NTS digital diary

Findings and recommendations from the second round of user-testing

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1 Background

1.1 Introduction

The National Travel Survey (NTS) currently collects detailed travel behaviour data including trip mode and purpose using paper diaries covering seven consecutive days of travel, starting on a specified day. NatCen Social Research (NatCen) collects these data on behalf of the Department for Transport (DfT) using a panel of interviewers who place, check and collect the diaries.

The NTS achieves a consistent response rate of around 60 per cent of fully productive households, where each household member completed a seven-day travel diary. Data from the survey are classified as National Statistics and are widely used by the Department, academics and many other public bodies.

The maturation of online data collection both in terms of survey research and for government services has led the NTS team to consider how mobile and web technologies can be mobilised to improve the NTS methodology. This needs to happen in the context of DfT's long term aims for NTS, which are:
- that data is collected that will meet the need of a wide range of users in an efficient and cost-effective approach;
- whilst maintaining accuracy and, as far as possible, comparability with the existing approach (so that time series of results are consistent).

One of the ways in which online data collection can be included in NTS is to offer participants an option of completing the diary online. NatCen and TSC Catapult were commissioned by DfT to design a digital diary for NTS. This report presents the findings from this exercise and recommendations for continuing the process.

Given the importance of the survey data, once a digital diary has been developed the next stage (assuming successful completion of the work) would be design of a large scale field test, which would allow assessment of impact on response rates, trip rates and data quality and comparability. This would be a potential follow-on project.

1.2 Project aims

The following were the key objectives for this development project:
- Collection of diary data using an online methodology;
- A mobile first approach, meaning that the diary is designed primarily for smartphone use, but also supports other devices (tablets and PCs);
- Collection of all *main* data items in the current paper diary. Whilst a digital approach offers scope to collect data differently, the key aim of this project was to replicate what is currently done as far as possible whilst maintaining accuracy and quality of the data.

In line with guidance from the digital team at DfT, it was decided to design a **responsive website**, rather than an app.

NatCen has conducted user-testing of the web instrument. This user-testing has combined cognitive interviewing methods with eye-tracking techniques and video recordings. It has been conducted in two rounds; the first round of testing was carried out in October 2016. Further development work was carried out in response to the feedback received from participants. The second round of testing was conducted in December 2016 with a version which incorporated the changes made based on the first round of testing.

This report will present the findings from the second round of testing and puts forward recommendations for the continuation of this work.

2   Round 2 testing procedures

2.1 What was tested

We tested the second prototype online travel diary which had been developed to capture journey information for the National Travel Survey (NTS), following revisions made to the online diary after the first round of cognitive testing. Some respondents (N=2) were asked to complete the diary using a desktop computer with an eye tracker attached, others were asked to complete the diary on their personal smartphone (N=3) or tablet (N=3) devices, whilst the process of completion was filmed. All the respondents interviewed in the second round were confident users of the devices they used for the interview. This requirement was introduced at the second stage because it was hypothesised that in a real-life situation only confident users would choose to use a digital device as opposed to the paper diary, when offered the choice. Findings on each page of the diary tested are included within this report, followed by our recommendations to improve the online diary.

2.2 How the testing was undertaken

User testing protocols were developed in consultation with DfT. These protocols incorporated think aloud, observation and probing techniques. All respondents were asked to record the travel they had undertaken the day before the testing (or alternatively the day before that if they had not travelled anywhere on the previous day). Some respondents to whom the recording turned out more challenging or time-consuming were only asked to record one journey (both the outward journey and return including all stages of their journey). Half of the respondents interviewed were given detailed instructions about how to fill out the diary (in line with how an interviewer would brief a respondent if they were to be part of the study). The other half of the sample received very limited instructions about filling in the diary (simulating a situation in which the respondent would not be present at the interviewer's visit to the household). The testing explored:

- Overall layout of the diary;

- Ease of registering and logging in to use the diary;

- Whether each section of the diary was understood and completed easily;

- Appropriateness of information given.

The testing managed to cover a wide range of different types of journeys using a variety of methods of transport, but given the number of interviews, not all the possible options were explored in depth.

A NatCen researcher who has extensive experience carrying out user-testing and cognitive interviewing conducted the interviews. Two respondents were interviewed at City University Interaction Lab, using the eye-tracking equipment, and interviews recorded with their consent. The other six interviews involved respondents being video-recorded completing the diary on their smartphone or tablet. Respondents were given a £30 cash incentive as a thank you for their time and help.

2.3 Recruitment of test subjects

Respondents were recruited via a recruitment agency based on quotas previously agreed with the DfT and interviews were carried out at City University Interaction Lab and the NatCen offices. Eight interviews were conducted in total. The respondent characteristics are outlined below.

Table 2.1 Characteristics of the desktop user eye-tracking sample		
Desktop with eye-tracker – Round 2 of testing		**No. with characteristic**
Gender	Male	1
	Female	1
Age	18-29	1
	30+	1

Table 2.2 Characteristics of the smartphone and tablet device sample		
Mobile device – Round 2 of testing		**No. with characteristic**
Gender	Male	3
	Female	3
Age	18-29	1
	30+	5

With regards to education, all respondents had completed at least their A-levels. All respondents said that they were confident or very confident in their ability to use a laptop, desktop PC, smartphone or tablet to access the internet. As part of the recruitment screening, participants were also asked whether they would use a desktop PC or laptop, smartphone or a tablet to keep an online diary of their travel. Based on their responses to this question, they were assigned to the different modes of testing. The smartphone and tablet sample was asked to bring in their own devices. These devices included: two iPhone 6; two iPad tablets; a Samsung S5 smartphone; and a Huawei tablet.

2.4 Analysis

Interviews were summarised by researchers who reviewed the audio and video recordings of each interview. Responses to each probe were recorded, along with observations made by interviewers and any think aloud notes. Recommendations in this report are based on the debriefing discussion, which took place between the NatCen researchers involved in the study and the DfT representatives, as well as a full analysis of the data.

3 Findings and recommendations

The following sections are divided by the pages in the digital diary and will provide a brief summary of the key findings from the first round of user-testing followed by the more detailed findings from the second round of testing. At the end of each section some recommendations have been given based on the feedback.

3.1 Navigation

The following section explores how respondents found moving from page to page within the diary.

3.1.1 Summary of changes from round 1

- All respondents encountered some difficulties understanding the journey and stage concepts which made the navigation through the pages challenging; those who had the difference explained in more detail and subsequently found it easier to navigate the website and record their journeys. This issue was addressed with the inclusion of additional instructions and i-icons which would give detailed instructions of what information was required in each field.

- Consistent spacing between field labels and information icon was pointed out as something which needed addressing for round 2.

3.1.2 Key findings from round 2

- Respondents found the diary quite easy to use and said that moving between different pages was easy and clear.

- Even the respondents who did not receive detailed instructions about the diary could navigate it quite easily, once they understood the meaning of journeys and stages.

- Nearly all respondents (including those who tested the website using a desktop PC) said that in real life situation they would most probably prefer to keep the diary on a mobile device.

- One respondent drew attention to the fact that the website should be available offline as well, as it would allow her to fill out the diary while on the tube for example.

- One respondent said that it would be very important to make the diary as easy to use as possible, allowing for copying and pasting repeat journeys across different days for example. He talked about how most people take the same route to work every day around the same time. To make the diary completion as easy as possible, the diary would need to allow respondents to copy the journey across different days or mark it in the diary.

- Similar thoughts were described with regards to the return journeys – several respondents said that they would prefer the return information to be recorded in the diary automatically, which they would then allow them to edit duration, departure and arrival time and any potential changes in the routine.

- One respondent said: *"Online forms are never a pleasure, are they?"* suggesting that the design of the online diary reminded him of filling out a form. He also thought that the diary *"wasn't super clear, there are lots of fields so it was difficult to remember what you'd filled in before and what to fill in next"* (RC25, desktop PC).

- Certain issues regarding navigation between the 'Day summary' page and the journey stage pages were identified and will be discussed in more detail in the respective sections.

- Some respondents said that at times the font appears too small on their smartphone screens. When trying to zoom in, some were successful, while others were not able to do this, which highlights compatibility issues. Some respondents tilted the smartphones in landscape view so that they could better read the instructions.

- Respondents were comfortable clicking the information buttons when they were unclear about something and saw this as a helpful feature, which is an improvement from the first round of testing where these icons were not used.

