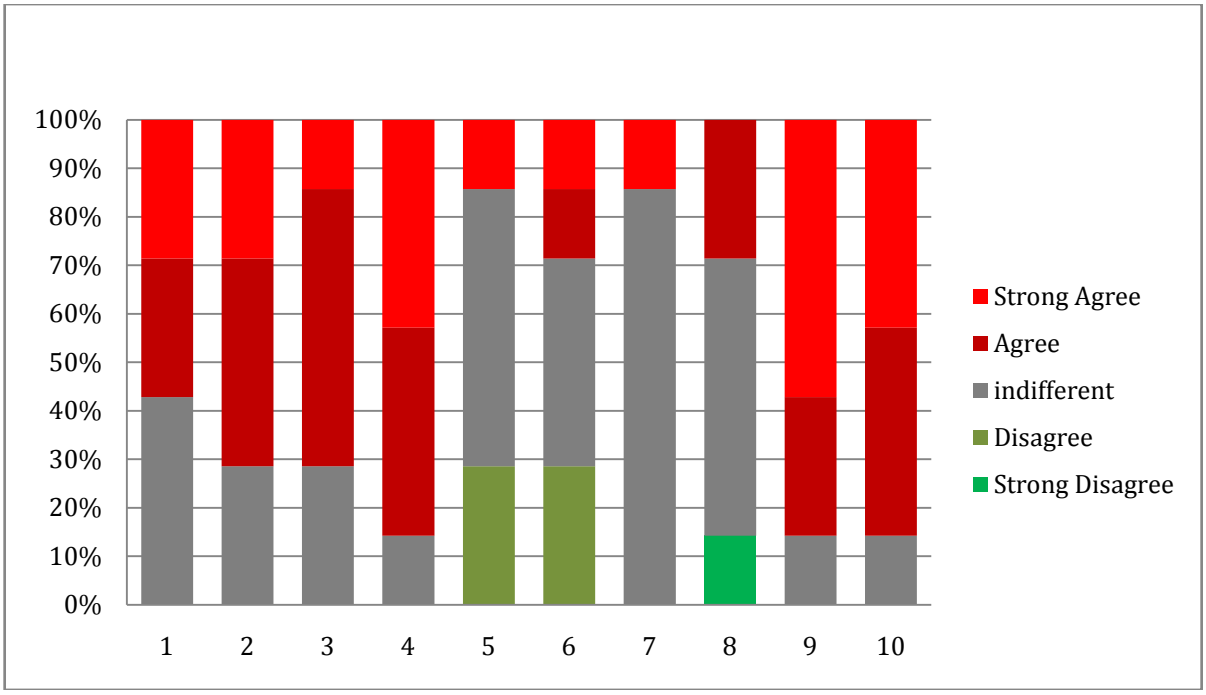
Question: Question is shown here.

0	1	2	3	4
Strongly agree	Agree	Indifferent	Disagree	Strongly Disagree

Ten questions were asked to search different aspect of the design as follows:

1. I like the Map App----The whole system
2. The App is easy to use---- The whole system
3. The App is consistent----System integration
4. The App is easy to learn----Learnability
5. The App provides more than one way to search----Flexibility
6. The interface and icon are understandable----The interface design
7. The interface is beautiful, attractive----Aesthetics
8. The function is logical----Categories
9. 3D navigation is easy to understand----Familiarity
10. The design(selection, searching, colors) is consistent ---Physically consistent

6.3 Outcome of the Evaluation



Overall results from the questionnaire (From 7 questionnaires)

It can be seen from the bar chart that people have a positive view for the learnability, the familiarity of 3D Map navigation and the physically consistent of the App application. However, people do not fell the interface design of the App is positive, people have a negative view for the flexibility and function categories of the App.

The negative comments were as follows:

- If I forget the key words of the destination, there are not any other ways for me to remind the key words.
- The button should use more icon instead of text, all the element are text make me feel chaos.
- Using color to separate different category of information is good but too many color tend to make people distract from their goal.
- I am worrying about there is some virus will transmit into my phone during transmit the app to my phone, the safety issue need to take into consideration.

Some positive feedbacks were as follows:

- The 3D navigation is more intuitive than the traditional 2D navigation especially in the small place
- Searching the destination is easily, I have experience with it because I usually use Google maps. I do not need lots of time to consider how to use it.
- The way to attract me to use this App and digital wall is good. I will feel it is very interesting when I find something written in my first language in an English environment.

6.4 Future work

The proportion of positive rate is 2.73/4 (68.5%) .People totally have a positive view of this design. In consideration of comments from the participants, there are some issues need to be improved and research in the future:

- The transmit way is entering the phone number to capture the Transmission Objectives, but some people do not remember their number, so the other transmit approach need to be designed to solve this problem.
- With the development of indoor navigation, people prefer searching the destination at home or on their smart phone, searching the destination on the digital wall would be one of the choices for indoor navigation.
- The speech input and search for disabled people should be considered in the future.
- The ethic issues (Personal privacy when search for someone) need to be taken into consideration.
- In view of the time constrain in designing this application, there were not enough people join the questionnaire. In order to get more quantifiable data, more people need to be invited to take part in the evaluation.

6. CONCLUSIONS

PACT is a good frame for the designer to analyze the requirements and to design the scenarios. Scenario-based design is a very useful way during the design process, it constantly reminds the designer to focus on the requirement and the original goal of the design, it is also helpful as a assistant to present the ideas and to test the design . Most importantly, evaluation is central to designing interactive systems. Designer tends to be subjective when they immersing themselves in their design, which will lead to the final design solution deviates from the original goal. Evaluation is a good method to solve this problem by focusing on the user's requirement and feedback of the design test. Evaluation is Iterative, the idea can be test at any step of the process, it is also helpful for designer to generate the idea because they usually be inspired by the feedback of the users.

In the key processes that are involved in designing interactive systems – understanding, envisionment, design and evaluation –To choose the appropriate method in different stage is very important for the designer. The capability to find the efficient and proper method during the design is more demanding for the designer especially in the fast developing digital market. Designers need to accumulate experience in the work to understand the advantages and disadvantages of different methods thoroughly and to apply these methods agilely in real work. In addition, collecting the other designer's experiences in the forum or conference is the other useful way to improve this capability.

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