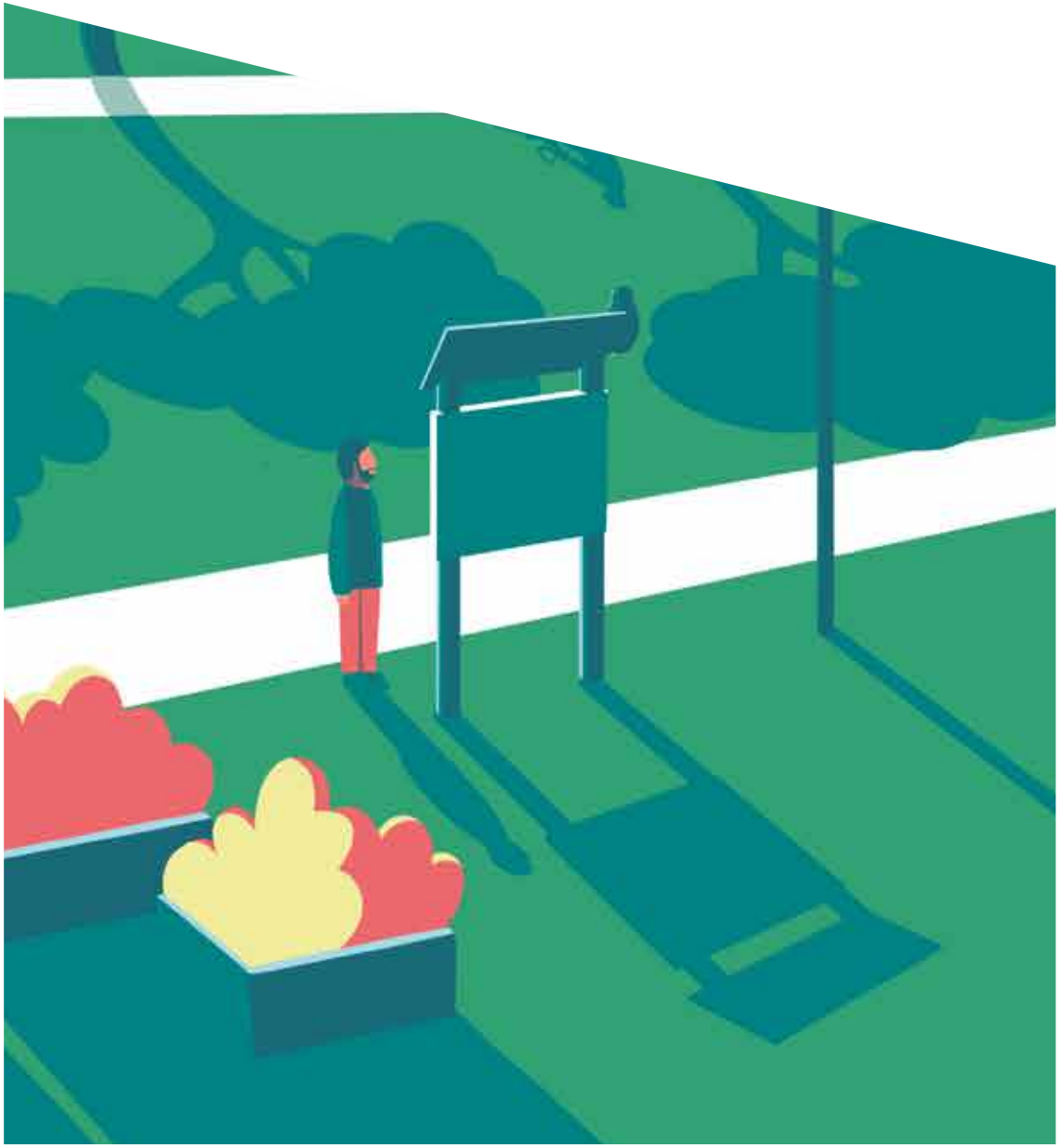

PARKLIFE

DATA TOOLKIT & REPORT 2020

Rethinking Parks

COMMUNITY FUND HERITAGE FUND nesta

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Why this project is important

Parks are precious places that provide people with space to relax, exercise and play sports, gather with friends and family and enjoy nature. Green space is of proven importance to our health and wellbeing. It is also of value in itself for wildlife, air quality and flood prevention. Although parks are heavily used and widely appreciated, they are under threat as council budgets for management and maintenance have declined markedly in recent years, a trend that is likely to continue.

It is therefore critical that the City of Edinburgh Council is at the forefront of developing innovative and sustainable approaches to help protect the city's public green spaces to better meet the needs of present and future generations and respond to the various environmental, social and health challenges we face today.

Where ParkLife fits in

Linked to the Data-Driven Innovation programme (part of the Edinburgh and South East Scotland City Region Deal), ParkLife reflects the growing importance of data in economic growth, social change and public services.

The project forms an important link between Edinburgh's strategic 2050 City Vision and the Council's Parks, Greenspace and Cemeteries Service's ambitious Thriving Greenspace project, which aspires to deliver new ways of working to ensure the on-going enhancement, protection and care of the city's green spaces.

The objective of the ParkLife project is to explore, develop and test new and innovative ways to use data and digital technologies to support long-term sustainable and inclusive operating models for parks. The data and engagement activities of the project have provided insights into how Edinburgh's parks are used and valued in the present and how to engage people in shaping their future.

As technology and knowledge develops, the prototypes developed by ParkLife will bring about further social and environmental benefits, linking into Edinburgh's techno-expertise and spirit of innovation, unlocking investment and better connecting people and communities to their parks and green spaces. This will allow Edinburgh's parks to grow, thrive and adapt over the next three decades and will help determine what our green spaces should look like, deliver and be used for in 2050 and beyond.

David Jamieson
Parks & Greenspace Manager
City of Edinburgh Council

EDINBVRGH
THE CITY OF EDINBURGH COUNCIL

CONTENTS

EXECUTIVE SUMMARY

Physical-digital noticeboard and web-based data dashboard (FRONT)

The Sensor Noticeboard was not a pre-conceived idea but arose as a concept following consultation with the park users and managers on the issues they raised and the data they were interested in capturing. The noticeboard design utilises existing off-the-shelf components. The core consists of a:

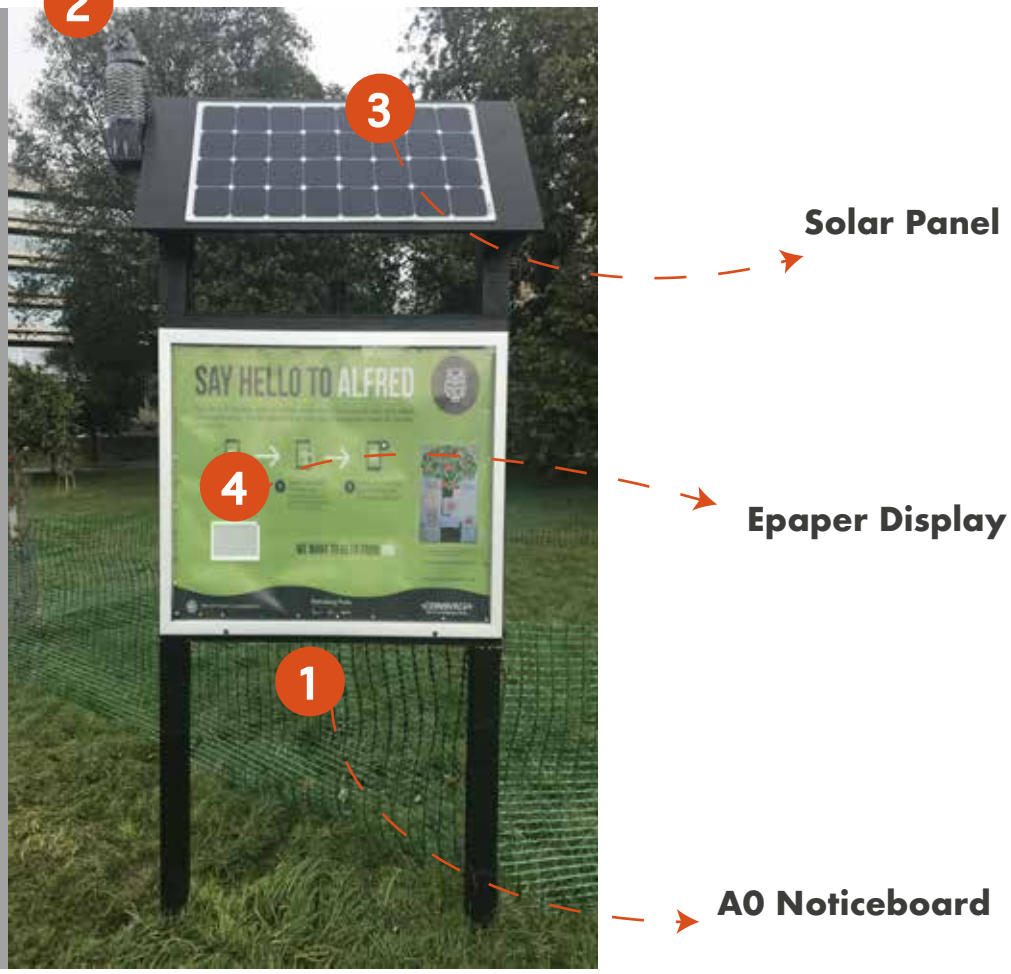
• standard outdoor wall-mountable A1 noticeboard with a lockable front plastic screen;

• 100W solar panel as used typically in caravans and boat applications;

• solar power charge controller and 20AH car battery;

• a custom built wood frame with hinged lockable access panel on the back for mounting and containing all the components.