- All respondents were asked how they found filling out the diary at the end of the practical task. The consensus was that even though some sections are not very intuitive, after filling out a journey or two, they knew what was required of them.

  - However, some respondents highlighted the importance of the diary being very user-friendly which would encourage more people to complete it accurately. The exercise was also seen as repetitive given the number of different fields a respondent needs to complete. Several respondents suggested that filling in the travel diary should be made easier, such that the burden on the respondent is reduced. They believed that this would encourage them to keep a diary for the whole week.

  - It was mentioned that daily reminders to complete the diary would be a welcome feature.

3.1.3 Recommendations and suggestions

- We recommend ensuring that the online diary is as user-friendly as possible and allows for at least some of the functionalities which would reduce the need for repeating some of the same information that has been given already (copying and pasting routine journeys, automatically recording the return journey and allowing a respondent to edit it before submitting).

- We recommend a comprehensive, professional review of the design (colour scheme, font type and size as well as the overall layout of each page) in order to ensure consistency and clarity of design across the diary, as well as user-friendliness.

- The travel diary should be accessible and suitable for those who are colour-blind, or those with other types of impairments (i.e., visual, motor and cognitive). The World Wide Web Consortium (W3C) provides guidelines which should be followed by all websites in order to comply with accessibility guidelines. Offering the diary in different minority languages should also be considered for further development.

- The online diary should also be thoroughly tested for bugs on various devices, platforms and browsers to ensure compliance and consistency as variation in quality still seems to

appear. This falls within the remits of the developing team. There are different tools currently available to developers which allow them to test compatibility with devices, browsers and platforms.

- Ultimately, it is important to understand the user experience, and that should be checked through user testing. However, user testing should not be used to identify error in coding and design, rather to assess the ease of use of the newly developed online tool. One of the main methodologies in user testing, think aloud, is a cognitive technique. Therefore depending on the changes made to the current version of the instrument, we recommend further cognitive interviews to assess user friendliness.

- We recommend adding a practice element in the diary to allow respondents to get accustomed to the online diary. This would be similar to the practice page currently included in the paper diary, which the respondent fills out with the interviewer present. Completion of the practice page has shown to enhance the data quality considerably as it gives the respondent an opportunity to practice recording their travel and discuss any doubts or uncertainties they might have. It should be clearly marked as separate from the other days of the online diary and something that respondents can either skip or go through. This could be exactly the same as a regular day of diary collection, but the information buttons that are deemed necessary and essential for diary completion would pop up at each stage – this will allow the respondent to read the information and force them to close that pop up in order to fill out the practice day.

- In the report from the first round of testing, we suggested adding a video tutorial as well which would show respondents how to fill out the diary and what information will be required of them. We believe this will also be a viable solution. Interviewers could draw attention to this functionality during the placement visit or it could be even completed during the visit. However, it is important that this would be an optional element, available for use if needed.

3.2 Overall look and feel

This section explored what participants thought of the overall look of the diary such as the layout, colour scheme and font size. They were probed to talk about the overall feel both immediately after completing the digital diary and at the end of the interview, after the various sections of the diary had been discussed.

3.2.1 Summary of changes from round 1

- Some respondents liked the clean and simple design of the website whereas others saw it as bland and boring. It was suggested that the diary could be more interactive. Some respondents said that making it more colourful and adding images would make the diary more appealing, especially to younger people. Others mentioned that the instructions on each page could be more targeted for that particular page and include specific examples.

3.2.2 Key findings from round 2

- Overall, respondents thought that the look and feel of the diary was fine. It was often seen as uncluttered and clean.

- Some mentioned that it is quite similar to a paper form or a paper questionnaire. If the website looked more visually appealing it would not feel like filling out a form which could make the diary completion more enjoyable.

- Most respondents thought the text size and colour was fine for them personally, but mentioned that people who have poor eyesight might struggle to read the text.

  – One respondent thought that the font size was too small and struggled to zoom in and view the page in landscape mode. It needs to be considered whether the font size can be increased to address this.

  – One of the respondents was red/green colour blind, and said he could not comment on the colour scheme, but thought the contrast was ok.

- Some respondents commented on the fact that the icons/buttons were unclear (e.g. expand, edit and delete) and that they were too close together.

- One respondent mentioned that the layout was narrow on a smartphone device.

- One respondent suggested that diagrams and icons (similar to what was displayed on the 'About' page) could be used more to make the diary more dynamic and user-friendly. The diary would benefit from clear visuals symbols which help you know how and where to enter information, rather than text to read at the top of each page. He said that the style of the diagram on the 'About' page could be carried throughout the diary where similar examples could have been helpful.

3.2.3 Recommendations and suggestions

- The consistency across the different areas of the page needs to be checked:

  – The size of the text boxes needs to be kept consistent across pages.

  – The colour scheme should be consistent across pages. The diagram should follow the same colour scheme as the website in general. The instructions should all be in the same font size and bold, and they should be highlighted consistently across the diary.

- The use of icons and diagrams throughout the diary would be beneficial. We recommend where possible, changing the text of instructions and/or the information buttons to icons or diagrams as they might be easier to understand at a glance. Frequent internet users are likely to be familiar with the most common icons and the functionalities they represent such as a 'bin' icon for deleting an element, 'pen' for editing, 'magnifying glass' for search.

- We strongly recommend using the full width of the screen to avoid the diary looking too narrow. This can be done through responsive design to ensure that the website adjusts depending on the device used.

- We recommend offering the option to increase the font size, as well as change the colour scheme of the diary in order to make it accessible for people with visual impairments.
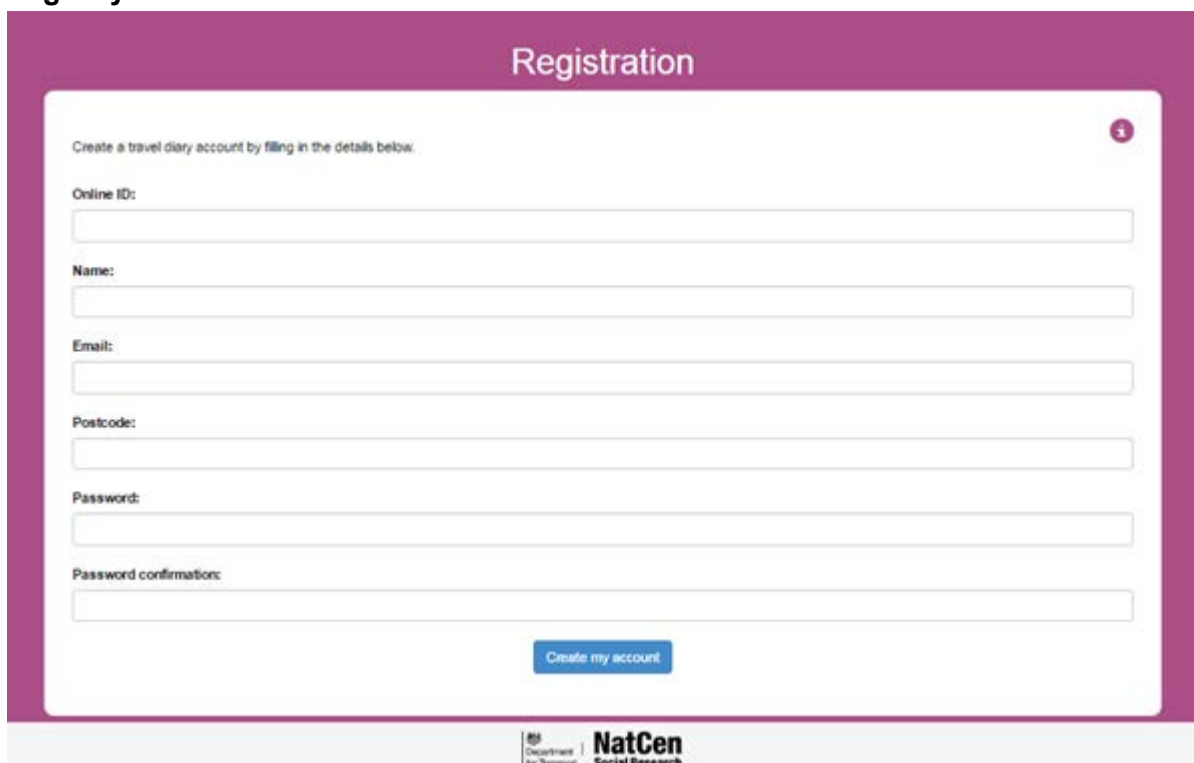
3.3 Registration screen

This section of the interview explored how respondents found registering and logging into the diary.

