LinkingPark

Connected Park. Connected People

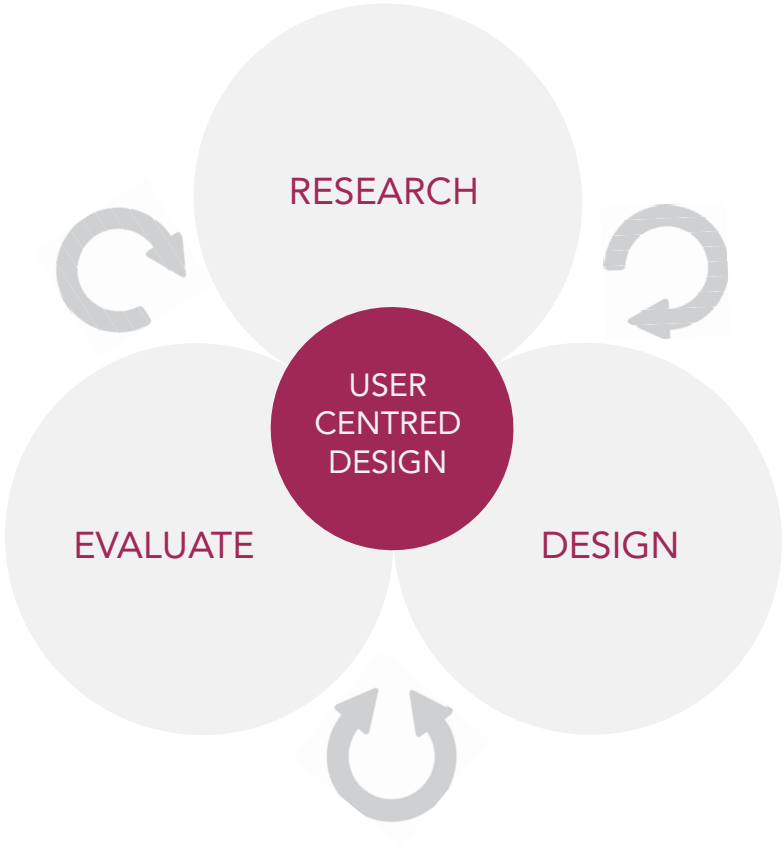
The Queen Elizabeth Olympic Park (QEOP) is being regenerated as an IOT enabled future smart city after the 2012 London Olympics. To support the vision, projects are being developed under Intel Smart City program- ICRI Cities. LinkingPark is a tangible interface concept developed under the same program to enhance public engagement with sports facilities at QEOP.

RESPONSIBILITIES

Literature review
Survey design
Sketching
Desk research
Wireframing
AB testing
Thematic analysis
Physical computing
Digital fabrication
Interviews
Observation

CONTENT

PROCESS



ITERATION 1
Finding design problem

- Literature Review
- Survey Design
- Quantitative Analysis
- Requirement establishment

ITERATION 2
Finding design features

- Sketching
- Desk Research
- Low-fi Prototyping
- AB Testing

ITERATION 3
Finalising design features

- Expert Review
- Thematic Analysis

ITERATION 4
Design concept creation

- Prototyping
- Observation
- Interviewe
- Empathy Map Creation

USER RESEARCH

RELATED WORK

Literature review was conducted to explore below aspects:

- Characteristics of a Smart City
- Notable successful public installations from the past
- The interaction models established to study people's behaviour with public interfaces were explored
- Effect of 'interactivity cues' and tangible elements on user's attention, motivation and sustained engagement
- QEOP smart city project themes by ICRI Cities were studied

KEY LEARNINGS

1. Citizens play importatnt role in shaping of a smart city
2. People interact with public devices both actively and passively
3. Display blindness and sustained engagement remain biggest challenges for public installations
4. Inclusion of physical elements to support different sensory modalities can introduce fun and enhance participation
5. Novel interfaces attract people
6. Anthropomorphic and zoomorphic shapes create trust and greater visibility

IN-THE-WILD QUESTIONNAIRE

Purpose

To know the subjective experience of users with the QEOP facilities to find their level of engagement.

