NTS TRAVEL DIARY DISCOVERY REPORT

DEPARTMENT FOR TRANSPORT

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1 DISCOVERY OVERVIEW

1.1 EXEC SUMMARY

The Discovery was conducted by Lagom Strategy (a digital service Discovery phase specialist agency) from **September to December 2018.**

The Discovery focussed on the **one week Travel Diary** component of the National Travel Survey (NTS).

The research activities were conducted in line with the definition and guidance of a digital service Discovery phase mandated by the Government Digital Service (GDS) Digital Service Design Manual.

All publicly funded digital services are subject to such a Discovery phase before proceeding to the next phase of technical development and design, and passing subsequent service assessments.

The Discovery has concluded with a validated, and prioritised user story backlog and a set of recommendations and experiments for the NTS Delivery Team to consider when progressing the service.

1.1.1 Key recommendation themes

The recommendations in this report are designed and balanced to:

- ➔ Help the Delivery Team seize this opportunity to better meet priority user needs
- ➔ Meet organisational goals
- ➔ Improve the technical situation
- ➔ Begin the journey to meet the GDS Service Standard

Note: all of these recommendations are explored in detail in Section 8.

Firstly, **we recommend that you proceed to an Alpha phase to begin the journey to replace the paper based diary with a digital diary.** There is sufficient user need and expected benefit of a digitised travel diary (as part of the NTS) for Diary Keepers,

Interviewers, and the NTS data users (although not technically users that interact with the Travel Diary).

However, this will be a considerable task to smoothly replace a well established paper service within a long-running, and stable data collection. Digital has the potential to bring many benefits, but also raises challenges and risks, especially for a voluntary collection that must sample across society. This report examines attitudes to a digital diary and how comfortable Diary Keepers may be with technology tracking their travel behaviour.

We believe the most appropriate option to pursue would be a bespoke browser-based form experience that Diary Keepers can manually complete across their mobile and desktop devices. This conclusion builds on previous commissioned research by the NTS Team, and is currently the best method for capturing the travel diary data (for the NTS question bank) from the widest possible user audience.

Such a digitised service would open up significant potential to improve the current user experience of Diary Keepers by reducing cognitive load, saving time, and improving recall and accuracy.

Diary Keepers that are responsible for multiple diaries could particularly benefit by relating the household diaries and sharing / tagging journeys to multiple householders.

A digitised version can also bring data validation upstream and into the actual service experience. Robustness of the NTS data is paramount and considerable effort already goes into validation downstream, so any opportunity to improve the accuracy of the data should be embraced.

There is also potential to automatically code the purpose of each journey at the point of entry. This is currently a manual step performed by the NTS delivery partner.

The diary could be extended to capture richer data about journeys such as decision making and sentiment towards individual journeys. This would help to satisfy the requirements of some data users.

A digitised diary also opens up considerable opportunity to improve the experience and efficiency of the *process critical* Interviewers. Realtime data from the diaries could be purposed to help them better support their assigned households, e.g. flagging

diaries that are not being completed. See the prototypes in the Recommendations (section 8).

The report recommendations also explore how further digital methods beyond browser-based forms could be harnessed to enhance the digital travel diary, e.g. use of mobile device GPS functionality.

We encourage further experimentation into the viability of these methods, and stress the importance of building on the firm foundations of a digital diary platform that can store and manage such data. Further methods should only be pursued where they meet validated and sufficient user need.

We do recommend you start by adopting the GOV.UK Design System and open source framework/s for the digital diary platform and front-end interfaces.

There should be a longer-term ambition to develop a digitised Travel Diary experience that is so user friendly that it requires no or minimal intervention by an Interviewer (or other NTS representative).

If this scenario is realised then a digital diary can in theory be scaled up exponentially as it is no longer constrained by the limit and cost of Interviewer resources. Importantly, a larger sample is desired by numerous data users to afford segmentation, especially at a localised level. However technology is not a silver bullet and considerable barriers will still exist for what is a *voluntary* survey.

The next steps are to assemble the necessary multi-disciplinary team (outlined in the recommendations) and to progress into an Alpha phase to develop and test proof of concepts (also outlined in the recommendations).

Please see the Recommendations section (section 8) of this report for full detail.

1.2 DISCOVERY PHASE GOALS

At the start of the Discovery we agreed on these goals with the NTS Team. They align with the GDS definition of the Discovery process, with some additional goals:

1. Understand the triggers, experience, context, behaviour and needs of your priority user roles with the current paper diary and a prospective digital diary.

2. Explore what you, wider stakeholders, and NTS data users want to achieve, where that does and does not overlap with user need, and how a digital diary could support those goals.
3. Examine the actual diary data and its life-cycle. How much is there? Where is it stored? Who can see it? Who should see it? When? How is it shared and accessed? How is it secured?
4. Understand the risk and barriers of shifting to a digitised experience, especially the impact and considerations of accessibility, and supporting assisted digital need users.
5. Develop a prioritised backlog of evidence-driven, validated user stories for a prospective digital diary (ready to develop in an Alpha).
6. Dig into the internal and external technology constraints and opportunities for a digital diary, inc. tech options, storage, security, sharing.
7. Develop user experience concepts for a digital diary to communicate direction with stakeholders and to test with users for early feedback.
8. Make clear actionable recommendations on how to proceed to an Alpha in line with the GDS Digital Service Standard so you can pass future, strict GDS Service Assessments.