3.3.1 Summary of changes from round 1

- No major issues were brought up in relation to this page from the first round of testing.

- It was noted that quality checks would need to be built in on this page. For example, an email address should contain @-sign somewhere in the email address.

Page layout – round 1

Page layout – round 2

3.3.2 Key findings from round 2

- All respondents were able to register and log in easily.

- Some respondents were unsure whether the postcode needed to be in capital letters or not, and whether it is necessary to enter the space between the postcode letters and digits.

- Some respondents were wary of entering their email address and wondered whether they would receive spam – the interviewer reassured them that they would not.

3.3.3 Recommendations and suggestions

- The information collected on the registration page should be reviewed in order to ensure that only the necessary information is asked of the participants.

- Given the fact that the online ID and the postcode needed to be provided by the interviewer, these pages were filled out with interviewer support, however, no major issues were identified.

- At the end of the interviews, some respondents recommended that more information could be collected at this stage which could be used to auto-populate some fields – home and work location, type of cars used during a typical week (personal car, car share, family car).

- We recommend that these extra fields are added on the registration page.

3.4 'About' page

The aim of this page is to provide some basic information about the diary.

3.4.1 Summary of changes from round 1

- It was found that respondents did not read or internalise the written information on the page. Given the importance of this page in setting out the basic guidelines for diary completion, it was crucial to re-think how to best redesign this page to be more user-friendly. What previously consisted of one page was split into two parts:

  - The lengthy written instructions which many respondents did not read or take in fully were replaced with a diagram. It was aimed at visualising the different stages a journey may have and helping respondents to take in the key information around the differences between a journey and a stage. The accompanying text was also revised and reduced.

  - A separate page was dedicated to introducing the respondents to the i-symbol which would contain extra instructions and information for reference since the first round of testing found that users were not using the information icons.

Page layout – round 1
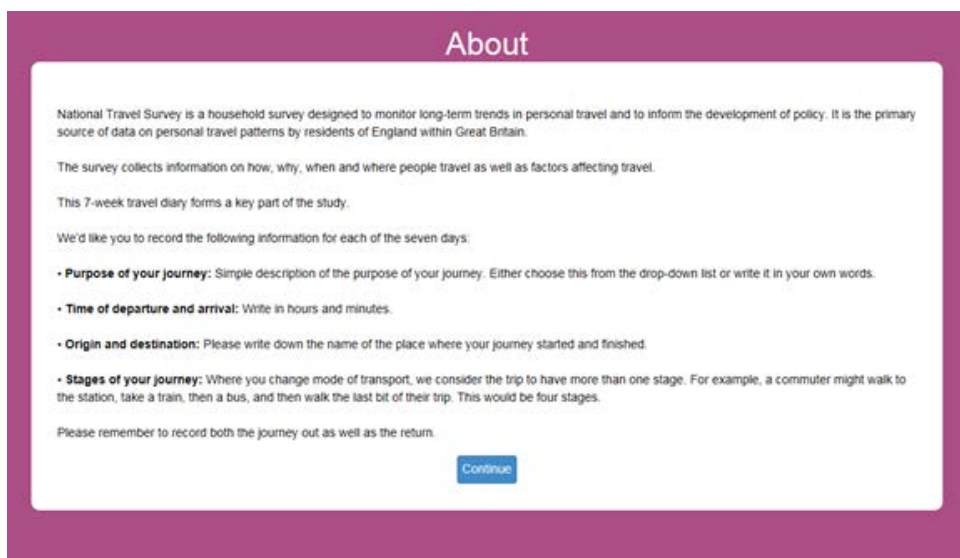
Page layout – round 2
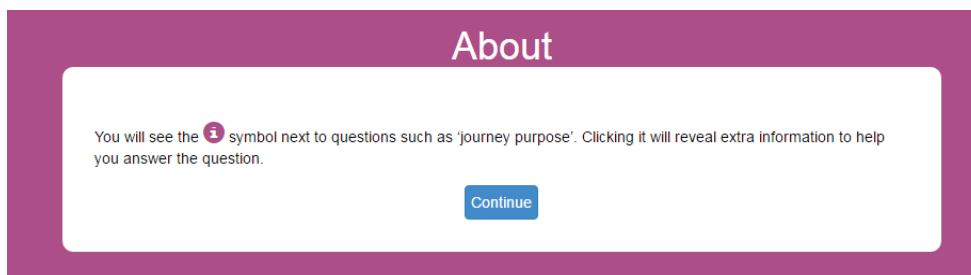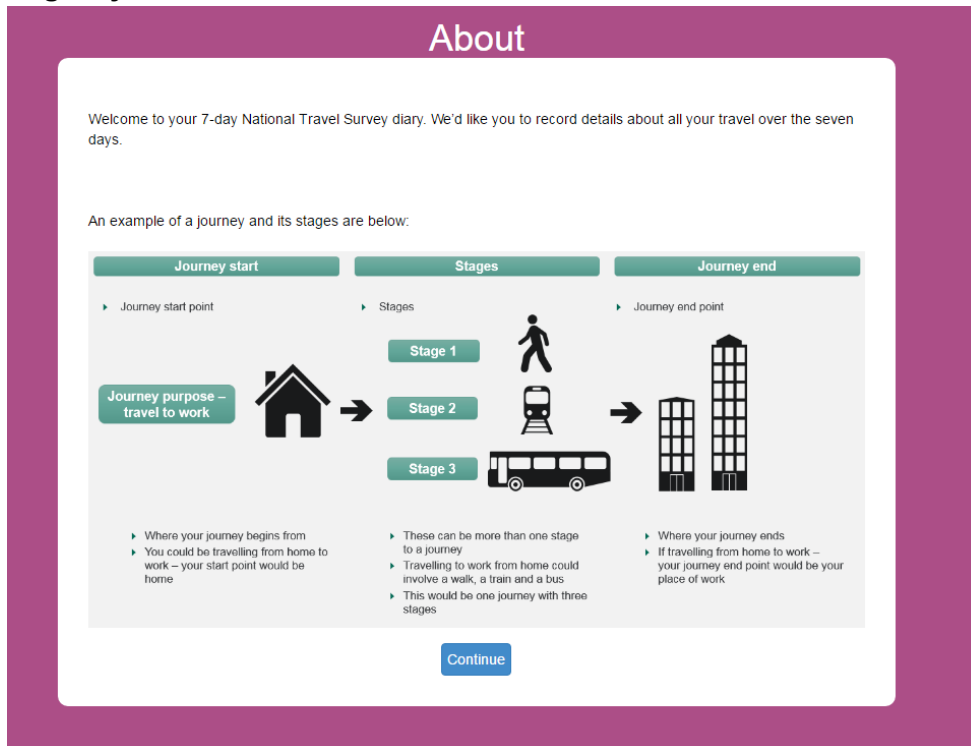
3.4.2 Key findings from round 2

First 'About' page – the diagram

- Most respondents thought the diagram was useful as it explained the journeys and the stages that needed to be entered. They said that the diagram was very helpful in building up their understanding of how to fill out the diary.

- Some respondents thought the font size on this page was too small.

- Others commented on the diagram suggesting that some of the text is repeated and that just adds complexity to what is supposed to be a simple easy to understand diagram.

- It was suggested that the diagram could be used (either entirely or parts of it) throughout the diary in order to remind participants of what they needed to do and to make the diary more interactive. A respondent suggested the use of icons from the diagram for different parts of the diary (such as having a home icon represented by a house, as well as a bus, a train, or a walking person to represent various means of transportation).

- Some respondents tried to zoom in on the diagram but were unable to do so due to compatibility issues between devices.

- To improve the diagram, respondents suggested:

  – Removing or changing the arrows, since the arrow points to the second stage of the journey leading to confusion around only the second stage being linked to the journey;

  – Adding a walking stage in between the different modes of transport to remind respondents that the walks need to be included;

  – Keeping the colour scheme consistent with the rest of the diary.

- One respondent also suggested that the text from the diagram should be moved onto a different screen so as not to be confusing.

Second 'About' page – the i-button

- One respondent suggested that the second page should be the same size as the previous one, because it is currently much shorter which could cause it to be disregarded by some respondents.

- All respondents said that the information presented on this page was clear and helpful. Many of them said that they were familiar with the icon used for retrieving more information.