The Noticeboard requires basic woodworking skills and workshop equipment to construct.

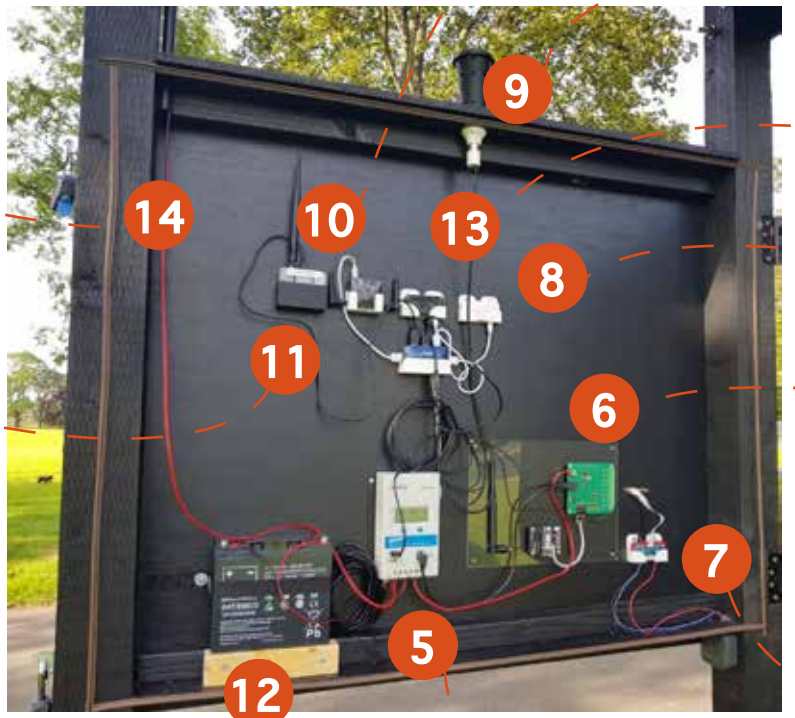


EXECUTIVE SUMMARY

Physical-digital noticeboard and web-based data dashboard (BACK)

See Technical Appendix for:

Noticeboard further technical info



Board Wifi

Ultrasonic Microphone

Solar Panel Lead

Raspberry Pi Bat Detector

Raspberry Pi Chatbot

LoRaWAN Sensor Relay

LoRaWAN Board Controller

Raspberry Pi MQTT Server

20AH Battery

Charge controller

INTRODUCTION

ParkLife was funded by Nesta, National Lottery Community Fund and National Lottery Heritage Fund as a prototyping project for the Rethinking Parks programme.

The aim of the prototyping projects was to test and learn from digital and data innovations with the potential to address challenges that parks face. The prototyping approach allowed participants to develop, test and improve on an idea to see how to make it work in the real world.

The challenge that ParkLife set out to address was to better understand who and how many people use Edinburgh's parks, for what purposes, and what they value in parks.

Working closely with park managers, Friends of Parks groups, and local communities, the project co-designed new ideas for how data and technology could contribute to more sustainable operating models for parks and tested some of these ideas in four of Edinburgh's parks.

The project focussed on four parks in Edinburgh - Inverleith Park, Leith Links, The Meadows & Bruntsfield Links and Saughton Park and Gardens. These parks were selected by the Council for their different attributes, location and surrounding demographics.

The final prototype that the project produced is a physical-digital noticeboard and web-based data dashboard that can provide real-time and historical data about parks.

The noticeboard supports a chatbot that surveys park users about their experiences in parks. This processed data can be hosted in the noticeboard or by an external website. Noticeboards were installed in each of the four pilot parks, and the web-based dashboard and chatbot have been added to the Parks service's website Edinburgh Outdoors.

We hope that the data generated through the noticeboard and chatbot will provide accurate, up-to-date and insightful information about parks that will help the parks service and communities work together to address the needs, interests and values of park users, leading to better support for parks, both financially and in terms of policy.

The following pages tell the story of the prototype, the project created and the steps and lessons along the way.

The associated data toolkit provides a guide for others who would like to experiment with the methods and tools the project used and / or create their own noticeboard, dashboard and chatbot.

THE FINAL PROTOTYPE

The resultant Sensor Noticeboard prototype we built and tested encapsulates these **unique characteristics**:

• A new physical asset within the park in a familiar format that can host a variety of sensing as well as signage (posters) and digital interaction (Epaper display and Wifi hotspot website).

• An extensible standalone sensor hub, incorporating solar power and wireless communication connectivity without the requirement for any additional infrastructure such as power lines or broadband cabling.

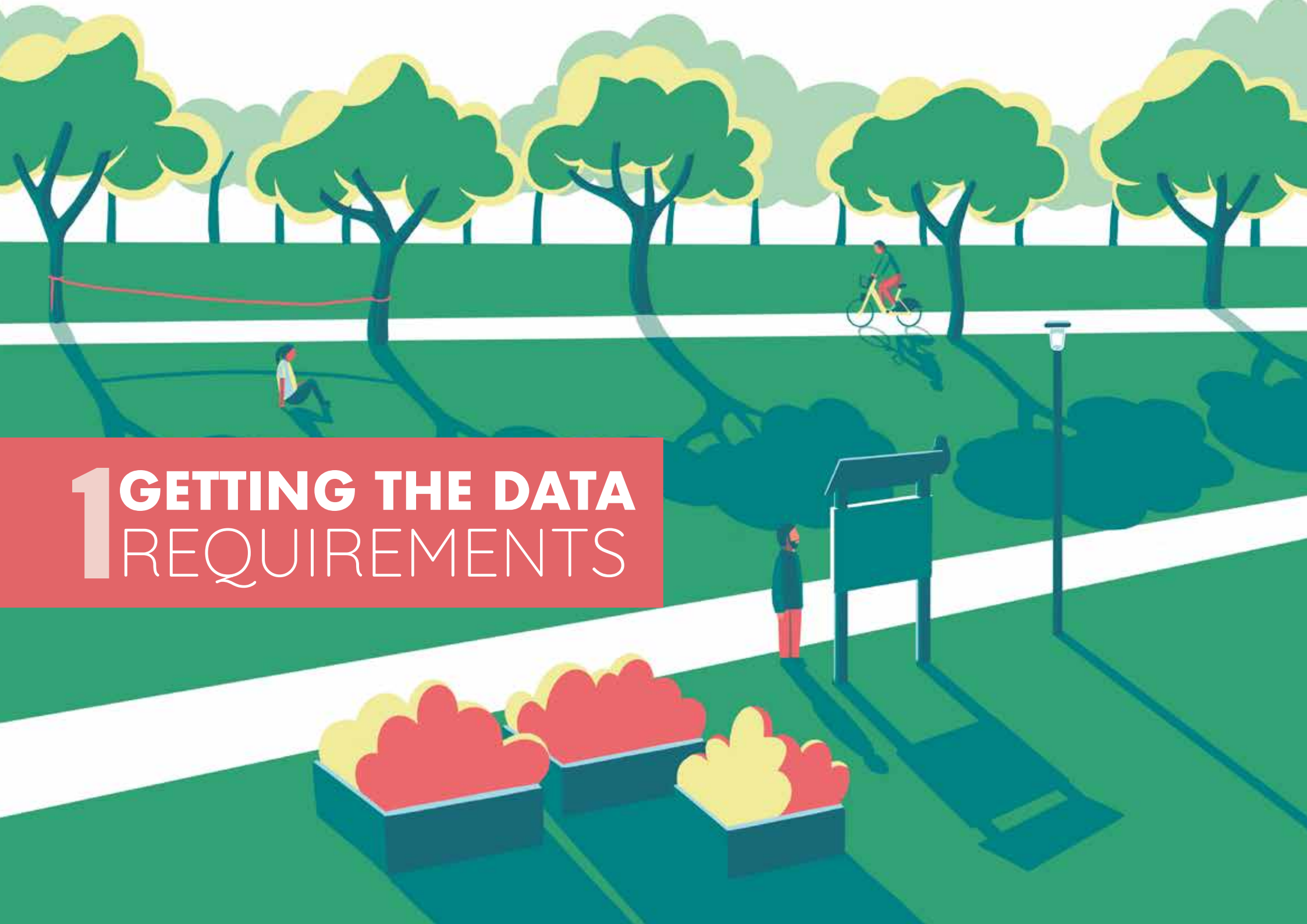
For detailed technical design and component specifications of the Sensor Noticeboard and how to access all the software we developed for the project, please refer to the **Technical Appendix** of this report.