1.3 THE SCOPE OF THE DISCOVERY

The **7 day Travel Diary component** of the National Travel Survey was the scope for this Discovery.

This Discovery did not focus on other potential sources of travel behaviour data.

1.4 PROJECT TEAM

1.4.1 Lagom Strategy

➔ Liam King - Lead Digital Strategist and Project Lead

➔ Dr Helen Taylor - User Researcher and Delivery Manager

➔ Stephen Hale - Stakeholder Engagement Lead

➔ Linda Young - User Researcher

➔ Chris Oates - Technical Lead

1.4.2 Department for Transport

➔ Darren Stillwell - Deputy Head of Local Transport Statistics, Statistics Travel and Safety

➔ Adam Evans - Senior Statistical Officer

1.5 DISCOVERY PHASE ACTIVITIES

The Discovery was conducted from **September to December 2018**.

These activities allowed us to generate the insights and recommendations in this report and the other Discovery outputs:

1. **Kick-off workshop** with key project stakeholders (26 September 2018)
2. Reviewed numerous online and documentary sources
3. Conducted **19 stakeholder and Data User interviews**
4. Conducted **20 one-to-one user interviews with Diary Keepers and NatCen Interviewers**
5. Ran a **user needs workshop** with a range of stakeholders and 6 end user role representatives, to generate proto-personas and use journey scenarios (24 October 2018)
6. Analysis of **2 user feedback surveys** with 123 responses
7. Analysis of **2 user needs surveys** with 174 responses (see section 3.2)
8. Observed a **National Travel Survey Interview** between an Interviewer and a Diary Keeper (15 November 2018)
9. Observed a **National Travel Survey diary mid-week checks and diary collection** between an Interviewer and three Diary Keepers (22 November 2018)

10. Analysis of an **Interviewer reasons households refuse or partially cooperate survey** with 42 responses
11. Analysis of **Diary Keepers attitudes to technology recording journeys** with 58 responses
12. Develop a **journey service map** of the current paper service
13. Created and prioritised **35 user stories** with the NTS team (16 November 2018)
14. Presented a project **show-and-tell**
15. Conducted a **technology review** (see section 6)
16. Performed a **landscape analysis including 3 interviews** (see section 7)
17. Mapped **core user journeys** for digital service (see section 8.4)
18. Assessed the **assisted digital impact**
19. Developed **concept prototypes**

1.5.1 User research participation levels

Participation levels in the user research activities were satisfactory or exceeded the level needed for a thorough Discovery process.

It is important to consider the Discovery the *start* and not the *end* of ongoing user research. Do ongoing research is one of GDS's 18 Digital Service Standard checks and critical to passing future assessments.

1.6 BACKGROUND TO THIS DISCOVERY

1.6.1 What is the NTS?

The National Travel Survey (NTS) is a household survey designed to monitor long-term trends in personal travel and to inform the development of policy. It is the primary source of data on personal travel patterns by residents of England.

The survey collects information on how, why, when and where people travel as well as factors affecting travel (e.g. car availability and driving licence holding).

The NTS covers travel by people in all age groups including children.

It is a continuous survey that began in 1988, following ad hoc surveys since the mid-1960s.

NTS Data is collected via two main methods:

1. **Interviews** - face-to-face interviews are carried out with all members of the household to collect personal and household characteristics along with information on all of the vehicles to which they have access.
2. **7 day Travel Diary** - each householder recalls details of all their journeys over a week.

The fieldwork in the 2017 survey started on 01 January 2017 and lasted until 03 March 2018.

In 2017 6,135 households participated fully in the survey (i.e. provided info via interview and completed the seven day Travel Diary). An additional 759 households participated in the interviews but did not complete a diary

The annual statistics are published on GOV.UK.

1.6.2 Focus areas for improvement

The NTS is widely respected by users of its data - see findings from the our consultation with such users (section 2.3).

However the NTS team are continuously looking at how to improve it. The brief for this Discovery project already acknowledged known or suspected shortcomings, including:

Fatigue

➔ About ~10% of households that agree to participate in the Travel Diary do not complete it (despite close support from the Interviewers)

- ➔ Fewer journeys are recorded on days 6 and 7 - the sample is designed to capture each day of the year, and later days are upweighted to account for the drop off

Data quality issues

Examples include:

- ➔ Diary Keepers forget to include return journeys
- ➔ Reliance on good recall by Diary Keepers for all their journey details over a week
- ➔ Reliance on Interviewers to quality checks diaries - this is known to diminish with more householders and closer to diary submission deadlines

Dropping response rates

Response rates used to be stable but have been in decline for the last several years.

