NOTOCO

say no to passive smoking

NOTOCO is a wearable design concept aimed at helping people to avoid passive smoking

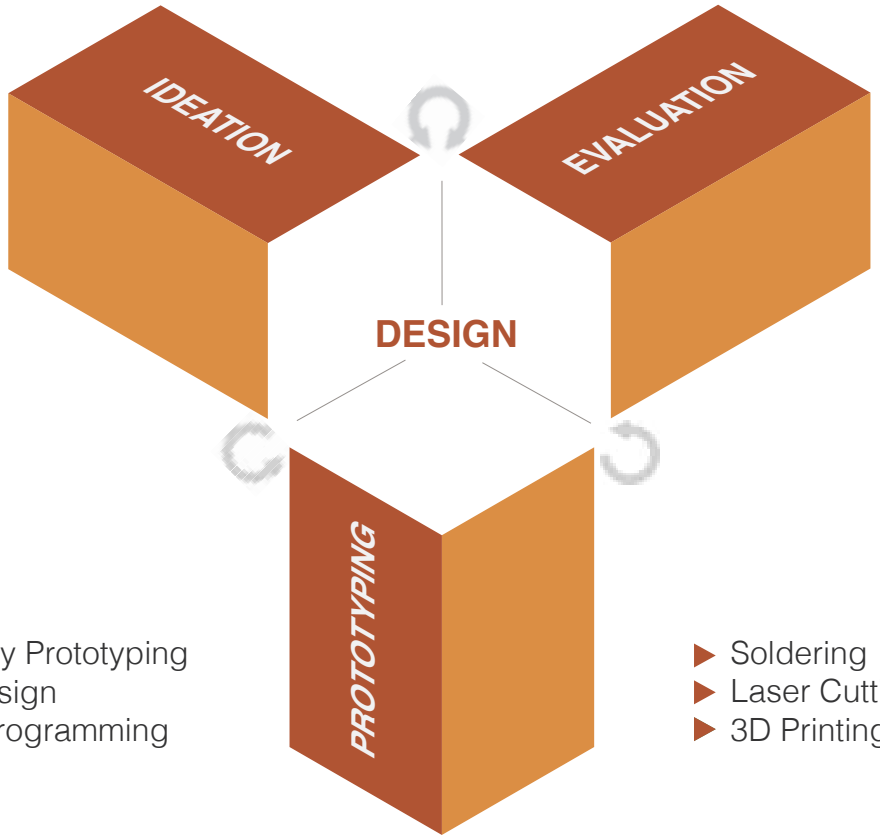
RESPONSIBILITIES

Desk research
Sketching and Storyboarding
Low-fidelity prototyping
Physical computing
Digital fabrication
Design evaluation
Branding
Video prototyping

CONTENT

PROCESS

- Brainstorming
- Desk research
- Sketching
- Storyboarding



- Expert Review
- 2X2 Evaluation Matrix
- Functionality Testing
- Usability Testing

- Low-fidelity Prototyping
- Circuit Design
- Arduino programming

- Soldering
- Laser Cutting
- 3D Printing

IDEATION

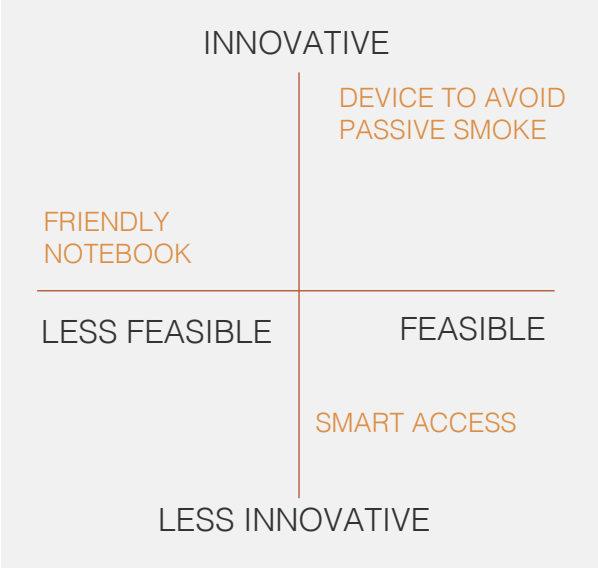
BRAINSTORMING

As part of Physical computing and prototyping module, I brainstormed for ideas to develop a design concept which could address an existing issue and posses an element of novelty in it. Three ideas were shortlisted