Execution

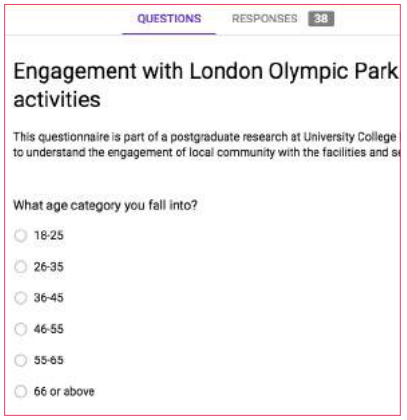
Considering that online surveys consume longer time to generate a sizable number of responses, by taking advantage of free Wi-Fi across the QEOP, the questionnaire was presented to the visitors of the Park in-person on a tablet.

38
Total response

3.5 Hours
Time to record responses

26.2 Years
Average age of particpants

Quantitative
Data Analysis



click to visit the questionnaire

DESIGN PROBLEMS

69% of frequent visitors reported **low awareness on park facilities**

40% of respondents had knowledge about existence of QEOP website indicating towards **lower digital awareness**

50% of people who felt that information was readily not available to them, **relied only on "word of mouth"**

76% showed **interest in other activities** which they were not involved in

84% showed **willingness to receive more information** on QEOP facilities

DESIGN GOALS

Design goals were established on the basis of learnings from literature review. The device should

- attract audience
- be accessible and easy-to-use
- be able to sustain enagagement
- be novel, tangible and fun
- comply with project themes of ICRI Cities for QEOP

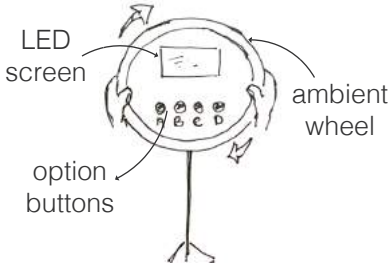
IDEATION

SKETCHING

Examples of ideas sketched to address the identified design problems

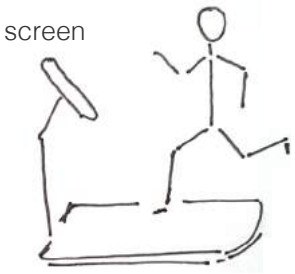
Interactive Map Floor

Illuminated floor reveals information for the part of map where user steps on.



Quiz Wheel

Questions appear on the LED screen on rotating the ambient wheel. The wheel illuminates to Red/Green based on answer's correctness.



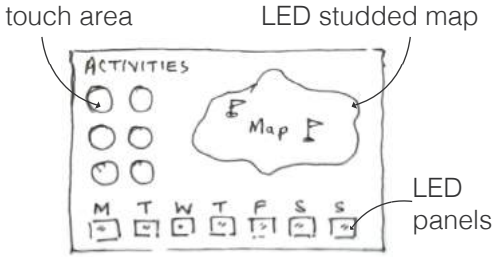
Fact Mill

Screen presents facts and information on facilities, activities and events on running.

SELECTED IDEA

The ideas were vaidated against:

1. Design goals
2. Capability to address more than one design problem



Wooden Touchboard

On touch of an activitity, relevant places get illuminated and availibility is shown on LED panels under each day, presenting the spatiotemporal info for touched activity

DESK RESEARCH

To find out

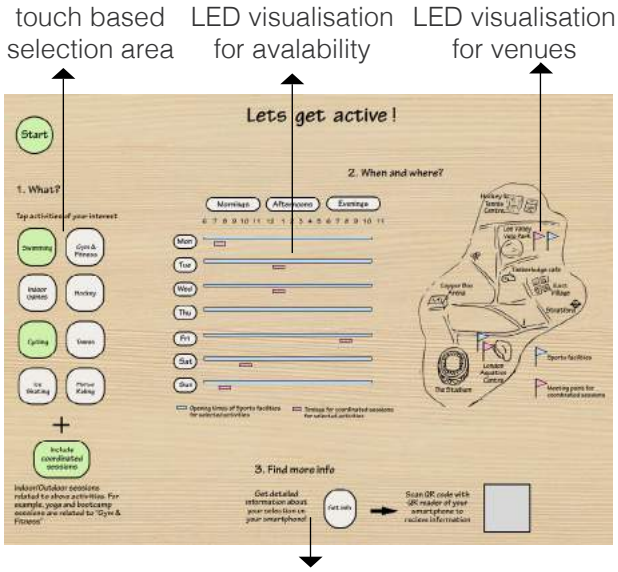
- Existing sources of information for the QEOP
- Presentation of information on those sources
- Facilities, opening times, and events related to the activites