In 2014 the national response rate was 59% and the achieved sample rate was 54%. **In two years the national response rate dropped by 6 percentage points to 53%** and the achieved sample rate also dropped by 6 percentage points to 48% in 2017.

The drop in response rates seen in the NTS is consistent with the trend seen in other Government Surveys: Declining Response Rates and Their Impact.

In the **2014** NTS, 6,900 households were defined as fully co-operating, with completed individual interviews and Travel Diaries for 16,491 household members. 539 households participated in the interview but did not complete the Travel Diaries which crudely results in an abandonment rate for the diary of 7%.

This compares to **2017**, when 6,135 households were defined as fully co-operating with completed individual interviews and Travel Diaries for 14,541 household members. 713 households participated in the interview but did not complete the Travel Diaries which crudely results in an abandonment rate for the diary of 10%.

1.6.3 Previous thinking and work around a digitised version of the NTS and Travel Diary

This Discovery builds on the good work already commissioned by the NTS Team:

Modernising the NTS report (2016)

Catapult Transport Systems performed an in-depth review of existing and new technologies and data sources that could be used to improve the NTS.

They specifically examined the potential of:

- ➔ GPS devices such as smartphones and dedicated GPS receivers
- ➔ Web-based Travel Diary survey
- ➔ Data sources such as mobile network data, social media data, and smartcards

They recommended completely **replacing the paper Travel Diary in the short to medium term with a web-based Travel Diary**. This would complement the current methods of the survey and would need to work **across a range of devices** [mobile to desktop].

They identified the **potential of GPS based devices**, but cautioned the ongoing need for 'participant interaction to correct and validate their journeys'.

They also recommended a helpline be introduced for participants to contact with survey related problems.

NTS Digital Diary prototypes (2016-17)

NatCen and Transport System Catapult collaborated to prototype an online version of the Travel Diary.

Their objective was to design a digital version that could initially replicate the collection of the data items in the current paper diary, whilst maintaining accuracy and quality of the data.

The team took a mobile first approach, meaning that the diary was designed primarily for smartphone as a responsive website, rather than an app.