3.4.3 Recommendations and suggestions

- Removing some of the text included in the diagram, so as to make it more succinct. It could be replaced with a short vignette at the top, describing the journey and stages presented in the diagram. The amount of white space (between the lines of text) should also be reduced.

- Changing the colour scheme to be consistent with the rest of the diary.

- Thoroughly testing this page on multiple browsers and devices to ensure compatibility.

- More walking stages could be added in the example.

- Alternatively, or additionally, the short video describing what a stage is and what a journey is could be included here.
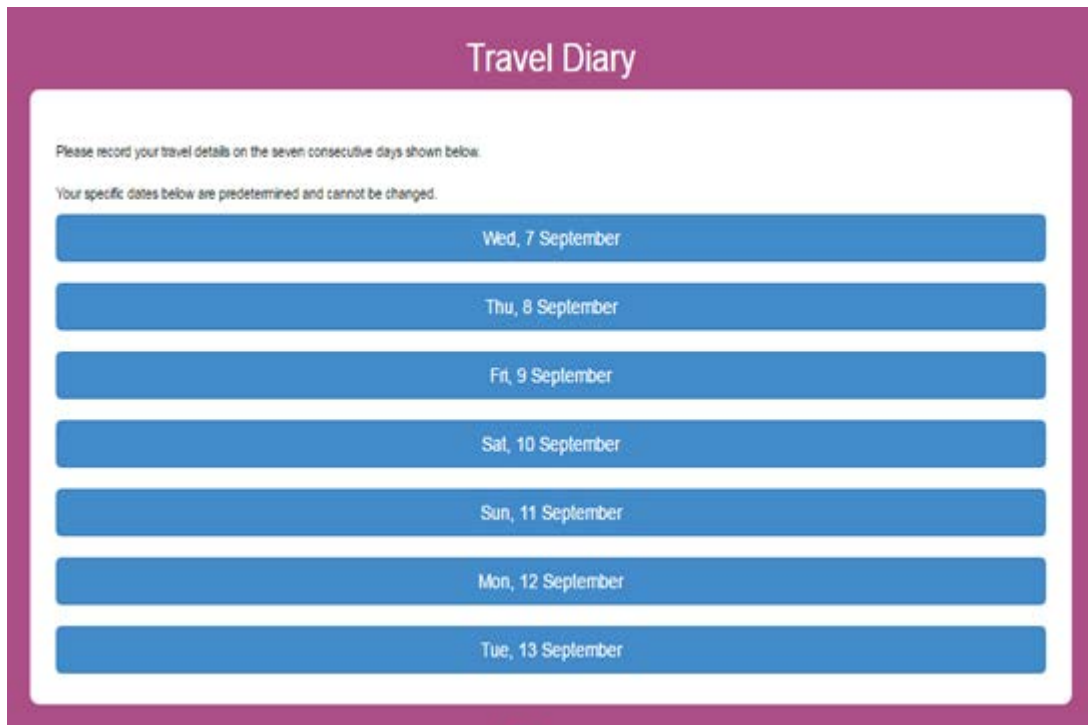
3.5 Travel week navigation menu

This section of the website asks respondents to select a date to start completing their journeys.

3.5.1 Summary of changes from round 1

- No major issues came out from the first round of testing in relation to this page.

Page layout – round 1

Page layout – round 2

3.5.2 Key findings from round 2

- All respondents understood the purpose of this page and were able to navigate from it easily to different days.
    - One respondent suggested that the text could also say that the dates should correspond to when the journeys were made, and not when they are entered, for those respondents who would fill out the diary retrospectively.
- Respondents were also happy with the fact that once a day is complete it changes colour and a tick is entered next to that day.

3.5.3 Recommendations and suggestions

- This page does not require any further changes.

3.6 Journey summary page

The testing explored whether respondents understood the instructions for adding a new journey. Following findings and recommendations from the first round of testing, a portion of the instructions text was highlighted in blue, attempting to draw respondents' attention to what they should include when recording the stages of their journey.

3.6.1 Summary of changes from round 1

- After the first round of testing we recommended including some further instructions on this page to clarify the information that would need to be recorded.

  – The information icon from the top of the page was removed.

  – There was also an attempt to make this information stand out a bit more by separating it in a coloured text box and displaying the 'tick' icon along with some instructions of what information should be recorded for each journey.

  – A summary element was included on this page following the first round of testing, which enables the respondent to review the key journey information. Once the respondent has entered at least one journey on a given day this is displayed in a summary table.

Page layout – round 1
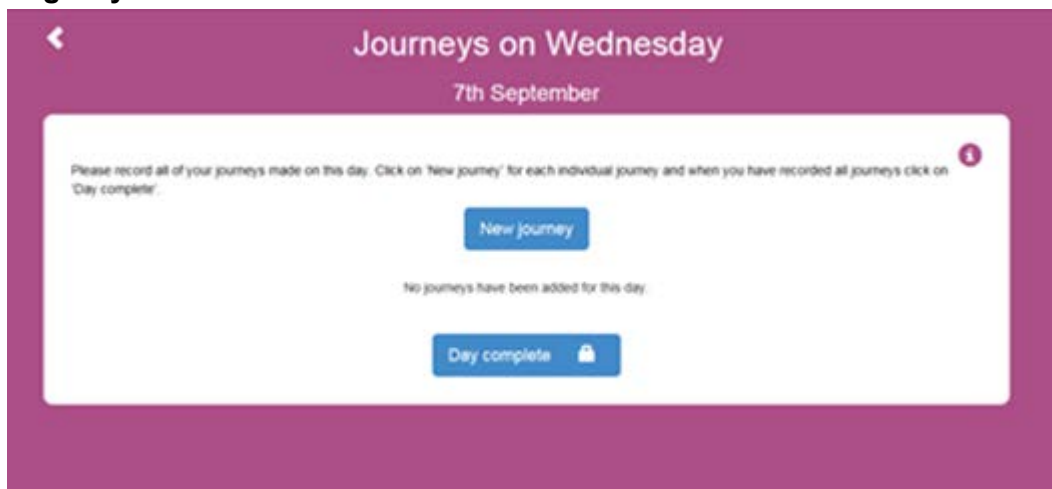
Page layout – round 2

Page layout with a table summarising journeys – round 2

3.6.2 Key findings from round 2

- Respondents had no problems with this page.
    - One respondent commented that either all the instructions in the diary should be highlighted in blue, or none. For him, the fact that only one paragraph was highlighted, but the one before and the one after was not, was confusing, this again highlights the need for a consistent colour scheme.

- The effectiveness of the summary table introduced following round one of testing was explored:

  – Overall, the page was seen as useful and respondents enjoyed seeing their journeys and stages displayed in one succinct format.

  – However, the page was only tested with some of the respondents since the two respondents who completed the diary on iPads could not see the icons for delete, edit and expand, thus the probing was limited.

- Respondents suggested some improvements to enhance its usability - these related to the display and functionality of the icons, the colour scheme and the alignment of the icons.

  – The red background colour signalled to one respondent that some of the information entered was incorrect.

  – One respondent suggested adding feedback elements related to their daily travel such as distance or time walked, amount of time spent driving etc. He thought this would be a nice bonus for the respondents when they complete a day of diary recording.

  – When probed about editing a journey or a stage, several respondents attempted to click on the particular fields in the table to edit them directly on the page. They said that this function would be very helpful and would reduce the time spent filling out the diary.

- All respondents understood how to mark that they have added all the journeys and stages for a day (clicking the 'Day complete' button), and how to navigate to another day.

  – One respondent said that this was confusing, because the lock symbol implies that once you click on it, you can no longer edit that day.

- Some respondents brought up again the possibility of introducing a way of recording the return journey by reversing the details of the outward journey and pre-populating a return journey, which they would then be prompted to edit.

- Respondents found it useful to see that the journeys and stages were displayed in chronological order on this page. One respondent wished that he could rearrange the order of the stages, which he said would be useful if he forgot a stage or made a mistake.

3.6.3 Recommendations and suggestions

We recommend changing the text on this page as follows:

INCLUDE all journeys separately, making sure to record the **outward** and **return journeys**, and all of their stages.

Changing the **mode of transport** during a journey, should be considered as a **different stage**.

When you have recorded all your journeys, click **'Day complete'**.

- The page should also be tested on various devices, platforms and browsers to ensure compliance and consistency across devices.

- The background colour of the stages should be changed to a more neutral colour and to be more in line with the current design and colour scheme of the diary.

- The table should be aligned with the instructions. Both the table and the instructions should be of the same width on the page

- A soft check should appear when the delete icon is clicked.

