Rethinking London’s Local Buses

Bus stop flag and post design

102
184
299

UXUK AWARDS 2015 WINNER
The design of London’s bus shelters has evolved only slowly over the decades, with a focus on cost reduction and mass production put ahead of users’ needs.

Our group project brief was to rethink the basic design of the London bus shelter, and how it supports use by different communities of passengers for local bus services in London suburbs. We were encouraged to think about comfort, convenience and safety, and how HCI could enhance passengers’ experience.

As an academic project, the other focus was on evaluating the ways that creative design techniques and tools might be used in the creative process, and in aiding us arrive at a design prototype with significant novelty and utility.
Design process

Research and analysis

Following the User-Centred Design process, we conducted a number of observations at bus stops and on buses in suburban areas of London, in order to understand the different passenger groups throughout the day, and how they use the space around local bus stops. We also made use of Google Street View to help us understand the variety of bus stops in London’s suburbs.

(We attempted to conduct some short semi-structured interviews but the main outcome of this was that we understood people don’t like being cornered by strangers with clipboards whilst waiting for the bus!)

Understanding users

Research helped define a number of core user groups which included commuters at peak hours, followed by many older passengers and mothers with pushchairs and shopping in the middle of the day. We also carried out secondary research into accessibility requirements and guidelines, noting the many frustrations of mobility impaired customers on online blogs and in forums. This informed personas which were used to help constrain requirements and keep us mindful of these groups.

Our initial analysis clearly showed passengers wanted two things: comfort, and information. Considering the diversity of bus stops and spacial constraints (some with shelters, some without), we chose to redevelop the touchpoint of the pole and flag (a common element of every bus stop with a design largely unchanged in 100 years), with a focus on improving access to information for passengers. Our priority was on empathy with users, relevance and user experience, but in particular we sought to meet Dieter Rams’s principles of good design, concentrating on simplicity in form and function.
Design process

Design: Flag and post

In addressing the design challenge, we identified the following passenger problems and frustrations with local bus services:

- Infrequent service: Buses may only come 2-3 times per hour (much less frequently than many inner-city buses)
- Lack of information: Passengers have little information beyond a printed timetable

This combination often meant passengers were constantly on the lookout for their bus and so frequently unable to do other things while waiting, such as read a newspaper.

Taking inspiration from inside the bus, this issue was addressed by the inclusion of a ‘stop’ button in our final design, and both audio and visual alerts when the bus is approaching (to support both passengers and drivers).

The basic flag/post design is largely unchanged in 100 years, despite the vast increase in passenger numbers, changes in demographics, and technological advances.

Design of components is driven by production costs with little thought given to the aesthetic and potentially iconic role this prominent piece of street furniture plays on London’s streets.

The timetable area is constrained by the width of A4 and height (3 sheets per panel). Positioning can often mean the user has their back to oncoming traffic, so could be unaware of their bus approaching. This also has clear safety implications and does not support wheelchair use, requiring wheels to be located precariously close to the kerb.

Existing bus stop flag and post design opportunities

Numbers read horizontally - finding the right bus route isn’t immediate when there are a large number of routes/rows of numbers.

Source: Trueform
At the top of the flag we moved the numbers to the opposite side of the post to improve visibility and findability from distance (by sorting numbers vertically). The numbers now also illuminate if a stop request has been made.

Local bus stops are often found in quiet residential areas; as a result the audio alerts are directed downwards from a directional speaker located at the top of the post, and alerts can be quietened or turned off at night-time if required.
Design process

Design: Timetable

The other major change is to the timetables on the post.

The current timetable area is designed around the width of an A4 sheet of paper (allowing for easy replacement), with up to 9 sheets of A4 over 3 panels, per post. By removing this constraint and using a screen and real-time information, we were able to drastically simplify the information being displayed.

Current timetables indicate approximate bus times throughout a day, but passengers typically only want to know how many minutes until their next bus arrives (this feature is now available at some bus stops with TfL’s ‘Countdown’ service, but there is scope for improvement by sorting by route, for example). We also considered some passengers may wish to check first and last services. We therefore focused on displaying the most relevant information, and presented this in several ways to accommodate regular users and those unfamiliar with the routes.

Considering our audience and expected use by several people at once, apart from the ‘stop’ buttons, there is no user interaction; this was deliberate considering the diverse user base and the fact it should be able to be used by as many people as possible at once. The most important information is presented at a much larger text size than the current timetable. It was also important that the display does not look like another screen (associated with obtrusive advertising), so it is intended to be a high-resolution e-ink screen which looks more like paper and works very well in outdoor conditions, including direct sunlight. The lack of glare helps it fit in with the residential surroundings, and is more likely to be appreciated by visually impaired users.

Evaluation

As we iterated the design, continuous evaluation against the personas with a particular focus on accessibility helped greatly: addressing accessibility helped improve the experience for all (for example: incorporating audio and visual alerts, using the e-ink screen, increasing text sizes, etc.).