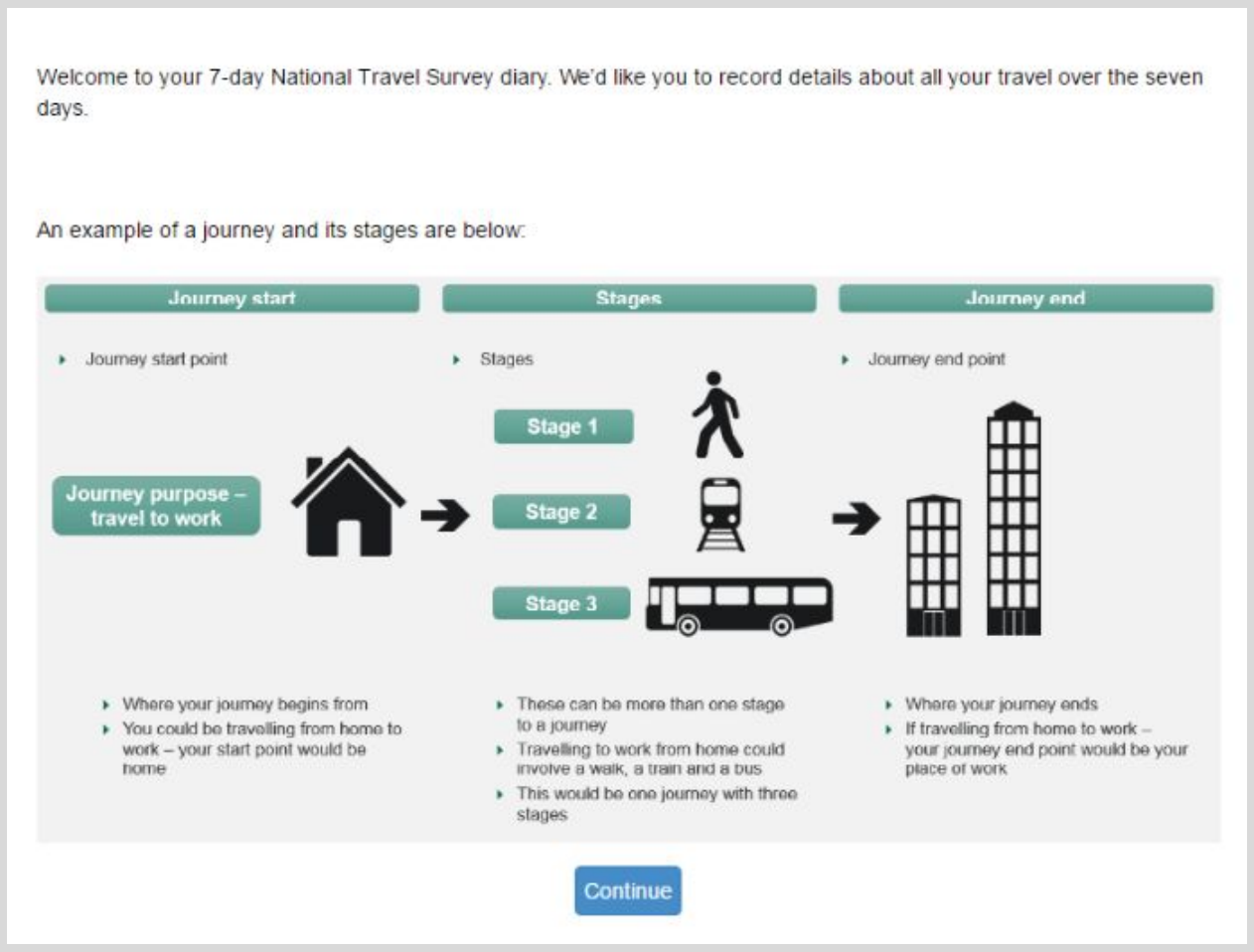


Image: example screenshot from the online diary prototype.

The prototypes were subjected to two rounds of usability testing to identify insights.

The team then recommended developing a '**bespoke, digitally-optimised mobile app** (for smartphones and tablets) to which the more sophisticated features could be incorporated'.

NTS Interactive Tool Research report (2017) [unpublished report]

Web Usability conducted user research with people that access and interrogate NTS data and statistics. They examined the feasibility of building a self-service interactive analysis tool for the NTS to meet their needs.

NTS GPS pilot (2011)

The NTS Team have previously explored the potential of GPS technology to capture journeys. GPS devices were issued to NTS participants in a pilot.

GPS was not adopted into the NTS after the pilot finished, ‘on the basis of the numerous and substantial differences between the results for the GPS pilot survey and the NTS diary data for the same period.’

GPS technology alone could did not capture several key data points, including method of transport and journey purpose. There were also concerns about the difficulties and absence of children in the data.

Review of the potential role of 'new technologies' in the National Travel Survey

An earlier research report exploring technology options for the NTS in collaboration with the University of Leeds.

2 CONSULTATION WITH STAKEHOLDERS AND DATA USERS

2.1 OVERVIEW

We conducted structured interviews with stakeholders and users of NTS data to ensure that their needs and views were understood and accounted for in the research process.

We completed 5 interviews with Data Users and 15 interviews with stakeholders (which included Data Users). Of those, 13 were employees of the Department for Transport, and 7 were external to the Department.

The interviews took place in October and November 2018.

Stakeholders and data users have quite different perspectives on the NTS, often based on their proximity to the process, or their particular needs from the data. However, although the ways in which they describe them varies, it is notable that there are **no significant differences** in the sets of issues raised by stakeholders and data users.

Most stakeholders and data users place a very high value on the current NTS, but welcome the opportunity to consider the opportunities and challenges of possible digital solutions for the Travel Diary.

2.2 KEY FINDINGS FROM NTS STAKEHOLDERS & DATA USERS

2.2.1 The high value of the NTS

Without exception, stakeholders mentioned the high value placed on NTS data:

> “NTS data is agreed as fact.”

> “It is the gold standard.”

> “[the NTS] is the crown jewels.”

NTS data gathered through the Travel Diary provides a unique combination of journey and demographic data on a national level that is not available from any other current source.

2.2.2 A demand for locally valid evidence from NTS data

Stakeholders recognise that the current sample size places limits on the value of NTS data. In particular, it limits the ability to provide the local insights that some transport policy makers and others data users seek.

Stakeholders recognise that it would require a huge increase in the sample size to provide the locally valid data that some users want, which would not be practically or financially possible without changing the method of collection.

> “Road safety is a local issue”

> “A lot of the work policy people want us to do it look at the impact of local interventions”

> “The sample size is ok for national trends but it’s too small for more detailed information. To overcome that we aggregate years.”

> “It would be good to go down to a local authority level - that’s probably not possible without a much bigger budget because of the sample size.”

2.2.3 A desire for increased accuracy in the data

Those responsible for the NTS acknowledge that the diary relies on estimates of distance and time, and is subject to recall bias and respondent fatigue.

Stakeholders mention concerns about the under reporting of walking in the diary, even given recent changes to account for this.

Some are concerned that the format of the paper diary is not well suited to recording chains of journeys, which may contribute to some under reporting.

Stakeholders describe the important role that Interviewers and coders play in improving accuracy of diary entries, but they recognised that this still may not provide the level of accuracy that some users want and need.

> “There are some things that we can’t explain. For example: for cycling, some organisations will tell you that the amount of cycling is going up year on year, but the NTS tells you that that the number of trips is a completely stable series.”

2.2.4 The value of an unbroken time series

There is not consensus about the value of the time series.

Some regard the time series as the single most important element of the NTS, and consider it essential to retain the current methodological approach in order to maintain it.

Others think the value of the time series may be diminishing, and would be happy to make more radical changes to the survey (that may break the time series) in order to achieve more accuracy in the data.

> “The time series is more interesting to us than the actual distance.”

> “I would definitely break the time series to achieve more accuracy. It’s much better to have improved data quality, rather than continuous time series.”