RECOMMENDATIONS

The ideal location for installing the Sensor Noticeboard in a park is beside a popular walking/cycling path that is not obscured by trees but remains close to insect-friendly habitat.

It is best installed facing due north or due south – the solar panel can be placed in one of two orientations to ensure it faces due south for maximum solar gain. The path-side location ensures that the sensors for people and cycle detection can be utilised effectively, where the sensor range extends out from the board across the path for up to 10 metres.

The proximity to insect-friendly habitat increases the likelihood of bat detection – the range of ultrasonic bat detection is typically limited to around a 40-metre radius. The popularity of the pathway location also increases the amount and validity of data being captured in relation to indicating the overall activity levels of the park.



1 GETTING THE DATA REQUIREMENTS

INTRODUCTION

The focus for this stage was to compile a list of data that could potentially be used to inform better management of parks and to increase engagement with parks. There were three main components of this process.

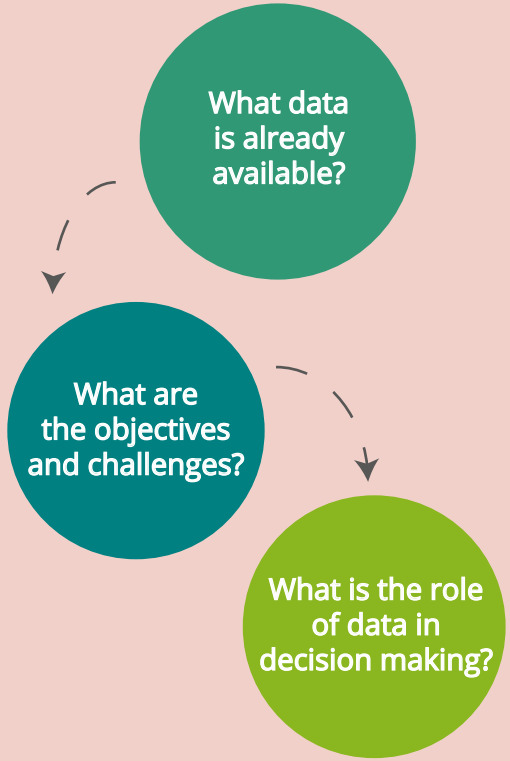
1) We carried out a data discovery process to identify data that was already being collected.

2) We identified the main groups of park stakeholders – park managers, Friends of Parks groups, community groups and park users – and asked them what data they would like to have about parks.

3) We developed a list of possible concepts of what the project could deliver.

One of the challenges in this early stage was helping people to understand and envision what the project could deliver. It was clear that we would need to address a gap in the use of data and technology about parks.

We needed to find a balance between getting people's ideas about what was important to them, demonstrating some possibilities to inspire their thinking, and communicating clearly about what was and wasn't possible within the context of the project.



See Technical Appendix for:

Data Audit guideline

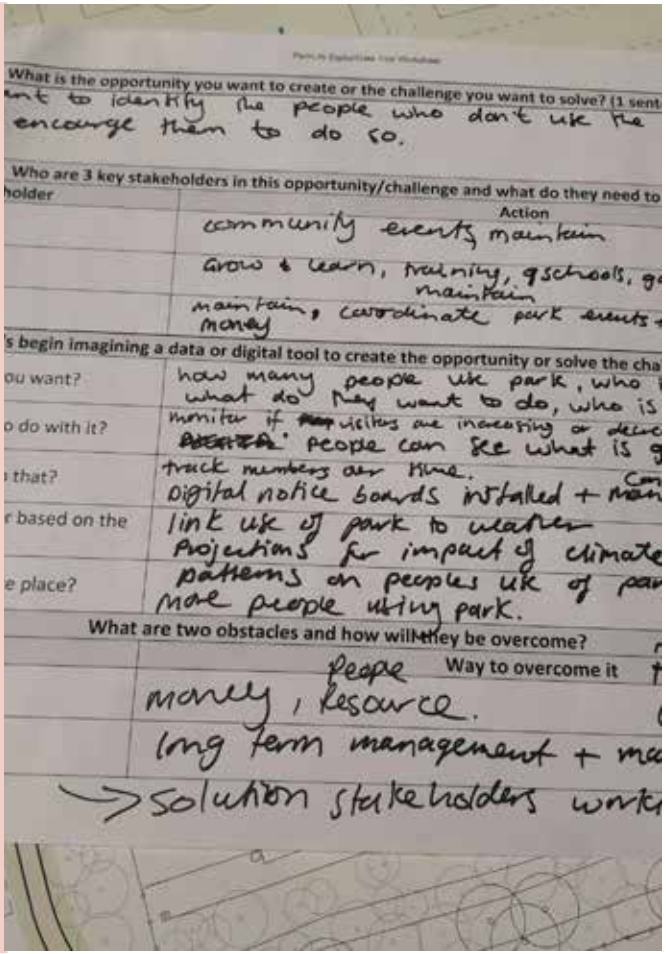
List of existing data

Data discovery blog post

DATA DISCOVERY AND REVIEW OF EXISTING DATA SOURCES

The purpose of this exercise was to get a rapid overview of what data already exists about parks in Scotland. While the exercise uncovered some interesting data sources on both local and national levels, it highlighted that there is a general lack of regularly updated data, especially at individual park level. It also showed that the data that does exist at this level is largely qualitative and is based on the perceptions of park managers rather than park users and how they experience parks.

This reinforced the value of focusing the project on generating data at the individual park level about how people and wildlife use parks.



CO-DESIGN ACTIVITIES

The purpose of the co-design activities in this phase of the project was to understand what data about parks might be most useful to people who care about and use parks.

We also wanted to begin engaging people and find out how interested they might be in the project. We used different methods for different audiences – **individual site visits with park managers** (4), **in-depth workshops with community groups** (4) and **surveys with park users** (228).

SITE VISITS

To start, we interviewed park managers during site visits to each of the four pilot parks.

The interviews were designed to explore more about park managers' responsibilities, how they operate and the challenges they face. The interviews also provided an opportunity for managers to share their understanding of how the park is used and valued by users, and for the project team to explain the potential role of data and digital tools to help in decision making.

See Technical Appendix for:

Site visit questions

Site visit findings

The highest data priorities for park managers were measuring biodiversity levels and building a picture of the total number of park users, what they do and where they go within parks.

Park Managers would use this usage information to support and evidence the need for park improvements and developments.

CO-DESIGN ACTIVITIES

COMMUNITY WORKSHOPS

The purpose of these workshops was to involve community groups in thinking about the whats, hows and whys of collecting data about parks – What challenges need to be addressed and what data could be used to address or understand them? How would the data be collected and used? Why would it be valuable to collect?

It was critical for the long-term success of the project to make sure that the data collected would feel relevant to the community groups that take an active role in supporting their local parks.

Many of them were familiar with sensors like cycle and people counters, which are already installed in various locations around the city – and in fact in a number of parks, although they are not always functioning, and the data they collect is not always publicly available or easily accessible.

However, sensors to count bat calls and give an indication of biodiversity were a new concept for most of them, and this sparked an imaginative conversation about how different types of sensors could be used for environmental monitoring and education. They were also curious to find out if issues that were important to them – for example, protecting the cricket pitches from misuse – could be addressed with sensors or other technologies.

The output of the workshop was **a set of ideas about how different data and digital tools could help solve challenges that they felt were important in their parks.**

See Technical Appendix for:

Workshop outline

Workshop handout

IDEAS	WHY
Speed, time and routes of cycles	There is a perceived issue with cyclists travelling too fast on shared pathways.
Number of people using different parts of the park	To build up a more general understanding of how the space within the park is being used.

IDEAS	WHY
Cricket pitch use	Bookings data from Edinburgh Leisure. There is a conflict between park users occupying the cricket pitches for a variety of reasons and those who have formally booked them to play cricket.
Visitation rates & times for the whole park	To gain a broader understanding of how the park is being used and when.
Detection of Bats	This park was involved in a previous project using microphones to detect bats. Participants were interested in this continuing.
Digital Noticeboard	There is a community garden within the park and participants want a noticeboard to display different types of information.

IDEAS	WHY
Visitor profiles / The condition and quality of the park experience / Donations from park users	To get a better understanding of the variety of park users, improvements for the park and whether park users would be willing to donate.
Number of users in different parts of the park	The greenspace is comprised of two distinct areas divided by a road. Observations suggest one of these areas is noticeably busier.
Using social media to canvass views on how the bowling green can be restored	There is an unused building in the park and there is potential to canvas park users how they would like it to be repurposed.