- The 'expand', 'edit' and 'delete' icons should be spread out further apart to avoid respondents clicking one by accident.

  – The edit icon could be removed altogether if the fields are made to be editable.

  – The expand icon should be replaced with one that is more representative for its function. Most commonly this function is represented with a plus sign. Hovering over the icon should display information about its role ('Expand' - for example, arrows could indicate expansion and contraction; or 'View' - for example, an open / closed eye could indicate view / hide the stages of each journey).

- A function to reorder the stages (preferably by drag and drop for desktop, and an equivalent for the mobile devices) should be introduced.

- When the day is marked as complete, the 'Edit' button at the bottom of the page should have the same icon for editing as on previous screens (i.e. the pencil).

- Adding feedback functions related to a day of travel could make completion of the diary more interesting and enjoyable. This could consist of some basic feedback such as when the respondent clicks on 'Day complete', a pop up box indicating some statistics relating to their journeys should display: 'Today you walked for X minutes and Y miles'; 'Today you spent Z minutes driving' etc.

  – As the respondents fill out more days, these statistics could relate to the day they had just completed, as well as the week so far.
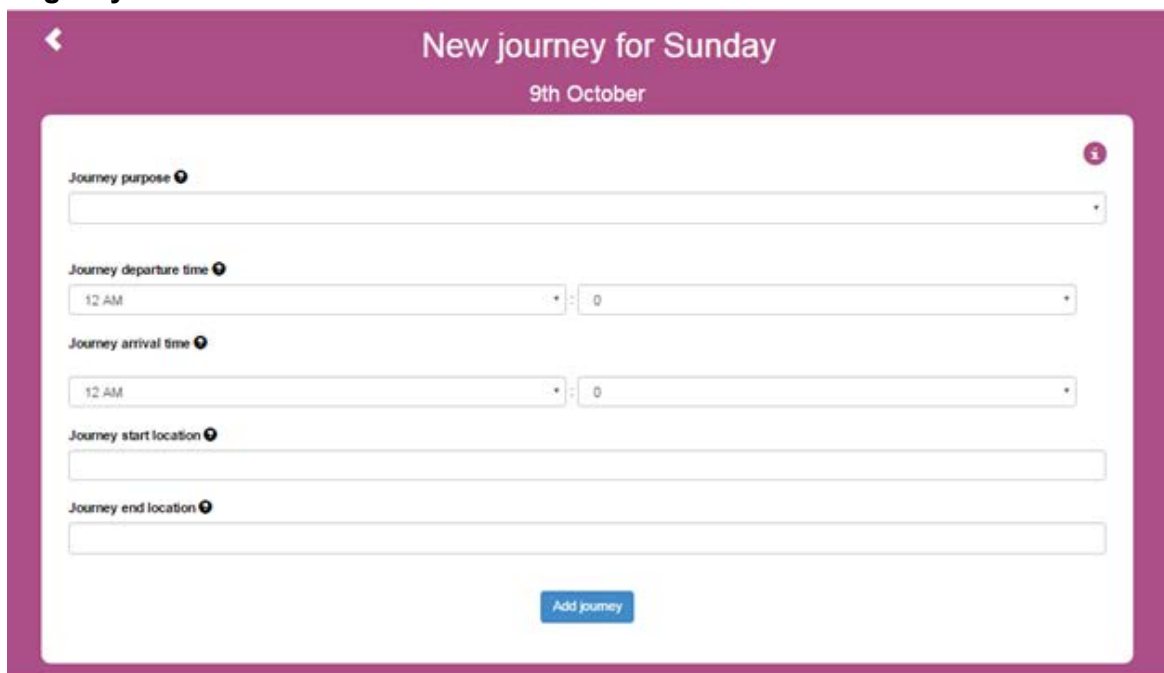
3.7 Journey page

Next we explored the ease of adding a new journey to the diary and whether respondents understood how stages of the journey should be recorded.

3.7.1 Summary of changes from round 1

- The question mark icons next to the data entry fields were replaced with i-icons next to each data entry field to avoid respondents confusing them to be question marks.

- An example of a journey and how to code it in the diary were added on the top i-icon.

- 'Taxi' was added as a method of transport in the dropdown menu and 'Underground' was changed to be 'Tube/London Underground'.

- 'Journey end location' was replaced with 'Final destination'.

- The departure and arrival time fields were changed from AM/PM format to 24-hour dropdown and the length of the fields shortened.

Page layout – round 1

Page layout – round 2

3.7.2 Key findings from round 2

Journey purpose:

- Respondents were happy with the journey purpose dropdown menu and the options that were presented to them.

- Some of them selected 'Other', as the purpose of their journey did not correspond to any in the list. They said that this was easy to do.

- One respondent suggested that the option 'going to school/college' should be changed to 'going to school/college/university'.

- Some respondents read the instructions, and one of them clicked the information button in the instructions section. He said that this is very useful, and that it should be a pop up that appears once the respondent reaches this page, so that they are forced to read this information.

  – One respondent said that the instruction text *'Please note that a journey can include multiple stages, which can be entered on the next page'* was not relevant at this stage and was confusing.

- For the respondents that were given detailed instructions and explanations of how the journeys and the stages should be recorded, this page and the following one presented no problems.

- However, the respondents that were not given detailed verbal instructions but had to rely on the ones provided on the screen, had some confusion about the terminology (whether walks should be included, whether walking to the station was a journey and how it should be recorded). Whenever a respondent was stuck or had made an error, the interviewer attempted to guide him/her to rectify the mistake without pointing out their mistake directly.

Journey departure and arrival times:

- Respondents were able to fill out the departure and arrival times easily.

- One respondent entered 02 instead of 14 for the hour. She realised her mistake when entering the arrival time and suggested that AM and PM format would be easier to use.

- Respondents were generally happy with entering the times in 5-minute intervals.

- One respondent entered an arrival time after the departure time. She only received an error message on the next page, which she found confusing. The interviewer explained her mistake and she was able to edit the information easily.

Journey start location and final destination:

- Many respondents clicked on the information buttons to check how specific they needed to be when entering the journey start location and final destination.

  - Some respondents said that they would have used a more specific location had they not checked the information provided.

  - In one instance, recording the start and end locations turned out slightly confusing as both locations were in the same area, thus she entered the same location in both fields.

  - Some respondents wanted to enter home or work as locations.

3.7.3 Recommendations and suggestions

Journey departure and arrival time

- A soft check should be added for when a respondent enters an arrival time prior to the departure time – this is a possible scenario if somebody travels at night (e.g. leaves at 23:15 arrives at 1:05), however, respondents should receive a message asking them whether this is correct on this page. The error message on the next page could then be removed.

- The departure and arrival times should be displayed in a wheel format, rather than a dropdown menu, particularly for mobile devices. A drop-down menu could still be used for the desktop version.

Figure 3.7.3. Example of two-wheel clock

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- For the desktop version, the hour and minute tabs should be narrower, as currently they occupy more than half the screen.

Journey start and end location

- We suggested earlier that some of the information could be recorded on the Registration page – the respondents could enter their home and work address, which could be auto-populated at this point (e.g. if the journey purpose is 'Going home', the final destination could be auto-populated with the word "home")

- We recommend that the respondents are advised to enter information that is more specific than just area (e.g. street, point of interest etc.), as in some cases they may be travelling within the same area.
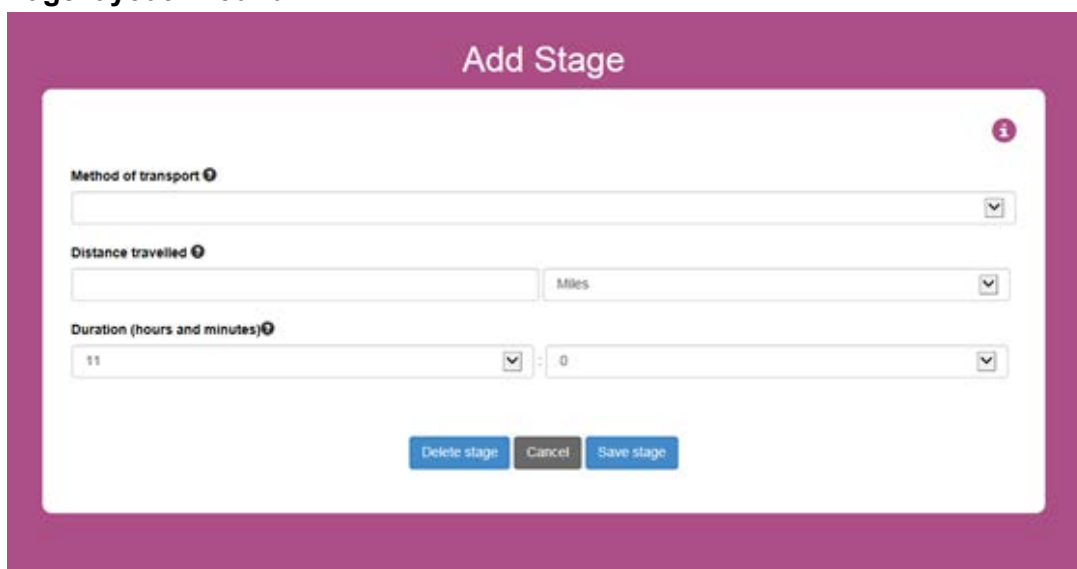
3.8 Journey stage page

The following section explored whether respondents were able to add a stage and whether they understood the difference between a journey and stage of a journey.