2.2.5 Validation and the correction of errors

Stakeholders describe common mistakes in the paper diaries, that require correction by the Interviewer or the Remote Coders.

Note: we do not have data on the extent of this, but it is feasible from our understanding of the challenge for Interviewers to review and of validate several diaries at pick-ups.

Stakeholders have faith in the rigour of the validation carried out by Interviewers and coders, but they acknowledge that there may be more efficient ways to validate diary entries.

> “The most common mistake people make is not including a return journey. There are some errors that are specific to paper diaries - recall error is one. It can be quite difficult to remember all elements of travel in retrospect.”

2.2.6 The efficiency of the Travel Diary process

Most stakeholders report that the paper diary places a significant burden on the Diary Keeper, and that this may have an impact on the quality of the data.

Some stakeholders also describe the burden a paper diary creates for data entry and coding, and the lag this creates in the production of the data.

> “A paper survey means it can be difficult and burdensome for respondents to fill out. There is also extra work for NatCen, because all the responses on paper needs to be put into a database somehow, so they have to employ a team of coders to do that.”

2.2.7 Limits to the flexibility of the NTS

Some stakeholders express a desire for more flexible digital solution that might enable a more targeted approach.

> “With a digital diary it may be possible to do things like a sample boost for local authorities.”

2.2.8 The relative benefits of technology options

There is a strong desire amongst stakeholders for technology solutions to remove some of the current burden by automating parts of the diary process.

Stakeholders also mention other potential benefits of digital solutions, including the ability to provide feedback to Diary Keepers which may provide motivation to participate.

Some defended the practical value of a paper survey.

> “There are strong views on research methods in the department, but we need to be moving to digital. It’s the right direction.”

> “It’s an unusually burdensome survey.”

> “A smartphone solution might have the advantage of accuracy of data, for timing or distances, or for practical things like handwriting.”

> “[I’d like to see] the functionality for someone not to have to manually enter their travel information. But a mechanism to enrich that travel information with questions about why they were travelling, who they were travelling with etc, in as light a touch a way as possible.”

> “There are many good reasons for using paper, because it’s the most inclusive form of survey. We don’t need to worry about whether people have a smartphone, or internet access, or whether they’ve left their GPS tracker at home.”

2.2.9 The inclusivity of possible digital solutions

Several stakeholders express concerns about the inclusivity of a technology options, particularly in the context of departmental priorities around inclusive travel.

Others regarded digital options as being potentially more inclusive than paper diaries, and several expressed a view that inclusive digital options are achievable.

> “You might need to do some work with people who face accessibility challenges.”

> “It should be as inclusive as possible, but you should be mindful of the fact that everyone will be doing more online in the future, and the idea of filling in a paper diary will be an alien concept.”

> “For someone who is blind, technology can really enhance their lives, and so digital methods might be more inclusive than paper.

2.2.10 Privacy and confidentiality concerns

Most stakeholders expressed some concern about the privacy and confidentiality implications of digital solutions, including potential resistance to any solution that could be regarded as Government tracking people's movements.

Some stakeholders describe the care currently taken to ensure that the paper diaries avoid these privacy and confidentiality concerns.

> "The more rich travel data we're getting, we need to be really clear to users about what we're doing with the data, how it's secure, how it's anonymised."

2.2.11 Possible solutions

Some stakeholders described possible solutions, including possible mobile or GPS options. Some described hybrid solutions, combining the best of the current Interviewer-led process, and a digital solution with a much larger sample size.

> "I could imagine a 2 tier NTS: Tier one with the Interviewer turning up at the door etc, and tier 2 a letter and whatever the digital solution is."

2.3 KEY FINDINGS FROM DATA USERS

2.3.1 The NTS is highly valued

The NTS is highly valued by the users of the data interviewed, providing trusted, comprehensive coverage that data users cannot get from other sources.

> "It's world leading in terms of national travel surveys, in terms of coverage of topics, the fact it's done every year, and the fact it does 7 day travel diaries."

Previous research with data users identified the following diary data points as most valuable in their work:

- ➔ Journey purpose, in particular travel to and from work
- ➔ School, and shopping
- ➔ Mode share
- ➔ Origin and destination
- ➔ Trip rates
- ➔ Distance travelled
- ➔ Time spent travelling
- ➔ Walking and cycling (sustainable travel)

2.3.2 The value of the time series

Some of the data users interviewed use the trends in the data to predict and model changes in transport. They regard the time series as essential to the value of NTS data, and express concern about any changes that might impact this.

Others favour improved accuracy in the data over maintaining the time series.

> “Some of our investments might happen for 20 years, and might last 60 years, so we need to make a forecast, and the only way to make predictions into the future is to look at what’s happened in the past.”

> “If it was a choice between the time series and postcode level accuracy, I’d want the accuracy.”

2.3.3 Inaccuracies in the data

All of the data users interviewed acknowledge that the current paper travel diaries can lead to inaccuracies in the data.

Some argue that the format of the diaries means some types of journey, including more complex journeys, are unlikely to be recorded. Others argue that the benefits retaining a paper diary outweigh these disadvantages.