IDEAS	WHY
Identify the most-used areas / Most-used times of day / Weather	To get a broader understanding of how the park is being used and how weather affects park usage

This table shows the outcomes of the four workshops with the Friends of Parks and Community Groups. The tables list their ideas for each park and why these were priorities for them.

FACE-TO-FACE SURVEYS

In order to hear the opinions and experiences of a large range of park users, we carried out face-to-face surveys over two days in each of the pilot parks.

In the case of Leith Links and the Meadows and Bruntsfield Links, one of the surveying days overlapped with community events hosted within the parks.

A student intern created a visualisation of the survey data to demonstrate how it could be displayed in different formats for a dashboard and how that might engage people in exploring the data and make it easier for them to understand and interpret.

230 SURVEYS

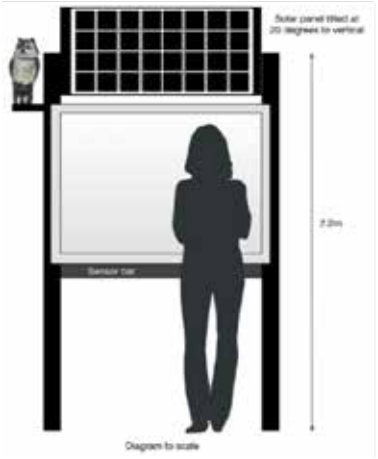
4 PARKS

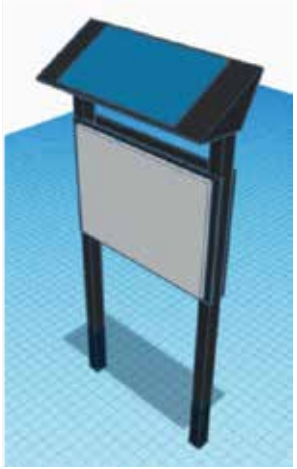
See Technical Appendix for:

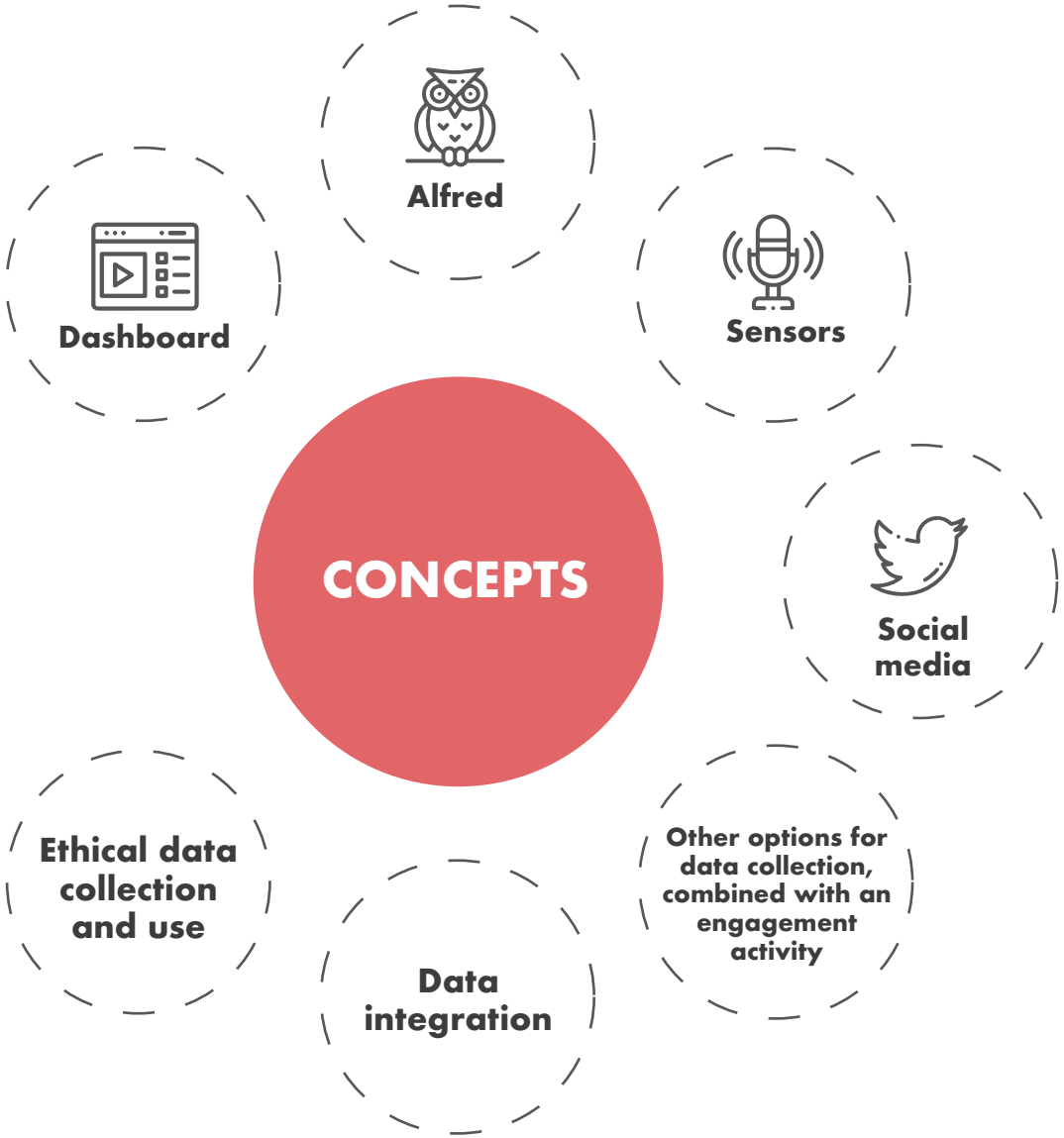
Surveys questions

TECHNOLOGY CONCEPTS

The possible options for the project presented to park stakeholders in our first workshop.







TECHNOLOGY CONCEPTS

Dashboard

Digital dashboard with local hotspots + website

Sensors

List of sensors and what information they can capture:

- Microphones for detecting bats.
- People and cycle counters on entrances/exits.
- Equipment monitoring (e. g. Detecting use of outdoor gym).
- Infra-red, ultrasonic and radar for presence and proximity detection of people, animals, bikes.
- WiFi and Bluetooth detection of mobile device presence.
- Temperature, humidity, rainfall, atmospheric pressure and possibly wind speed.

Other options for data collection

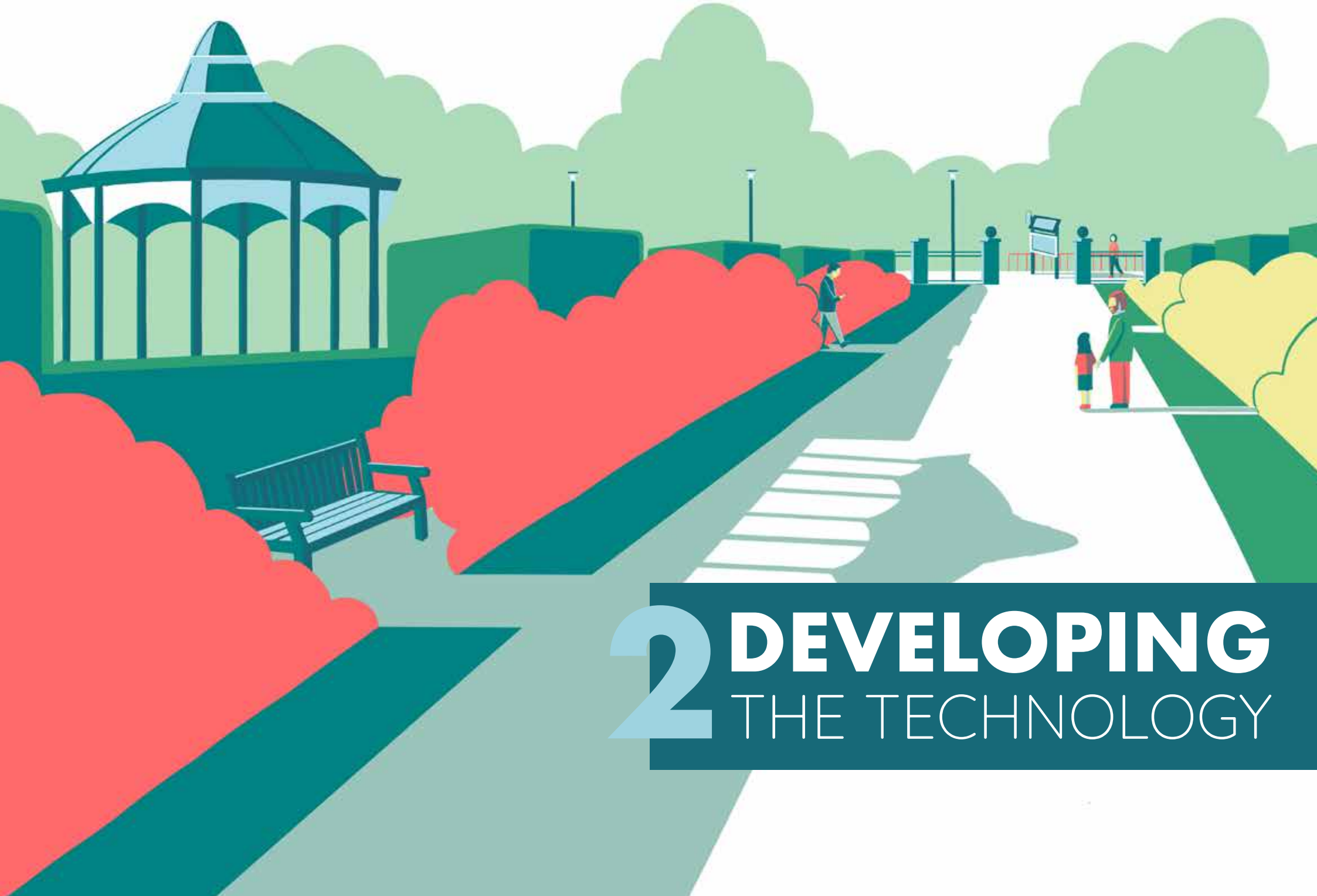
Social media (sentiment analysis, feedback from park users)