3.8.1 Summary of changes from round 1

- Added instructions around completion of this page and an example under the i-icon.

- Text was added for people who select walking as a mode of transport to help with approximating the distances: 'It takes the average person 20 minutes to walk 1 mile'.

- The distance travelled was found to be the easiest to record in miles, instead of miles and yards, so the 'yard' option was removed.

- The 'Delete stage' button was removed from the bottom of the page.

Page layout – round 1

Page layout – round 2

3.8.2 Key findings from round 2

Overall

- The majority of the respondents were able to fill out the first stage of the journey, although quite often the interviewer had to intervene to explain or clarify points related to the differences between journeys and stages.

    – One respondent thought that the return journey needed to be added as a stage to the journey, rather than a separate journey.

    – Another respondent wanted to add the different tube boardings as different stages of the journey – he thought he should also enter the walk within the tube station.

    – Several respondents did not include walking to the station as one of the stages, until prompted by the interviewer.

- Many respondents mentioned, without being prompted, that they would like to have a function on this page for the return journey (for example a button to click), which would then pre-populate the page with the return information. They would only then have to review it and edit some of the fields if needed.

- One respondent suggests changing the title of the page to 'Add journey stages'.

- Some respondents would have liked to be able to enter the number of the stage, i.e. whether it was the first stage of the journey, second etc. One respondent suggested that he would like to be able to edit this later, in case he forgets a stage and needs to enter it at a later point, and thus the stages would remain in chronological order.

Method of transport

- Overall, respondents had little problem when entering the modes of transport, with only few exceptions:

    – One respondent entered train as her mode of transport and later realised she should have entered tube/London underground.

    – One respondent asked whether Overground should be recorded as a train or a tube.

    – Another respondent asked whether the DLR was considered a train or should be added under 'Other'.

- One respondent said that she found it tedious to have to enter the information related to the make of her car every time she entered a car stage.

Number of boardings

- One of the information buttons which was clicked most by respondents was the one to do with the number of boardings suggesting a level of uncertainty over what should be recorded in this field. Some respondents had an idea of what this might be referring to and just wanted to check that they were right, while others said that they had no idea what was meant by 'Number of boardings'.

- After reading the information provided, most respondents were clear about what needed to be entered.

    – One respondent, however, said that it was somewhat confusing since the text mentions trains or buses, but the example refers to just changing buses.

    – One respondent said that in his view changing tubes should be recorded as two stages, as there is also a walking stage between the two tubes.

Distance travelled

- Adding the text *'It takes the average person 20 minutes to walk 1 mile'* proved to be a helpful addition as most people could then approximate how much they have travelled based on the time it took them.

    – Some respondents said that they walk faster than the average person, and calculated the distance with that in mind.

- Some of the respondents realised that they were not required to enter a distance in order to progress to the next page, and found that to be very useful; they said it would have been irritating if they were forced to write something in.

- One respondent said that he found it difficult to approximate distances on public transport. He said *"Public transport distance is not the same as distance on a map as journeys often aren't as direct as on a map"* (RC25, desktop PC)*,* so he thought that checking the distances using Google Maps would not be an option.

- Another respondent though, thought that using Google Maps to at least approximate the distance would be an acceptable option.

- Respondents were happy to enter the distance in miles.

  – One respondent said he would prefer to have to option of choosing either miles or kilometres in the form of a dropdown menu.

  – One respondent also discussed that he would prefer to enter long distances in miles and shorter ones in meters (a point that was raised during the first round of testing as well).

- One respondent attempted to put the distance as 0.25 miles, however, the text field is set to only accept one decimal, so her answer was rejected; she amended it to say 0.3 miles.

Duration (hours and minutes)

- Some respondents were initially confused about the reason they were asked to enter the departure and arrival time on the previous page, and the duration on this page - this again points to confusion around the concepts of a journey and a stage.

  – However, once they understood why they were asked for the duration of the stage, most participants had no difficulties recording it.

- One respondent said that in the duration of his bus stage he also included the time he spent waiting for the bus.

- Some respondents said that for some stages (short walks, car journeys, bike rides) they could have entered a more exact duration.

  – One respondent described how she knows that it takes her exactly 12 minutes to walk to the bus station but she rounded up to 15 minutes.

- Almost all respondents clicked on the hour dropdown list first, rather than the minute list - this happened repeatedly, even for subsequent stages they entered, indicating that the design still needs improvement.

Ticket type and cost

- It is important to note here that all respondents interviewed lived in London at the time of the interview, thus some of the findings in this section are clearly influenced by the transport options available in London.

- Some of the respondents said that they used a contactless card to pay for their journeys on public transport and were surprised not to see it included in the list.

  – Some respondents noticed that there was no option for selecting 'Other', and entered that they were using a pre-paid Oyster instead, justifying this by saying that the cost was the same; other selected 'Single' or 'Return'.

- Many of the respondents were not sure of the exact cost of their trips made using public transport.

- Some of the reasons identified were the difference between peak and off-peak charges on the tube, the Oyster cap for daily spending and the use of contactless cards for payment.

- One respondent said she used a weekly or monthly travel card, and was unsure whether to enter the cost of this card at every stage. In the end, she did record the cost of the travel card for each stage. She suggested that apart from the one day travel card, the weekly and monthly travel cards should also be included in the dropdown list.

- Out of the respondents who were unsure of the cost of their travel, some did not enter anything in the 'Ticket cost' field, others tried to estimate the cost, while others entered text such as "nil", "n/a"

- One respondent who said she used a pre-paid Oyster recorded the cost of her travel as 'Return', because she did not notice the other items from the dropdown list on her phone (RC21, iPhone) - she justified this by saying that her travel included both an outward and return journey.

- One respondent found entering the ticket type and cost quite frustrating and told the interviewer that in real-life this would have been the point in which he would have stopped filling out the diary.

3.8.3 Recommendations and suggestions

Overall

- The text displayed in the information button of the 'Duration (hours and minutes)' refers to the modes of transport. This needs to be corrected.

- The filed boxes on this page are not aligned – 'Distance' and 'Duration' should be shorter, narrower fields.

- The text and spacing should be aligned and consistent.

Method of transport

- The information box should include clarifications with regards to how respondents should code different modes of transport.

- When the respondent selects car as a mode of transport, the responded should be asked whether the car was their own or a different one; the information about the make of their own car is already collect at other points in the survey and the respondents found it tedious to add it in every time they recorded a car journey.

Number of boardings

- We suggest amending the text in the information box based on the feedback. The text could read:

"Write here the number of different trains or buses you used at each stage of your journey (e.g. if you used two separate buses enter '2'; or if you had to take three different trains, enter '3')."

Distance travelled

- Miles should be in bold as all other text on the page is bold.

- The text field should allow for 2 decimals.

- Following the first round of testing, two lines of text were added when the respondents select walking as a mode of transport:

"Please give us your best estimate.
It takes the average person 20 minutes to walk 1 mile"

  – We recommend that the text "Please give us your best estimate" is added to all modes of transport.

  – Since giving examples has proven to help respondent estimate distance, when people select bicycle as a mode of transport, text could be added to say: "It takes the average person 7 minutes to cycle 1 mile in the city".

Duration (hours and minutes)

- Similarly to the first round of testing, we recommend that the duration hours and minutes is replaced with a wheel, particularly for the mobile devices (See Figure 3.7.3 for example).