> “We’re interested in complex trips, where several purposes and trips are combined. Understanding this is a gap for us at the moment. We think that a lot of people are doing trip chains, but they’re not necessarily measured, because NTS data records start and finish of a trip.”

> “People may look back in 10 years time, and wonder why we didn’t change to digital diaries now to get more reliability and accuracy in the data.”

> “It might be worth accepting some of these inaccuracies in favour of keeping the continuity in the time series.”

> “Careful design will prompt respondents for the correct answer or identify responses that are illogical etc and therefore can replace some elements of the Interviewer’s guidance.”

2.3.4 The benefits of a larger sample size

Some of those interviewed express a strong desire for data that would have more practical value to those working in local transport.

Some favour a larger sample so that the NTS can provide more insight about particular categories of people.

> “We can say how many people go shopping by car, but we can’t say how many people go shopping by car in Dudley.”

> “The NTS really struggles to give us any information about the travel patterns or experiences for the 25% of the population who have some form of disability. With the NTS we struggle to get to that level of

information - for cycling, or BME, or disability or other categories of people."

2.3.5 The publishing cycle

Some of the data users interviewed suggest that changes to the way data is published might give the data more practical value, suggesting self service options, or changes to the annual cycle.

> "What it lacks is an online portal, that I could use to self serve more easily."

> "If you want to know whether a set of circumstances has led to a change in travel patterns, the NTS won't help you, because they will be smoothed out over time. "

2.3.6 The importance of inclusivity and a representative sample

There is consensus about the need to retain a representative sample if introducing digital methods.

Some express concern about this, while others are more confident that inclusive digital methods are possible.

> "The methodological issue will be that we need to include every member of society, and the thing about the paper diary is it is inclusive. But I don't think that this would be that difficult to solve for a digital service."

2.3.7 Opportunities for a more efficient diary process

Some of those interviewed see opportunities for greater efficiency by using more digital methods. Some suggest particular advantages of automating more of the validation of diary entries.

> “The NTS is a very praiseworthy exercise, and it’s important to maintain it. But with modern technologies it should be possible to get more data at a smaller cost.”

> “You still need to do validation with any digital solution. But you might do it by exception, rather than systematically face to face.”

2.3.8 Additional data needs

When considering possible digital solutions, some data users express a need for additional data that they do not currently get from the NTS, including richer qualitative data about factors driving decisions to use particular modes of transport.

> “We’re interested in what drives decision making in travel - structural factors, and psychological factors. So having more prompts or questions that gave us more data on that would be really useful to have.”

> “I’d like to see how people actually move, rather than their reported movements.”

2.3.9 Possible solutions

The data users interviewed describe digital methods that might introduce new possibilities for the NTS, including: larger sample, more automated validation, additional questions, possible longitudinal data.

Some suggest that it might be possible to retain the current methods alongside new digital approaches.

> “The ideal scenario would be to maintain the current method, and introduce new methods alongside it.”

> “There would be a lot to be said for trying to track the same individuals over time, which would be much more feasible with online or remote monitoring.”

> “I could imagine a digital version producing an aide-memoire - ‘You made these journeys, now tell us more about them’.”

> “We’re interested in what drives decision making in travel - structural factors, and psychological factors. So having more prompts or questions that gave us more data on that would be really useful to have.”

3 USER RESEARCH

3.1 METHOD

Our researchers consulted with a range of Travel Diary users during the Discovery to explore their context, needs, emotions, and behaviours.

3.1.1 Qualitative research

- ➔ 20 one-to-one interviews with Travel Diary user representatives (Diary Keepers and NatCen Interviewers)
- ➔ Six user participants in a user needs workshops
- ➔ Observed an NTS interview, mid-week checks and diary pick up
- ➔ Reviewed open text comments in the six online surveys

3.1.2 Quantitative research

- ➔ 123 respondents to the user feedback surveys
- ➔ 174 respondents to the online user needs surveys
- ➔ 100 respondents to the further follow up surveys about barriers to diary uptake and completion, and attitudes towards technology recording journeys
- ➔ Reviewed published and unpublished NTS statistics

Note: due to budget and time restraints, all surveys were online surveys in which links were sent to email addresses. It is appreciated that this brings in a bias toward users with a higher level of digital literacy. This was considered when interpreting the results and balanced by interviewing users with lower digital literacy.

3.2 KEY FINDINGS FROM THE USER RESEARCH

3.2.1 Who are the (prospective) users of the Travel Diary?

In the Discovery kick-off meeting we identified Diary Keepers and Interviewers as the primary prospective users of a digital Travel Diary.

Diary Keepers are householders that are selected at random by their postcode and as such can include any segment of the UK population. This can include families, sole occupants and individuals living together in a shared house.

Diary Keepers can be:

- ➔ Individuals that complete the Travel Diary on behalf of another (children are included in the NTS but are not expected to fill in their diary independently)
- ➔ Householders that have not taken part in the NTS in recent years

Interviewers:

- ➔ Around 250 of them around the country
- ➔ All work for NatCen on a freelance basis

Important: in this context we consider users to be roles who do or could directly interact with the Travel Diary. The users of the actual NTS data and statistics (e.g. policy makers) are not considered to be *end users* of the Travel Diary. The needs of such data users are explored in section 2.3.