Data integration

List of events publicised by the Parks service via existing websites (e.g. Edinburgh Outdoors) and other datasets identified in the data discovery process

Ethical data collection and use

Consent form, explanation of person tracking



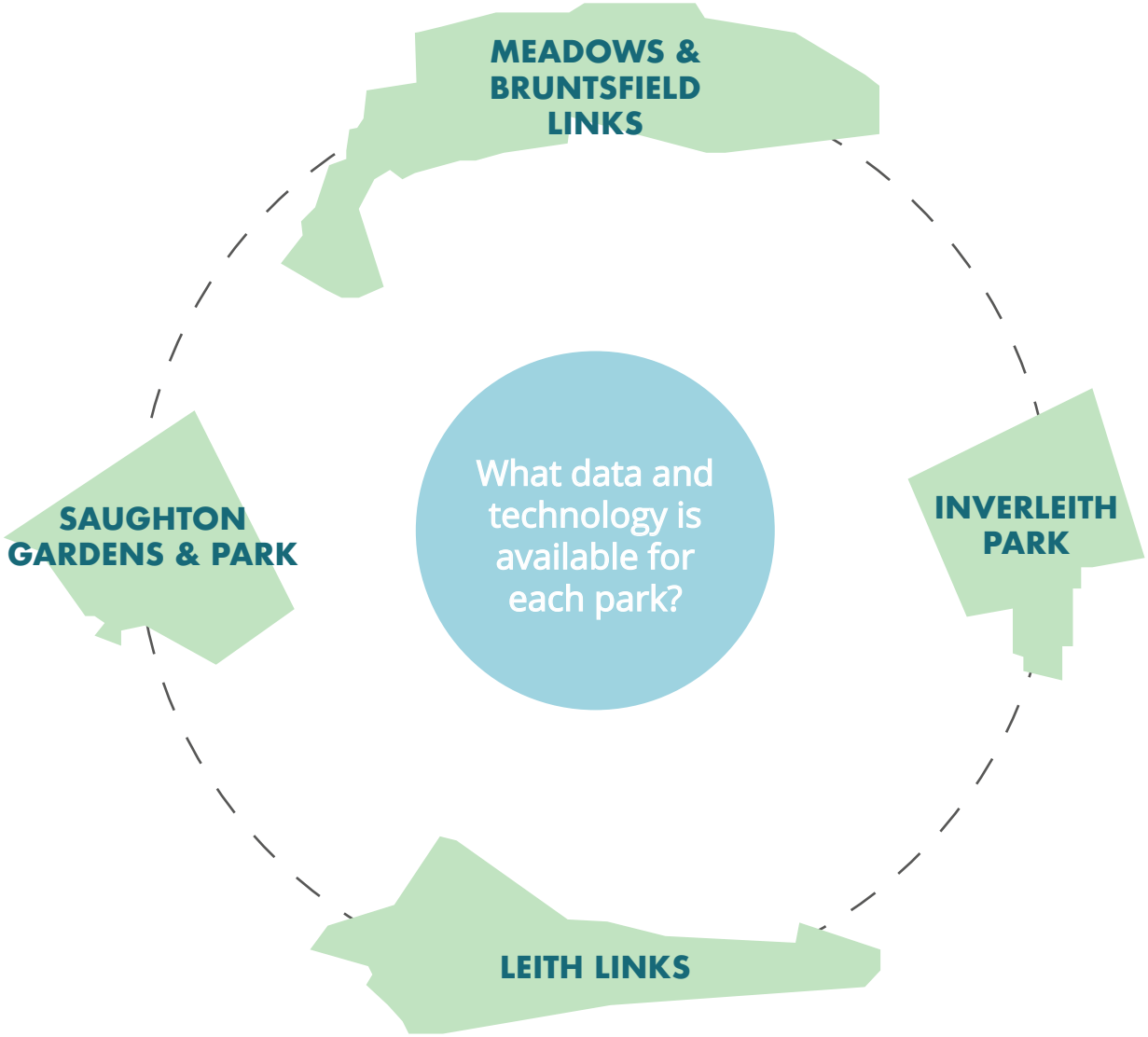
2 DEVELOPING THE TECHNOLOGY

INTRODUCTION

The aim of this phase was to build on the ideas generated during the first phase and begin developing prototypes that we could test in the four pilot parks.

This involved looking at how to balance the ideas from Phase 1 with the available technologies and the potential to actually implement them in the parks. To do this, we reviewed the list of ideas and identified possible solutions.

The majority of the time in this phase was focussed on exploring and setting up the physical infrastructure and digital technologies that would enable the project to deliver useful and valuable information about parks.



REQUIREMENT	DATA ACQUISITION
Cricket pitch use	This booking data is available from Edinburgh Leisure.
How many people visit the garden	There are two options for doing this: 1) display a notice inviting people to tweet a selfie in the garden with a bespoke hashtag; 2) place a people counter on the noticeboard.
Visitation rates and times for the whole park	This information can be depicted as an aggregation of all data from sensors deployed in each park.
Detection of Bats	This will be new data produced by the ParkLife project using Audiomoth.
Digital Noticeboard	This is a new idea generated by ParkLife. This allows park users to connect to a digital platform to access sensor data and other types of information.

REQUIREMENT	DATA ACQUISITION
Speed, time and routes of cycles	There are no existing cycle counters but there is potentially data from Strava or Edinburgh's bike-sharing scheme.
Number of people using different parts of the park	Consented smart-phone tracking ground-truthed by observational surveys carried out by the Friends of Parks.

REQUIREMENT	DATA ACQUISITION
Visitor profiles	Consented smart-phone tracking ground-truthed by observational surveys carried out by the Friends of Parks.
Who doesn't use the park?	This was deemed out of the scope for ParkLife and more appropriate for a next phase.
Park condition	Sentiment analysis of social media, possibly in response to campaigns asking people to post on Twitter & Instagram.
Donations from park users	Donations can be given through My Park Scotland website, a previous Rethinking Parks project.
Number of users in different parts of the park	Consented smart-phone tracking ground-truthed by observational surveys carried out by the Friends of Parks.
Public consultation on new use for the former bowling greens & other under-used spaces	Social media such as Twitter or Instagram could be used as some form of digital campaign.

REQUIREMENT	DATA ACQUISITION
Identify the most-used areas	This can be obtained through data from existing people counters, the chatbot & consented smart-phone tracking.
Digital noticeboard	This is a new idea generated by ParkLife. This allows park users to connect to a digital platform to access sensor data and other types of information.
How to get more local people to use the park	This was deemed out of the scope for ParkLife and more appropriate for a next phase.
Encourage considerate use of the park	This was deemed out of the scope for ParkLife and more appropriate for a next phase.
Most-used times of day	For large premier parks in Edinburgh, Google data already displays this information.
Weather and Environmental Quality - air quality and noise levels.	The dashboard could be equipped with sensors to collect data on the wider environmental conditions.

NOTICEBOARD DESIGN

See Technical Appendix for:

List of sensors

The starting point for the noticeboard concept was to develop a durable and relatively easy-to-deploy digital package. This package would include a collection of sensors to address key data requirements, an e-ink display for showing live data in the park, a wifi hotspot that people could connect to without needing mobile data, the required infrastructure to maintain the sensors and transmit the data, and a paper poster explaining the project and how to connect to the noticeboard.

After gathering the data requirements and reviewing the options for implementing them, we began to develop the idea of installing a physical noticeboard in each park.

A physical noticeboard was preferred over a digital one for several reasons:
1) it allows us to display information about sensing taking place within public parks and provide an obvious interaction point within the park;
2) it provides a standalone sensor operation – in particular, a power supply to enable continuous sensing and remote monitoring;
3) the opportunity to collect data from park-goers requiring individual informed consent;
4) a platform for other innovative services that could support further engagement with parks and create a viable economic model for installing and maintaining the noticeboards.