Ticket type and cost

- Because of the vast range of transport tickets that can be used in the country, it is difficult to include a representative set of tickets in the list.

  – Given the high number of errors recorded for these fields, we believe that it would be beneficial to include an 'Other (Please specify)' category for the ticket type field.

- More information about what the respondents should include in case they use travel cards should be included in the information box.

3.9 Journey summary page

This section established whether respondents are clear how they add another stage to their journey and what to do if they have completed the details for that journey.

3.9.1 Summary of changes from round 1

- A shorter and more concise, summary page was introduced in the diary after the first round of testing (See Section 3.6 for details). This page was still kept in the diary as the navigation to edit the journey would have otherwise proven too complicated.

Page layout – round 1 and 2

3.9.2 Key findings from round 2

- Respondents used this page mainly to check the journey information entered and to add additional stages or edit the ones already entered.

- Some respondents said that it was useful and rewarding to have a summary of the stages of the journey.

- Some respondents found it very confusing that the stages were displayed by mode of transport, rather than chronologically.

  – Of these respondents, some wondered whether they had entered the stages in the wrong order.

  – Others suggested that it would be useful to be able to edit the order of the stages - suggestions included adding numbers, such that they would reorder automatically, being able to drag the stages and drop them in the desired order - it was suggested that this would be useful in case the respondents forget to record an intermediary stage.

3.9.3 Recommendations and suggestions

- If the new summary page will be made editable, then this page would become redundant and we recommend it be removed. The current structure consisting of two pages which both summarise the journeys and stages is likely to confuse respondents.

3.10 Help and error screens

The following section explored whether respondents used the help screens or encountered any error messages when completing the diary and what they thought of the content of the messages.

3.10.1 Summary of changes from round 1

- The question mark icon used in some places in the diary in the first round of testing was replaced with an information icon which was placed next to each data entry field, and respondents were introduced to this at the beginning of the diary.

- Error messages should appear on the page where the error occurs.

3.10.2 Key findings from round 2

Information button

- All respondents made use of the information buttons to some extent and they were all clear what the purpose of the information icon was.

- Most of the information found was considered useful, and clarified potential confusions the respondents had, although respondents suggested that the text should clarify better was is expected of them at that stage, and be more informative. The 'Number of boardings' information button was clicked most often which helped respondents to understand what information is required (See Section 3.8.2 and 3.8.3 for details).

Error and warning messages

- One respondent saw an error message when she tried to record 0.25 miles for the distance walked at one stage. The error message said: 'You must enter a valid value' which she found confusing as she thought that the value can be recorded on two decimals.

- In some places, error and warning messages were missing - for example, when deleting a stage or a journey, there should always be a warning message asking respondents if they are sure they want to delete that stage / journey.

3.10.3   Recommendations and suggestions

Help and errors screens

- The information boxes and error messages should be checked and tested to ensure the format and colours are consistent throughout the diary, and the wording is clear and helpful.

4 Recommendations for further development

The aim of this stage of the NTS digital diary development was to develop a well-functioning prototype of the diary. The key considerations which were set out at the start of the project were that the digital diary should provide the same functionality as the paper diary, as far as possible, including:

- Details of each trip entered one at a time;
- Ability to review trips recorded and edit later (e.g. to add missing details);
- Ability to copy similar trips between days;
- Notes to aid completion of the diary (currently on the pull-out flap).

All functionalities listed above are currently part of the prototype, aside from the ability to copy similar trips between days. Whilst the current version of the diary functions well in many respects, there is still some work which will need to be carried out before the tool is ready for further larger-scale testing.

We have detailed the changes that we recommend throughout this report. Given the scope of this project, the majority of these are smaller visual changes and error corrections which should be straightforward to implement. However, there are also issues that would need more resource to implement, such as providing feedback to respondents about their journeys and adding a function which allows journeys to be marked as return so that some of the return trip information can be pre-populated. There is also a need for more bug testing on different devices, operating systems and browsers, to ensure that everything functions as intended.

Given this, we see three main options:

1) Implement the smaller changes and carry out further testing on different devices to arrive at a version of the diary that works and can then be taken forward to large scale field testing;

2) In addition to smaller changes also implement the more substantial suggestions, such as providing respondent feedback or even incorporating GPS, which could automatically capture people's trips. This would necessitate further user testing, before field testing can commence.

3) Take the learning from this development project, but instead of focusing on developing an online version of the paper diary direct the resources to the development a bespoke, digitally-optimised mobile app (for smartphones and tablets) to which the more sophisticated features can be incorporated.

Ultimately, which option to take depends on what DfT wants to achieve with a digital diary. If it is to continue to develop an online version of the paper diary to phase into use, then option 2 would be logical next step. If it wants to develop a fully digitally optimised diary to ultimately replace the paper version, then option 3 should be considered. In the light of wider

changes in the web survey world and the ever-increasing use of digital devices in our lives more generally, we favour the third option.

For a digital diary to be a viable alternative to a paper diary it needs to offer respondents something that the paper diary cannot. This may be in terms of ease of use (e.g. by incorporating GPS) or making the experience more enjoyable (e.g. by providing feedback). It also needs to be intuitive and user-friendly, as it will inevitably be judged in the context of other often sophisticated digital tools that respondents encounter. Our experience with digital diaries and that of other research organisations shows that if this is not achieved, then there is a substantial risk that respondents will continue to use the paper diary. This would mean that any cost benefits that could be achieved from using the digital diary are reduced, as the set up and management cost of two modes would outweigh the time spent on entering the paper diaries. Furthermore, any introduction of a digital diary will cause a break in the time series. If the ultimate aim is to move to a smartphone-based approach, it may be sensible to focus development on that and introduce one break in the time series rather than a few.
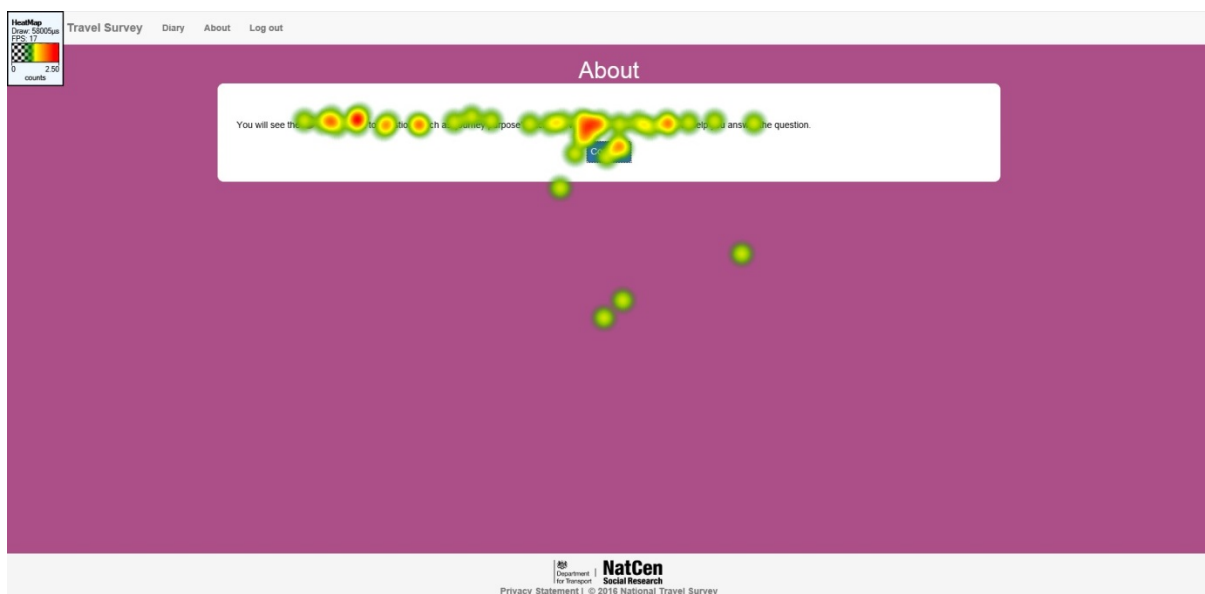
5 Appendices – Heat maps[1]

Below are examples of heat maps from the eye-tracking experiment.