(Note: the next step would be to conduct user testing of this design, but this wasn’t part of the scope of this project.)
Design process

considering how to simplify timetables by focussing on the most important details

Buses from this stop towards Clapham Park
First bus: 05:35 (tomorrow)
Last bus: 00:12 (this evening)
Buses run every 7-10 mins

<table>
<thead>
<tr>
<th>Destination</th>
<th>due in</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Clapham Park Atkins Rd</td>
<td>13 mins</td>
</tr>
<tr>
<td>Maximum capacity</td>
<td></td>
</tr>
<tr>
<td>Please board the following bus if possible.</td>
<td></td>
</tr>
<tr>
<td>2nd Wimbledon</td>
<td>17 mins</td>
</tr>
<tr>
<td>Seats available</td>
<td></td>
</tr>
<tr>
<td>3rd Wimbledon</td>
<td>25 mins</td>
</tr>
</tbody>
</table>

Minor delays are reported on this route

TfL’s current ‘countdown’ system

adding real-time information about bus status (including seating)

traffic conditions on this route are currently good

You are here

Buses run approximately every 7-10 minutes

Last bus departs around 00:15

Minor delays are reported on this route

vertical routes facilitate comprehension

examining glanceable, visually appealing ways to display next bus information (that might even be a bit fun!)

TfL’s current ‘countdown’ system

adding real-time information about bus status (including seating)

traffic conditions on this route are currently good

You are here

vertical routes facilitate comprehension

taking inspiration from TfL’s vertical ‘spider maps’: how could these be improved using live data?
Final design

The final design proposal is presented on the following pages.

Grounded in our initial user research, the storyboard (opposite) details how the new design can improve the experience for one passenger on an off-peak journey.
Storyboard: Passenger sets off to meet a friend

1. A woman walks to her local bus stop

2. She glances at the timetable to see her next bus is 8 minutes away

3. She presses the ‘Stop’ button for her bus, as the corresponding number at the top of the post lights up

4. The woman goes to sit down in the shelter and read her newspaper

5. A sound alert indicates the bus is due

6. The driver sees the number is lit and pulls over, allowing the passenger to board
Key features

1. **Real-time information**
   Bus times are updated using actual bus location data, meaning timetable information is accurate and relevant.

2. **Innovative timetable and map design**
   Only the most salient information is shown, so that passengers can quickly view details of their next bus, at a glance. Times are sorted by route and actual bus positions are indicated on the map. Simple graphics are used to aid quick comprehension. Sections are modular and scalable, allowing for roll-out across multiple bus stops.

3. **Route-specific stop buttons**
   No need to be on constant lookout for the bus! Passengers can request their bus to stop by pressing a button when they arrive at the bus stop. Route numbers at the top of the post illuminate accordingly, which alerts the driver so that passengers can then relax in the knowledge their bus will not pass by. Other users can also quickly see if their bus has already been requested.

4. **Traditional aesthetic and unobtrusive design**
   The post, flag, and timetable display have been designed in accordance with TfL’s brand guidelines and with careful consideration of the iconic history of London’s buses. The route numbers are positioned in a vertical orientation on the other side of the flag, to enable easy scanning and comprehension of routes available. The unit is in keeping with TfL’s familiar aesthetic and could easily be rolled out onto London’s bus network without confusing users.

5. **High resolution, high contrast, colour E-ink display**
   The display uses E-ink technology which performs well outdoors including in direct sunlight (comparable to paper). Unlike bright, backlit LCD screens, it is unobtrusive and particularly suitable for use in residential areas. It is a low-power display, and can easily be updated remotely. The deliberate lack of touch screen input allows the display to be viewed at the same time by several passengers.
6. **Excellent integration with existing infrastructure**

Flags, route numbers and screens can be easily attached to existing street furniture (such as street lights) to minimise clutter and cost. Components can also be fitted to TfL’s standard bus stop posts, and are compatible with solar power units.

7. **Addresses needs of all users**

Accessibility has been considered from the start (in accordance with UK/UN bus stop design and accessibility guidelines) in order to improve the experience for all passengers. This includes the inclusion of the ‘Stop’ buttons, the physical attributes and small footprint, the positioning of the screen, the tactile quality of the buttons with raised numbers, Braille and lighting to indicate a ‘press’, the location of the information on the screen, how the information is displayed, and having both audio (high-frequency directional speakers) and visual feedback.

8. **Safe, robust and anti-vandal design**

The display is housed in a strong protective case, with rounded edges to minimise the risk of accidental injury (particularly to young children). The post design is based on existing proven and reliable infrastructure.