3.2.2 Interviewers are both the major enabling and limiting factor in the Travel Diary experience

Interviewers are key in the Travel Diary experience and enable participants to complete the Travel Diary.

Acting as administrators

Interviewers carry out a range of administration tasks and frequently work unsociable hours.

> “I’m not a full Interviewer, I only take on projects when I know I can make the slots.”

> “You know you need extra time for interviews, ringing them back, and going back to collect the diaries.”

A personalised, one to one service

Interviewers support Diary Keepers throughout their diary week. Some Interviewers even complete the Travel Diary with or on behalf of the Diary Keeper.

> “I fill in the front and some details on each page to make it easier for participants.”

> “If they [Diary Keepers] don’t know what they’re doing or if they’re struggling, I’ll ask them to write it on a piece of paper and we can do it together.”

Encouraging Diary Keepers

Interviewers will do all they can to support and encourage Diary Keepers.

> “I’ve had to go round every night and sit with them to do the Travel Diary.”

> “I like to have something to give them, like a box of jellies or something if I think I'm going to lose them. Sometimes it needs to be something more thoughtful, the other day I got a pot plant for a lady from Asda.”

Travelling and unproductive doorstep calls

Interviewers spend a large proportion of their time travelling and carrying out unproductive doorstep calls.

> “Getting the interview is the problem and you need the face-to-face contact.”

> “It’s very disheartening when chasing travel diaries and then you come to a point when you have to give up.”

> “Some [diaries] have not been completed when I call back.”

Checking completed diaries

Some Interviewers said that explaining the Travel Diary and checking through diaries is one of the most time consuming aspects of their role.

> “Explaining the first day and showing a practice day takes a lot of time.”

> “Checking them afterwards and finding most have made mistakes and having to go through them in detail to make sure they are correct.”

3.2.3 Diary Keepers exhibit a range of diary keeping behaviours

There are various methods and approaches that Diary Keepers adopt to complete their diaries.

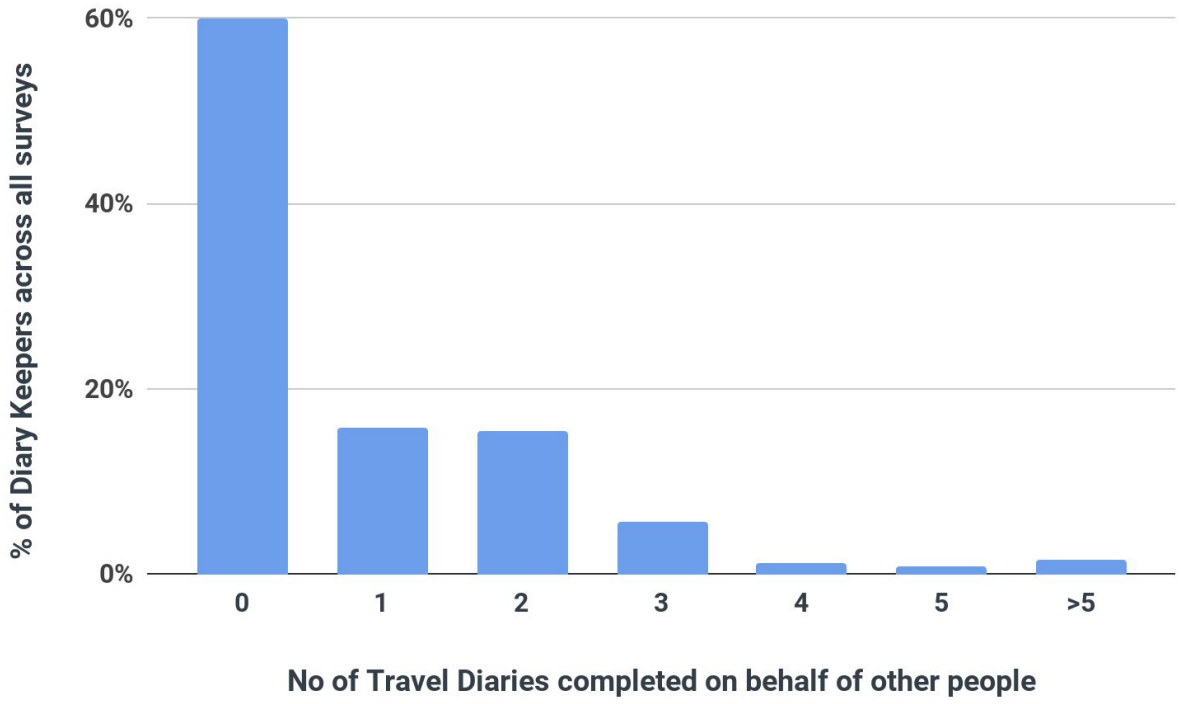
The Travel Diary is completed by proxy

A common behaviour is to complete the Travel Diary by proxy.