Image 1.The 'About' page
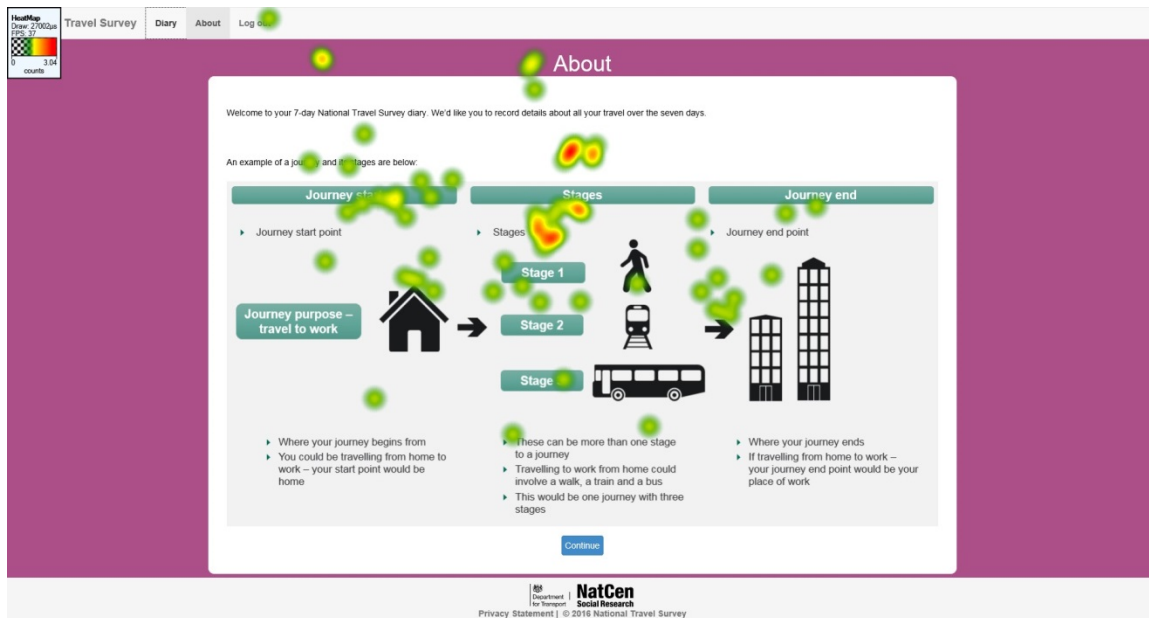
The first heat map shows where the participant's gaze stayed longer, i.e. on the images, and not so much on the text descriptions

Image 2. The second 'About' page

The participant read the instructions on the second 'About' page in detail.

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[1] The heat maps have been retrieved from the eye-tracking experiment conducted with two participants for the second round of testing of the online diary

Image 3. Journey summary page

The participant read the instructions closely, before proceeding to recording a New Journey. This heat map indicates that highlighting these instructions could draw the participants' attention to them.

Image 4. Journey Summary page – contracted and filled out
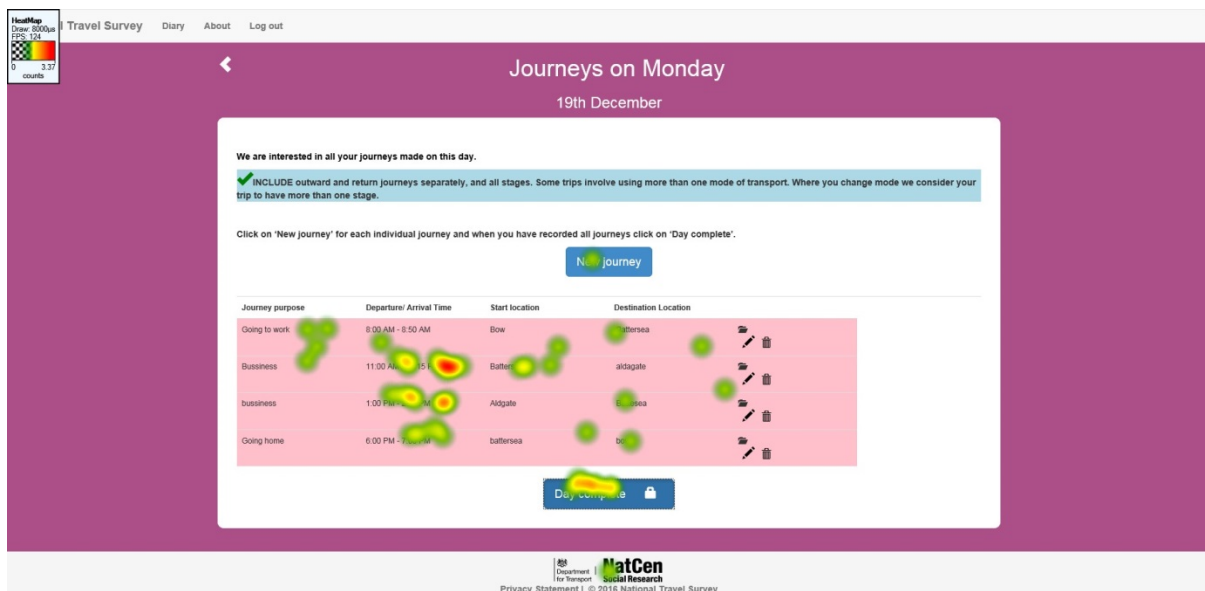
The participant reviewed their journeys using the summary page. They attempted click on the various text fields in order to edit the information, until they noticed the edit icon on the right hand side.

Image 5. Journey summary page – expanded and filled out

After filling out various journeys and stages, this participant reviewed the Summary page. The participant was puzzled about the icons being so close to each other, as indicted by the heat map.

Image 6. Old summary page
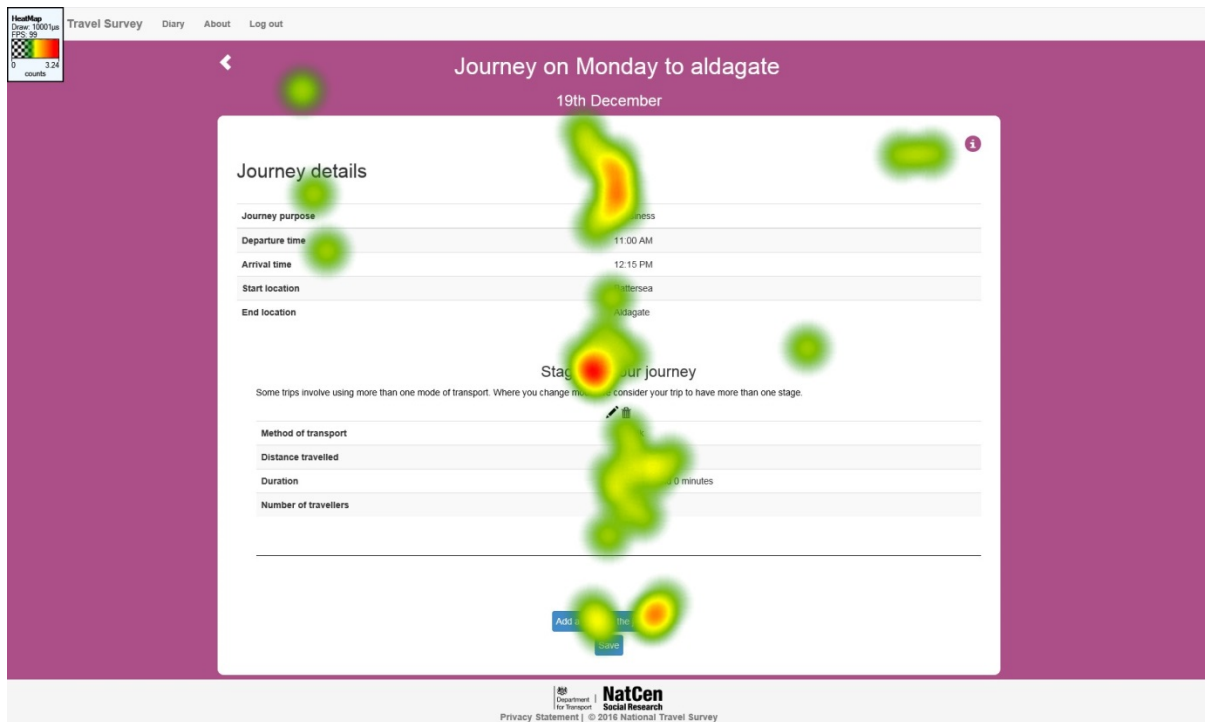
Similarly to the results of the first round of testing, on the Journey Summary page, the participant's gaze mostly fixated on the stages they had entered, and not the text fields. This led to the initial recommendation to simplify the summary page.