Overall, the shift from a digital to a physical noticeboard was significant to make the data gathering functional in the short-term, but it was also designed with a long-term view toward sustainability and replication of the prototype.

DEVELOPMENT OF FIRST CHATBOT AND DEPLOYMENT

From the outset of the project, we planned to compliment sensor data with other technologies to **engage people directly** and **collect qualitative data** that reflected people's individual and collective experiences of parks.

BACKGROUND

One of early ideas was to use sentiment analysis of social media feeds to collect data on how people use and value parks. In the time between us proposing this idea and receiving the Rethinking Parks grant, the Cambridge Analytica scandal caused social media companies to withdraw the APIs and permissions for using their data. We submitted data requests to several of the companies, but they did not respond.

We looked at examples of how to use other examples of digital technologies to engage people, from social media campaigns to citizen-science platforms such as iSpot and iNaturalist to digital Pokemon Go-style exploration games.

We also looked at various digital consultation tools such as Consult. During this review exercise, we discovered a project that used a chatbot mechanism to engage people with public art and collect their opinions, input and feedback on different artworks.*

This concept seemed to fit well with the ambition of ParkLife in several ways:

• Chatbots can be accessed either through the local wifi hotspot or online;

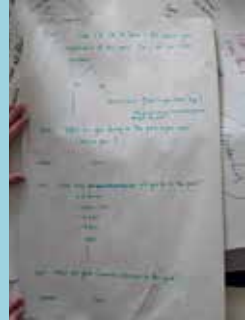
• They offer a creative, engaging and personalised way for the project to interact with park users;

• With the appropriate permissions, Chatbots could allow park users to voluntarily share information with us and document what is happening in the park;

• Chatbots have the potential to be adaptable to different parks and different situations.

* https://www.designinformatics.org/research_project/stips/

Working with a researcher and a technologist from the project, we developed a prototype chatbot through several steps:



CONVERSATION BRAINSTORMING

The chatbot should:
• Have a simple and intuitive interface (akin to WhatsApp) and encourage users for both text responses and photos.
• Ask questions seeking to find out more about why park users visit the park, how often, how far they have travelled to get to the park, what they value about it, and the sorts of activities they do when they are there.
• Contribute to building a picture of how people use parks and make comparisons with national-level data, particularly frequency and duration of visits, and perceptions of greenspace quality.

1.

CONVERSATION REFINING

Translate individual questions into a short but engaging conversation. The dialogue is constructed of a series of branches with both the affirmative and negative responses joined together by linking dialogue to add flow and personality to the interaction. Additionally, we also added in feedback loops into the structure to encourage users to continue conversing with the chatbot to the end of the conversation.

2.

CONVERSATION PERSONALISING

The drafted chatbot script was taken away by the chatbot developers and refined further.

3.

CHATBOT PROTOTYPE BUILDING

An overview schematic of the finished chatbot design can be viewed within the data toolkit.

4.

CHATBOT DEPLOYMENT

This iteration of the chatbot was hampered by technical issues which restricted data collection. We attempted to address these issues in the next iteration of the chatbot (See more information under Phase 4 – version 2 chatbot).

5.

See Technical Appendix for:

Chatbot schematic

CONSENTED MOBILE PHONE TRACKING

One of our key ideas had been to set up a programme of smart-phone tracking with participant consent. This would allow us to get a sample of how people move through parks, which would provide much more insight than a simple people counter.

See Technical Appendix for:

Tracking consent form

CHALLENGES

We spent extensive time investigating this idea, looking into how to engage park users to consent to being tracked and how to do the tracking ethically.

After careful consideration, we decided not to attempt this, as the ethical and privacy concerns were substantial, and it would require significant effort to get enough people to participate to collect meaningful data.

However, we still think mobile phone tracking could provide a very valuable data source. Other options for further research and exploration include getting mobile phone data or data from public wifi providers.

Another project in the Prototyping programme was also working on this – **read more about WiseParks here**:

nesta.org.uk/project/rethinking-parks/university-nottingham-wiseparks/

REFLECTION

Developing the first iteration of the chatbot was useful for showing us how these tools are constructed and operate. However, the chatbot did not easily provide data in a form that others can process and analyse, and required advanced technical expertise to adapt it. It is reasonable to assume that not everyone we hope will use our tools will have the necessary technical skills or resources.

We, therefore, undertook a web-based, rapid review of off-the-shelf and open-source chatbots that might offer a less technical solution. Our review used the following criteria:

- Accessible via QR code and browser on any smartphone
- Simple design, build and deployment tools
- Free and open-source
- Natural Language Programming is not essential
- Data output: service ideally provides analytics and visualisation
- Service can provide multiple channels
- Can be hosted either in the cloud or on own infrastructure

We reviewed a handful of different types of chatbot offered by online service providers, stand-alone digital tools and open-source frameworks. The current range of chatbots tools did not perform well against our criteria. The exception was Botpress which offers easy-to-use tools, flexible hosting options, general analytics, and has the capacity to deal with more complex user queries. We then used Botpress to develop the second iteration of the chatbot. A guide to setting up your own chatbot can be found in the **Technical Appendix** of this report.

3 CO-DESIGNING

THE TECHNOLOGY DELIVERY

INTRODUCTION

The main focus for this stage was to begin testing the prototypes in real life. The noticeboards had been installed in two parks, and installation was underway in two more. The first sensors were collecting data, and a complete chatbot dialogue could be accessed by a wifi hotspot at the site of the noticeboard.

Two aspects of the technology became the focus for testing:

1) engagement with the noticeboard and the chatbot in general;

2) engagement with and interest in the data the project was generating and would generate.

For the first, we looked at how to improve communication about the project and to be fully transparent about the data being collected. For the second, we began another iteration of the data dashboard and organised small workshops to collect feedback from park managers and Friends of Parks groups - the project stakeholders who would be most likely to access and use the data in the first instance. We also began to look at options for the longer-term management of the technology and how to set up the 'behind-the-scenes' data flows to adapt and respond to the changing needs and interests of park managers and users.

ENGAGEMENT WITH THE NOTICEBOARD
Illustrations

From the beginning of the project, we carefully considered the sensitive issues around data collection in public places.

In order to show what the notice board and sensors were doing, we worked with an illustrator to create visual representations of the data being collected. We added text for further clarification.

See Technical Appendix for:
Illustrations

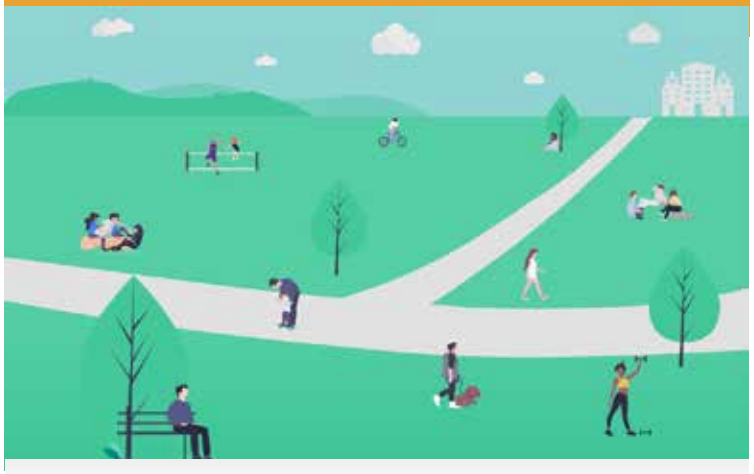
'Consented mobile phone tracking'

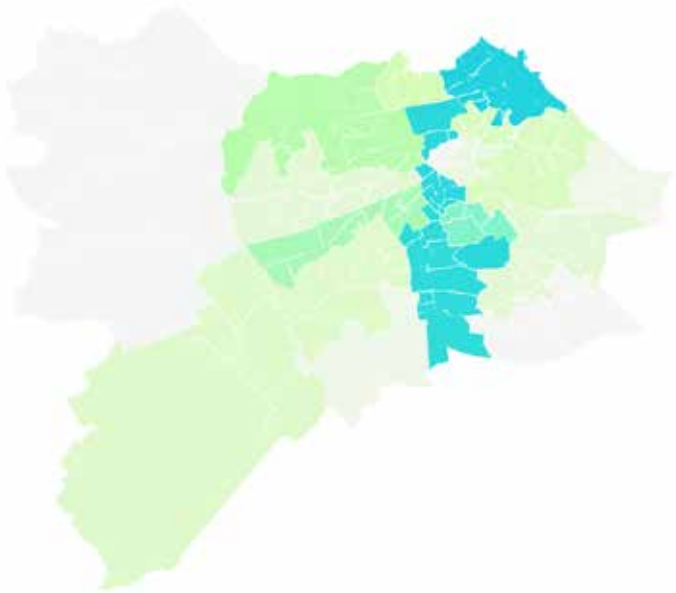
'Chatbot'

'Bat presence detection'

'Cycle counting and direction of travel'

SURVEY RESULTS
Data visualisations





See Technical Appendix for:

Guide to creating the data visualisation

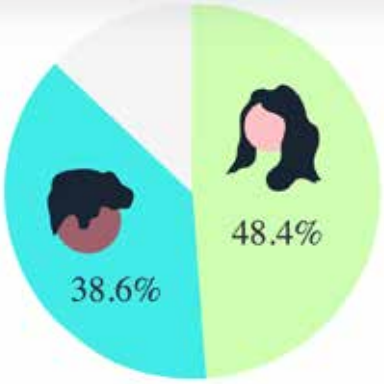
INTERACTIVE VISUALISATIONS

In order to better understand the results of the face-to-face surveys of park users, we worked with a student to develop visualisations of the data. This was one of our first attempts at data visualisation in the project.