LOW-FI PROTOTYPE

Below findings were discovered from desk research, which were considered before creating the digital prototypes

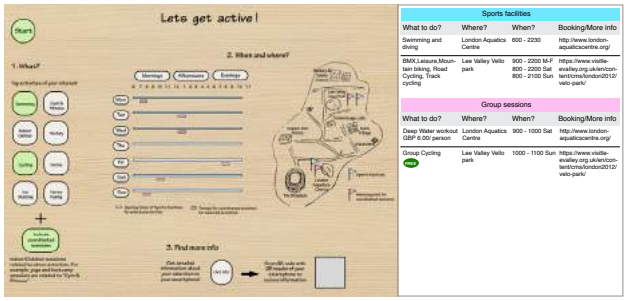
- QEOP website presents information on the basis of venues rather than activities which affects the discoverability
- Activities have dedicated QEOP sports venues, and related group sessions and events which are all governed by different agencies with independent websites

Digital prototypes were wireframed in Sketch software and the interactivity was added using InVision app

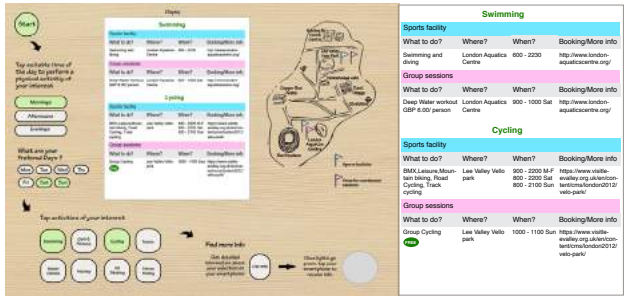


VALIDATION

AB TESTING



Prototype A



Prototype B

AB Testing in progress

Purpose

To find the information flow and design features

Material

Two variants of

1. Fully interactive digital prototypes with different information flow, and distinct visualisation and smartphone retention features. Background of prototypes were set to a wooden texture to simulate the wooden-interface
2. Non-interactive life-size paper prototypes to complement digital protypes
3. Screens for information on smartphone

Method

1. The digital prototypes were presented on a tablet.
2. Each participant was asked to complete a scenario based task using both prototypes in a Contextual Inquiry session followed by post-study Questionnaire

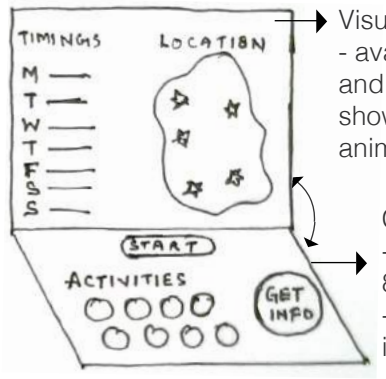
KEY FINDINGS

- ‘Type of activity’ followed by ‘availability’ and ‘location’ emerged to be top three factors to decide on an activity
- LED animations of Prototype A for time visualisations were found to be fun
- Tapping function was preferred over QR code for smartphone retention feature

EXPERT REVIEW

Below aspects were not addressed in AB Testing and were discussed with fellow HCI researchers

1. Information overloading- How much information to be presented?
2. Form factor of the device
3. Minimum Viable Product (MVP) to test the concept



Visualisation panel:
- available time slots and location to be shown through LED animations

Control panel:
- touch buttons for 8 sports activities
- tap function for info retention

Conceptual sketch after Expert Review

PROTOTYPING

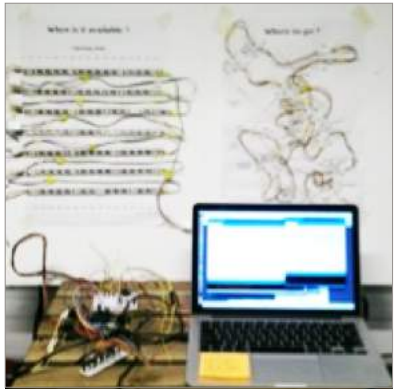
ERGONOMIC FITTING TRIALS

Ergonomic fitting trials using an adjustable low-fidelity mock-up were conducted with users of different stature to determine convenient width, height, clearance from ground and angle of control panel for finding an appropriate fit for all types of users.