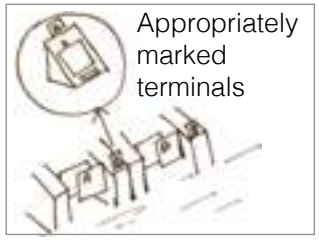
- Smart Access
- Friendly Notebook
- Passive Smoke Prevention

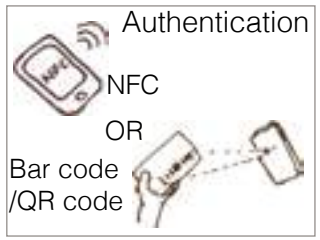
FILTERATION OF IDEAS

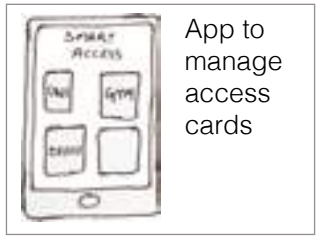
Ideas were filtered on the basis of innovation and feasibility using a 2X2 evaluation matrix.

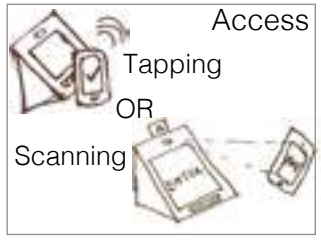


1 SMART ACCESS



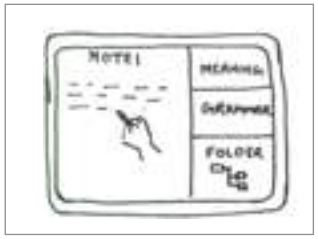






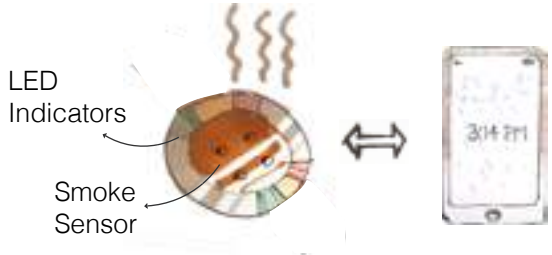
In daily life, people carry multiple access cards and sometimes fiddle with them to find right card on reaching the terminal. Additionally, the card-reader's placement is inconsistent all over which conflicts with user's mental model and creates confusion. These issues result in frustration and sometimes forces long queuing. Smart Access is to ease the access process using Bar-code/QR code/NFC and an App

2 FRIENDLY NOTEBOOK



Non-native English speaking students come across many unknown words or phrases during lectures. Friendly Notebook will help in instant exploration of meaning and grammar usage, and save the notes in familiar folder structure by simple drag-n-drop functionality.

3 PASSIVE SMOKE PREVENTION



People get exposed to passive smoke on daily basis but have no means to avoid it. This is a wearable device concept which detects the smoke around and can alert the toxic level through LEDs. It can be paired with an App which will reflect the toxicity inhaled through a live wallpaper.

IDEATION

DESK RESEARCH

People in general ignore passive smoking despite of being aware of its affects. The statistics related to passive or second hand smoking(SHS) found through desk research are show below

12000+
deaths per year in the UK are indirectly or directly caused by SHS

50%+ non-smoking UK workforce gets exposed to SHS daily

27% of increase in chance of lung cancer due to SHS

80% of UK adults confirmed awareness about impacts of SHS

76% of them admitted that they were ignorant towards SHS

EXPERT REVIEW

The ‘passive smoke prevention’ idea was proposed to peers and experts for their review. Considering that alerts through LEDs might not go well in social set up, modification was suggested. However, live wallpaper idea was well appreciated.