The visualisations helped us to understand the data better and gave us a variety of ideas about how we could present data about parks in a way that would be **easily accessible to people** with different degrees of data literacy.

In other words, they wouldn't have to understand or perform statistical analysis to get a quick at-a-glance view of data about parks.

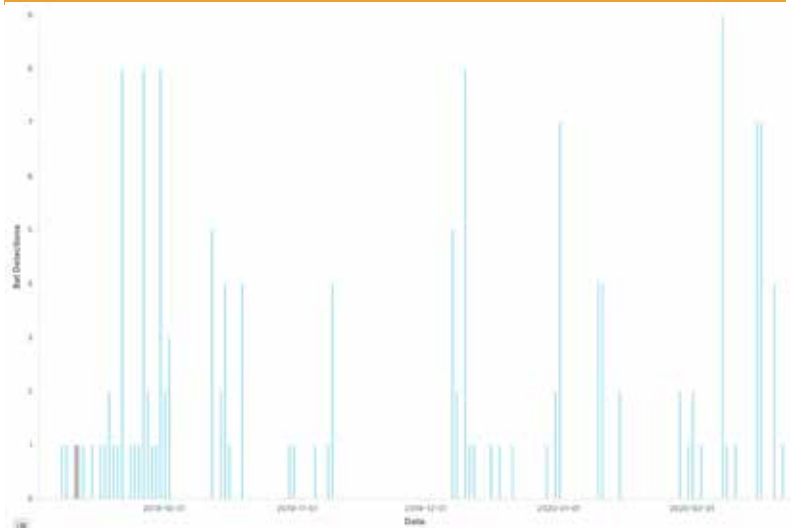
Some of the ideas that people found particularly useful were the **illustrative 'graph' of activities** by popularity, **the word clouds**, and the **various visualisations providing insight** into parks of users – bar graph of different types and the map of where people come from.



DASHBOARD DESIGN
Data visualisations

One of the key objectives of the dashboard design was to produce data that would be useful and accessible to anyone.

From the first phases of the project we established what data people were interested in and what they wanted to use it for. We also knew that some people in our target audience would not be particularly digital- or data-literate, and seeing real-time data about bats and human activity in parks would be a new experience for them.



We held three **focus-group-style workshops**, two with park managers and one with Friends of Parks and community groups, **to discuss and explore different ways of visualising and presenting the data**.

We created a series of graphs using some of the initial data we had started to collect from each park to serve as a basis for these conversations.

For example, the bar chart depicts the number of bat detections from sunset to sunrise across the autumn and winter period of the project. Only a single bat detection was recorded in the Meadows (red); all other detections were made in Inverleith park (blue). Inverleith is a much more suitable habitat for bats than the Meadows, so this significant difference is not surprising. It is interesting to note the rate of detection is highest during September with most nights triggering bat detections and that there is a fallow period from November through December.

You can explore more of these visualisations and the insights we started to learn from the data in the resources section.

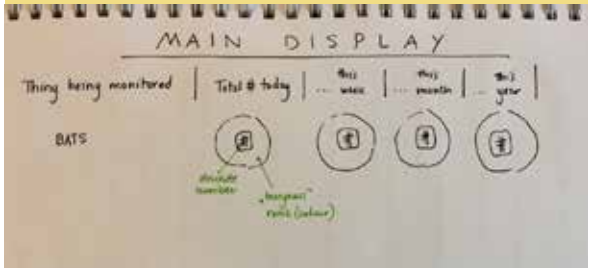
See Technical Appendix for:

Illustrations of sensors data

Having identified what new data our target users wanted, the workshops helped us get a better sense of how they wanted this information displayed.

Overall our target users were seeking a broader picture of park use over the short to longer term, with data being displayed through a combination of figures and graphs that provide a quick and easy impression of activity levels.

The default display option is the daily total within indicative trend icons. Wider trend graphs could be provided via clickable links for those who wish more detail and to make comparisons.



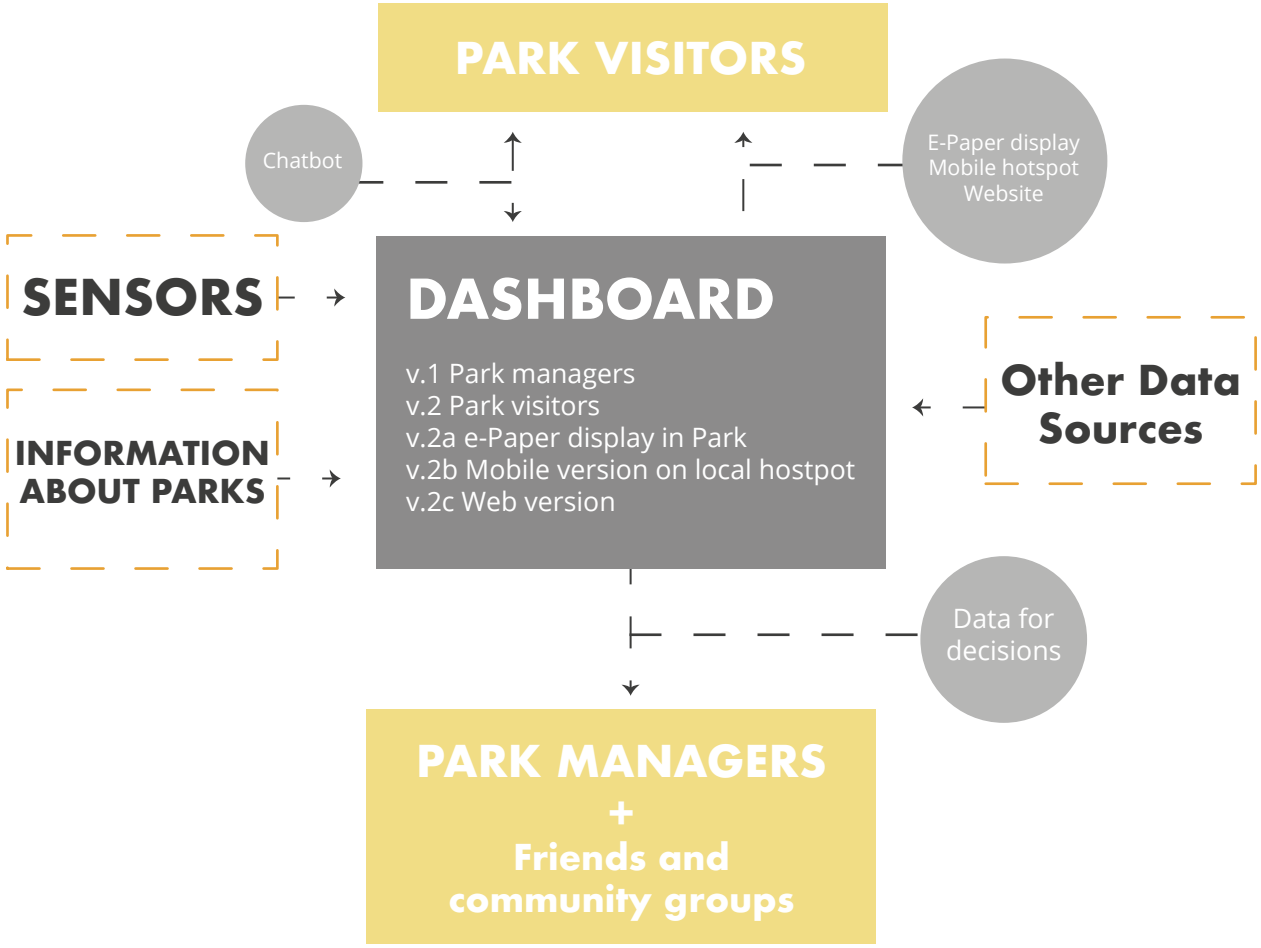
DATA FLOWS AND MANAGEMENT

Noticeboard and dashboard design and integration

At this stage we were thinking extensively about the final design of the noticeboard and dashboard, how they would work in the future, who would be responsible for their ongoing development, and what options there might be to develop a sustainable service and marketable offering out of the initial concept. This would be essential for the prototype to be developed and replicated in other parks around the country.