SOFTWARE

A responsive website using Bootstrap framework was created for 'Information retention on smartphone' feature to display detailed information on touched activities.

CIRCUIT DESIGN



The circuit was laid on a foam core based cut-out of actual dimensions obtained after Fitting Trials. It was programmed using Arduino IDE software. Key electronic components used were:

Arduino Uno

MPR121 board

Neopixel LED strips

NFC Tag

FABRICATION

External components were created using fabrication techniques of 3D printing, carpentry and Laser cutting.

3D printing

Capacitive touch buttons- 3D printed from conductive PLA (Polylactic acid)

Carpentry

Frame of the device- prepared out of hard wood to support and protect electronics and hardware from abuse

Laser cutting

QEOP map- cut and engraved on plywood

DESIGN CONCEPT

DESIGN FEATURES

Discoverability
Large fonts of the header text were intended towards attracting audience from distance. The figures are London Olympics' mascots and are representative of QEOP's space, which people can relate to.

Enjoyable
The timing-location slots for LED animations and engraved map were used as a novel way to present spatiotemporal information to make it more accessible and fun.

Mental model
Around 2/3rd of the UK adults own a smartphone and are familiar with touch-based interfaces. Touch buttons were used to match their mental model.

Affordance
Button surface was made 7mm higher than the wooden surface for easy touch.

LinkingPark
2D view

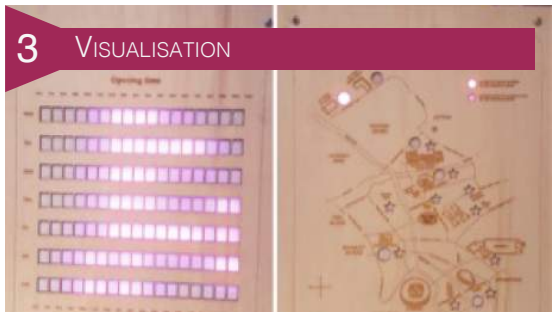
Visibility
As learned from Literature Review, anthropomorphic (human-like) shapes create trust and visibility. LinkingPark was given a face-like shape to enhance the ability to attract attention.

Icons and Signifiers
Relevant icons were used on buttons to enhance the perceptibility and identity of correct activity. Arrows were used as visual cues to guide towards next step.

Health and safety
The device had to be deployed in public for testing, sharp edges were avoided and edges were made curved to minimise health and safety concerns.

Learning
Information showed on the device could be stored by tapping smartphone on NFC tag.

INTERACTION FLOW



EVALUATION

IN-THE-WILD STUDY

Purpose
To evaluate the concept in 'real world' environment

Method
The concept evaluation study had two parts
1. In-situ deployment to observe and video-record user interactions and behaviour with the device.
2. Post-interaction evaluation consisted of
   (a) A System Usability Scale (SUS) questionnaire
   (b) An exit interview to explore below aspects
      - factors that attracted the user,
      - experience with the device and
      - physical discomfort (if any)

Set-up
LinkingPark was deployed in a café at QEOP for a day. Two cameras were used in parallel to record people's movement in relation to the device. The SUS was presented on an iPad to the users.

Set-up for the in-situ deployment


Post-interaction study with the participants

RESULTS

Say
Respondents mentioned about knowing new activities they never knew existed.

"I live nearby but didn't know that they had Ice Skating and Horse Riding here..."

Users appreciated the concept and were positive on the utility of the device.

"I think its very nice idea, it's very easy to understand and it's very interactive..."

Do
In 71% of direct interactions, user interacted multiple times, showing longer engagement with the LinkingPark

People got attracted by seeing other people interacting with the device.

QEOP Visitors

Feel
All respondents felt device easy-to-use scoring more that 70%tile in SUS which is above average (68%tile).

No user felt physical discomfort while interacting with the device.

Pain
Less awareness/mistrust on NFC tecnology used for 'information retention' feature

Added affordance to place buttons higher than wooden surface led to incorrect usage, 1/3rd of users 'pressed' buttons.

Gain
LinkingPark was successful in catching the attention of 60% of potential users.

Video analysis reflected that users enjoyed LED animations for data visualisation and touch feedbacks.

Empathy Map representing the highlights from in-the-wild study outcomes

This project was completed as part of MSc dissertation project which was awarded Distinction by University College London Interaction Centre (UCLIC). The thesis was published on UCLIC's website. Link to thesis