PLACEMENT OF DEVICE

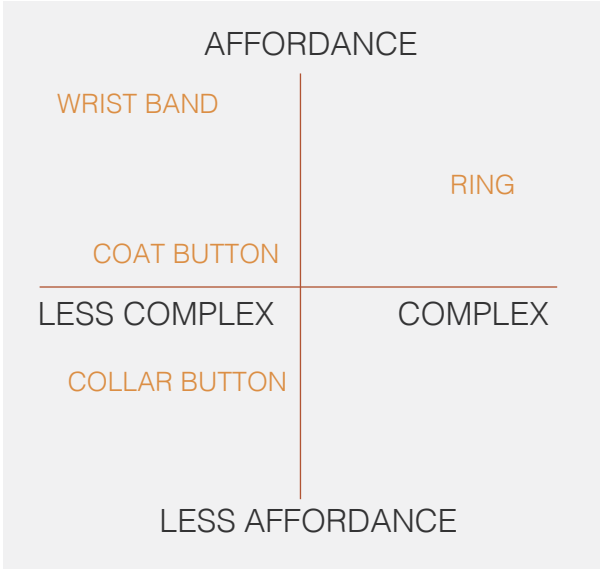
Placement of device was determined through a 2X2 matrix evaluation against complexity and affordance.

Collar Button

Ring

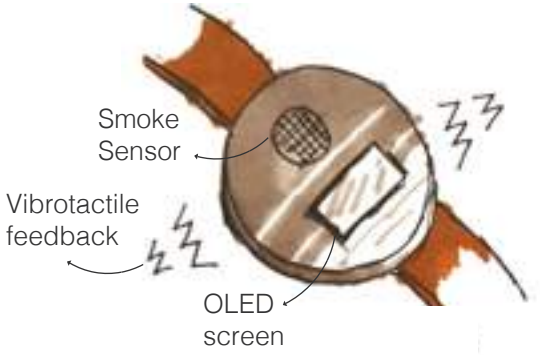
Coat Button

Wrist Band



REFINED IDEA

The original idea was refined on the basis of findings from expert review and 2x2 matrix evaluation for placement. Wrist band was selceted as form, and the LEDs were replaced by a vibrotactile motor and a LCD screen as feedback modules.



PROTOTYPING

The prototyping of refined idea went through following stages

Low-fidelity prototyping
- Cardboard prototype

Physical Computing
- Circuit Design
- Soldering
- Arduino Programming

Digital Fabrication
- 3D Printing
- Laser Cutting
- Assembly

CARDBOARD PROTOTYPE

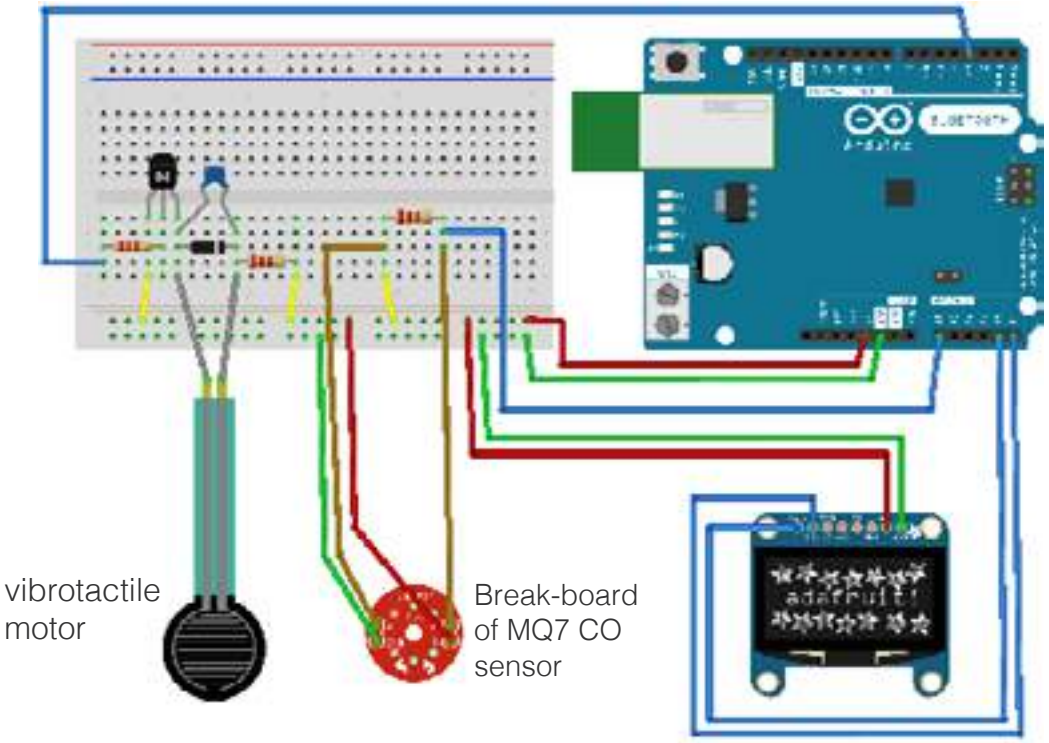
A Low-fidelity card-board prototype was made to explore the form and dimensions of the device. It was tested with eight peers, out of which six provided positive feedback.