One direction of our focus was to look at how our original target users – Friends and community groups and park managers and park visitors – might interact with the noticeboard and dashboard in the future.

How would we ensure continuous streams of data? Would there be options to integrate new data sets into the future? How would the data be accessed? To do this we created a sketch of the data flows and the user interactions.



4 DELIVERING THE TECHNOLOGY

VERSION 2 CHATBOT

The numbers of people engaging with the noticeboard compared to those passing the noticeboard was relatively small. This suggests requiring people to connect to the local hotspot in order to use the chatbot was not sustainable. We then decided to revert back to our original idea of hosting the digital dashboard via the web. This will enable us to promote the chatbot more widely in places and to people via a QR code.

We created a second iteration of the chatbot using Botpress. The tool is open-access and requires less technical capacity to set-up and maintain, allows Park Managers and Friends of Park groups to customise the dialogue based on their own needs, and the chatbot session data can be more easily integrated into a dashboard. To allow for the collection of unique data for each park, we produced variations of the chatbot for each of the four Parks.

1. Open the camera on your phone
2. Scan the QR code
3. Click on the link
4. Talk to Alfred the Owl about this park

The long term aim is for the chatbot to integrate new information being collected about our parks. This will turn the chatbot into a **two-way communication** with park users: for park users to tell us about their experiences and for the chatbot to provide them with new information about their park based on their preferences.

You can access one of the chatbots via scanning this QR code:

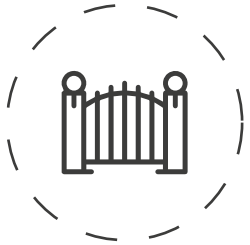
To set up your own chatbot, you can access the quick-start guide and the templates in the **technical appendix**.

THE DASHBOARD

The sensing we focused on for implementation in this project covered three main aspects:

Pathway presence counting -

using infra-red based distance ranging LiDAR, which enables precise detection of people (and bicycles) passing within the bounds of a close by pathway.



Gate openings in children's fenced play areas -

using a simple magnetic switch that is activated whenever a gate is opened and closed. By measuring the rate of gate openings over a set period we can infer how busy the corresponding family play area is.

Detection of bats -

using ultrasonic microphones, which provides a strong indicator of healthy biodiversity, since bats require an abundance of insect life, which in turn need healthy flora.
Ultrasonic sound is above the range of human hearing (>20KHz) and helpfully this simplifies the deployment of the microphone into a public area, since we can demonstrate we are not storing or processing the lower frequency sound range of the human voice.

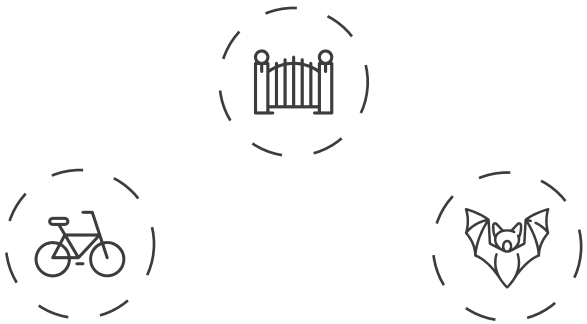
THE DASHBOARD

The concept for the dashboard was to combine these multiple data sources across different features of park centric activity from people and nature into a single display.

This form of infographic display is intended to make it easier to understand park behaviour and answer questions such as: when is the park busiest, who is making most use of the park, how influential is the weather on park use, do events or maintenance work on the park impact park users, is there a pattern to park use, and is this day a particularly busy or quiet day?

We originally looked at integrating data about existing activities e.g. about groups that meet regularly in the parks. However, accessing existing sources of data proved to be difficult during the project due to both a lack of available data and sharing constraints on behalf of the data owners. Our approach therefore focused on direct sensing to capture data for a dashboard that most importantly was not privacy invasive and would have broad applicability to all parks and greenspaces.

The sensors we have deployed in our parks create a partial picture since they can only provide a measurement for the area around them within sensor range. It is, therefore, only possible to be representative in measuring activity rather than entirely precise; we cannot count exactly how many people are in a park at a moment in time for example, without perhaps



However, we can combine these different sensor measurements to create a more complete view and a comparable measure over time for each park. This type of analysis will be unique to each park and allow patterns of behavior to be compared.

THE DASHBOARD

This is the current view of the dashboard located on the City of Edinburgh's existing Open Data portal and their park information website Edinburgh Outdoors. For privacy and security reasons, the data can only be viewed up to the day prior to the one it is being accessed. You can read more about the individual dashboard components in the appendix.

The dashboard has the range of sensors currently operating in Inverleith Park and The Meadows and Bruntsfield Links. We are still troubleshooting the sensors deployed in Leith Links and Saughton Park and Rose Garden, particularly in relation to establishing automated data sends, and general connectivity and power consumption issues. Getting the technology to function consistently and reliably in all four parks has been a significant part of the prototyping process.

In time this dashboard will develop as the data from the fully functioning sensors and new sensors will be integrated into the display. Once we have built up a regular and dynamic information flow, we will then be able to offer a dashboard available for each park as a separate page on EdinburghOutdoors. This will allow both the Park Managers and Friends of Parks groups for each park to access the new data remotely.

CONCLUSION

This report is aimed primarily at people - local authorities, trusts and other park management groups - who are looking to generate new data about their parks and greenspaces. The tools and resources within this report and toolkit could also be applied to other public spaces and used by other organisations and land owners.

We have outlined our prototyping process in terms of co-design, development and deployment of various technologies, and how to make some specific sensing operate within parks and greenspaces. We have used sensors that are currently available and, due to ongoing advances in technology, the likelihood is that there will be further sensing options in the near future.

If you wish to do your own sensing, then you need to be aware that collecting personal information about park users requires GDPR approval to maintain ethical and privacy standards. Collecting simple counts of people, bikes or gate movements may give you most of the information you need without requiring any personal data at all. Having more specific information about park users will improve the relevance of the insights you get but also substantially increase the amount of time and resources required to secure, regulate and maintain the data. Here we have demonstrated a system that strikes a balance between providing representative data and meeting high ethical and privacy standards.

You can replicate this system in its entirety or cherry-pick the sensing options that match your requirements, time and resources. The chatbot has relatively minor up-front costs but does require a modest investment of time to set-up. All of the sensors we have used require an investment of funds and time, especially in response to maintenance issues. Given they are located outdoors and in public spaces they can get damaged and vandalised. This can be reduced if park infrastructure, such as gates or noticeboards can have sensors built-in to provide a more robust and sustainable option.

What does this mean for parks?

We have shown that there are specific instances where sensing can provide useful data for those who use and manage parks. There is relatively little open-access data at an individual park level so any data we collected was welcomed by our target audience. In the short term, we expect this data to provide more evidence to help inform park managers' day-to-day activities. Over time we will be able build a broader picture of what is happening in parks, which could help inform longer term investment decisions like the provision of new infrastructure or adapting management regimes.

This picture of parks will become more detailed as more sensing options become available, including those we were unable to implement within the project timeframe. In particular, the consented smart phone tracking was identified by park managers as potentially providing very useful data, but due to time and resource constraints we chose not to pursue this approach. This type of sensing is also likely to prove more contentious with the public. Understanding how to communicate well with park users about data collection and how to get informed consent from them would provide the basis of a worthwhile follow-on project.

What is the future of data and technology for supporting parks?

As technology becomes ubiquitous so will its use in parks, greenspaces and other public spaces. Sensing technology is improving all the time and becoming more cost effective, particularly around detecting the wider environment and biodiversity. These advances will provide further opportunities for prototyping. For example, sensors detecting bees could be used to identify whether an area of a park given over to floral meadows has increased the population of pollinators on the site. The noticeboard provides a ready-made, low-powered and fully automated platform to integrate or be a conduit for this type of sensor.

How are people involved?

We worked closely with people who value and care for parks to co-design the prototype. We hope this process and the use of technology to gather more data will facilitate ongoing constructive and joined-up conversations around park management and investment. As the amount and depth of data increases then there is greater potential to communicate and engage with the wider public. This is exemplified by the chatbot, which provides an ideal platform for gathering and communicating new information about a park. The tool is flexible, allowing ongoing co-design of the conversation, how it is used, and for what purpose. This links back well with Edinburgh's Thriving Green Spaces Project and the community empowerment agenda within this, allowing Friends groups and the wider community to truly explore and invest in their precious local parks and green spaces and ultimately improve their quality and the experience for all park users going forward.

ACKNOWLEDGMENTS

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The project team would also like to give special thanks to the following people who helped with distinct tasks throughout the lifetime of the project: Morgan Currie for managing ethical approval, Michaela Hubmann for her management of the survey and volunteers, Erica Mason for her assistance with data processing and analysis, Qinru Zhu for helping with data visualisation and chatbot reviewing, Miranda Smith for her excellent illustrations, Benedetta Catanzariti for her graphic design work, and lastly Harry Newton for developing the second iteration of the chatbot and instructional materials.