9. **Environmentally friendly, low cost, and low maintenance**

Recycled aluminium is used for the flag and post; use of existing infrastructure and materials where possible minimises cost and additional wastage. Remote updating of the display reduces the need to update timetables or other information in person. Automatic error detection and reporting allows maintenance personnel to be dispatched only when necessary.
**Route map**

102 **STOP REQUESTED** towards Brent Cross

<table>
<thead>
<tr>
<th>Bus</th>
<th>To</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Brent Cross Shopping Centre</td>
<td>7 mins</td>
</tr>
<tr>
<td>2nd</td>
<td>Golders Green</td>
<td>19 mins</td>
</tr>
<tr>
<td>3rd</td>
<td>Brent Cross Shopping Centre</td>
<td>30 mins</td>
</tr>
</tbody>
</table>

First bus: 05:05
Last bus: 00:28
Buses run every 10-12 mins

184 **STOP REQUESTED** towards Turnpike Lane

<table>
<thead>
<tr>
<th>Bus</th>
<th>To</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Alexandra Palace</td>
<td>4 mins</td>
</tr>
<tr>
<td>2nd</td>
<td>Turnpike Lane</td>
<td>11 mins</td>
</tr>
<tr>
<td>3rd</td>
<td>Turnpike Lane</td>
<td>28 mins</td>
</tr>
</tbody>
</table>

First bus: 05:35
Last bus: 00:12
Buses run every 10-15 mins

299 **STOP REQUESTED** towards Muswell Hill

<table>
<thead>
<tr>
<th>Bus</th>
<th>To</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Muswell Hill Broadway</td>
<td>3 mins</td>
</tr>
<tr>
<td>2nd</td>
<td>Muswell Hill Broadway</td>
<td>12 mins</td>
</tr>
<tr>
<td>3rd</td>
<td>Muswell Hill Broadway</td>
<td>25 mins</td>
</tr>
</tbody>
</table>

First bus: 05:35
Last bus: 00:12
Buses run every 9-12 mins
1. Countdown display

The top of the display features a traditional ‘countdown’ panel, showing the next buses in order of expected arrival. This is intended mainly for people who may be able to take multiple buses to a destination and want to quickly see which bus they should take and when it will arrive.

2. Route-specific timetables

Access to real-time data means much of the timetable information currently present at bus stops can be ignored. Passengers typically want to know when their next bus will arrive. This route-specific information is therefore given precedence on the display.

Bus numbers and bus direction is shown at the top, with buses listed by order of arrival. Other key elements are indicated as follows.

A. A visual indicator on the display shows whether a bus has already been requested to stop. This information is also apparent from the flag and light status of the corresponding button.

B. Space is available to show any route announcements, such as the current traffic status and whether delays might be expected.

C. Bus occupancy levels and seating availability is indicated below each bus, so that passengers can know what to expect and take appropriate measures (such as deciding to wait for the second bus).

D. The only timetable information which does not relate to immediate travel is shown here: first and last buses and an indication of frequency. Other information may be displayed in any shelter or would be available to access online (when planning travel).
3. ‘Spider’ map with actual times and bus locations

TfL’s familiar ‘spider’-style map is reinvented with estimated arrival times now based on actual road conditions. Unlike existing maps, greater detail of the route to the stop is now displayed, with visual indicators showing approximate bus locations and times until arrival.

4. At-a-glance indicator of nearest buses

The bottom of the display features a fun, visual indicator of buses en route to the stop. Buses closest to the left side of the screen are due to arrive next, with space to show all buses arriving in the next ten-minute period. Salient information is shown again: expected arrival times, and seat availability including wheelchair (or buggy) spaces (this is positioned at the bottom of the display where it is easiest to read by users in wheelchairs).

5. Other display options

The display is one unit, and therefore screen contents can be easily changed according to requirements. For example, if roadworks require the stop to be temporarily put out of service, the screen can be quickly and remotely updated to inform passengers, and a map of alternate bus stops could be displayed.
Next steps

Design considerations

Further iterations based on user testing and stakeholder feedback would be expected next steps but this was not in our original scope.

Some work refining the modularisation and scalability of the timetable and the number of displayable routes is recommended; with some tweaking we believe the timetable could accommodate up to 9 routes but it would be necessary to ensure additional complexity does not reduce at-a-glance ease of understanding.

With a larger number of routes displayed, better button configuration on the post would also be required to make sure buttons are logically placed and reachable by all users.

Technology

Our timetable design relies on colour e-ink screen technology which is not currently commercially available at this size. However, high resolution and high contrast 3-colour e-ink displays are now being used in several applications from digital price tags in supermarkets [1] to electronic billboards [2]. While full-colour displays are also available in commercial products such as e-readers [3] and smart watches [4], colours currently appear washed out compared to paper or LCD alternatives.

Companies like Amazon Liquavista [5], however, are aiming to change this and product demonstrations indicate improvements are progressing at a rapid pace; it is only a matter of time before large-scale commercial deployment.

We believe this project highlights one area where use of e-ink displays could bring huge improvements in service and user experience.

Thank you for your interest in our project!

For more information please get in touch:

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