CIRCUIT DESIGN

The Circuit of the device was designed using Arduino Uno as base micro-controller. A Bluetooth shield was used in conjunction to interact with mobile App. Below are the micro-controller modules used for input and output

- MQ7 CO Sensor to detect Carbon Monoxide in the cigarette smoke
- Vibrotactile Motor to provide vibration alerts
- OLED screen to display toxicity level indicators

designed circuit



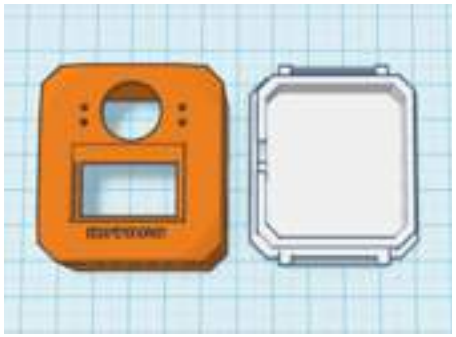
Frtizing representation of electrical circuit of NOTOCO

PROTOTYPING

ARDUINO PROGRAMMING

The circuit was programmed and unit tested using Arduino Integrated Development Environment.

3D PRINTING



The case for the device was sketched using Tinkercad software and was 3D printed using Polylactic Acid (PLA) material in Ultimaker2 3D printer.

LASER CUTTING

The control box was sketched in Adobe Illustrator and laser cut out of Acrylic.

SOLDERING

In order to make circuit compact and fit into Control box, it was soldered into 1/4th sized solder breadboard

ASSEMBLY

The Input/Output modules along with 3D printed case were assembled to form the device. Rest of the circuit was fitted into laser cut box to form Control box of the device

EVALUATION

Functionality testing was conducted by exposing the device to cigarette smoke. Usability testing was performed using auto-ethnographic evaluation technique in a smoke filled environment

DESIGN CONCEPT

NOTOCO

The concept of NOTOCO is based on Carbon Monoxide content of cigarette smoke which is measured in parts-per-million (ppm) by CO sensor. The device detects the CO level and alerts the user through vibrations when entering a zone of toxicity beyond tolerance. The duration of vibration varies, depending on level of toxicity in that area.

The level of toxicity is subsequently shown in NOTOCO OLED screen in the form of level indicators displayed through horizontal bars in incremental manner. Device can be connected to NOTOCO App which changes the live wallpaper of phone depending on exposure to toxicity. Figure 1 shows a wallpaper of blooming garden turning to Grey through different levels of toxicity

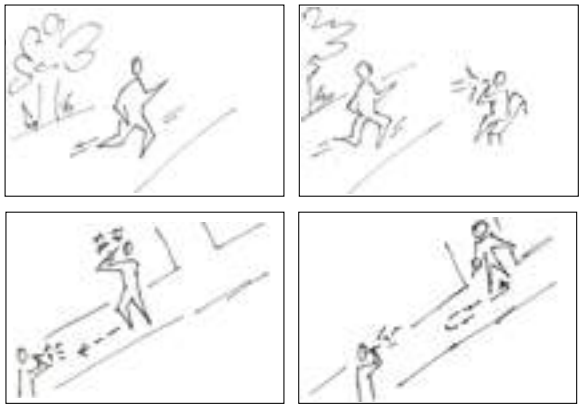
Figure 1

LIMITATION

The NOTOCO uses CO gas sensor as main input module. The accuracy of gas sensors can always be debated and is directly proportional to their costs. To make NOTOCO highly efficient, a high cost sensor would be required which would increase the overall cost of the product.

CONCEPT VIDEO

Video was conceptualized through storyboarding and Wizard-of-Oz method was implemented while shooting. Below are the excerpts from storyboard



- Link- https://youtu.be/m719s1urvrY

FUTURE WORK

The 1st phase of NOTOCO was aimed at exploring the possibilities of a smoke prevention device. It needs to go through below mentioned refinements for a sustainable design solution

- Circuit board printing (PCB)
- App programming
- In-the-wild evaluation
- Integration with other wearables