> “There were 8 booklets in one family and the 13 year old daughter did them all.”

> “It was time consuming completing it for all family members.”

Survey responses from previous Diary Keepers showed that 40% completed the Travel Diary for others.



Source: Diary Keepers User Feedback Survey , Diary Keepers User Needs Survey and Diary Keepers Attitudes to Technology Recording Journeys Survey (n=267)

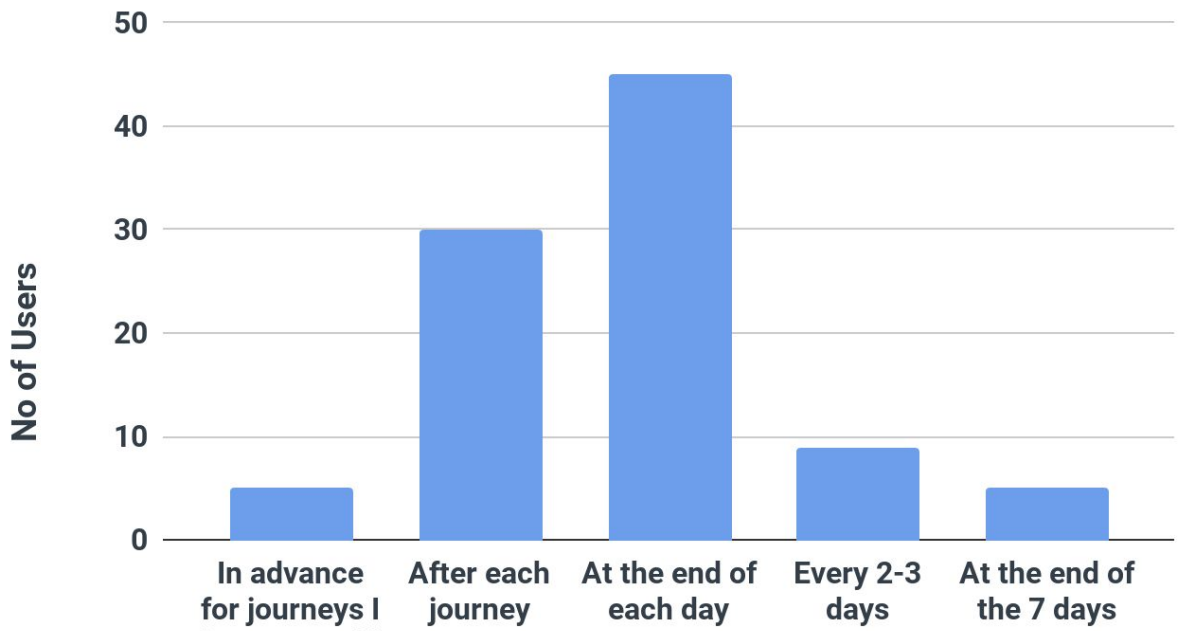
Out of those participants that completed the Travel Diary for others, **80% completed for a child/children** and **42% completed for another adult/s**.

Filling in the Travel Diary at different times of the travel week

Another diary keeping behaviour identified was for Diary Keepers to complete the diary at different times during their travel week, for example, before, during or after the journey has taken place.

> “I filled in the diary with journeys I knew I was going to do and added the times in afterwards … that made it a bit easier.” I sat down last thing every evening before going to bed [to complete the diary], whilst it was still fresh in my mind.”

The graph below shows the range of behaviours for completing the diary. Most users complete the diary at the end of each day and a lesser number after each journey.



Source: Diary Keepers User Feedback Survey (n=89)

The survey highlighted less common, but still significant behaviours of completing the Travel Diary before the journey has taken place, 2 - 3 days after the journey and sometimes 7 days after the journey has taken place.

3.2.4 Diary Keepers are motivated by the relationship with the Interviewer and their own social responsibility

Some Diary Keepers are motivated to populate and complete the Travel Diary because of the relationship that has been established with the Interviewer.

> “It’s about having a rapport with them [Diary Keepers].” - Interviewer

> “If it wasn’t for me, they would have thrown it away.” - Interviewer

A case study of the Interviewer and Diary Keeper relationship

We observed an Interviewer on the doorstep of a Diary Keeper, ready to collect the household’s diaries. The household was a family of four, with two children (under 10 years).

The principle householder was the mother who was completing the diaries for her two children. The principle householder explained that their house was being renovated and “it’s been chaos” so she could not complete the diaries. She said: “I still have a day and a half [unpopulated] to complete.”

The Interviewer explained to the Diary Keeper that it's "better to do it sooner so best to do them as soon as possible while it's [the journeys] are still fresh in your mind."

The principle householder then asked the Interviewer if she could have a day to complete these and that she would "definitely have them ready."

The Interviewer and principle householder arranged another meeting in a few days time to collect the diaries.

The relationship between the Interviewer and Diary Keeper was revealing: the Diary Keeper was apologetic and concerned that she had not completed the diaries and the Interviewer supportive and friendly in response.

The Interviewer was disappointed at not being able to collect the diaries but was accepting and understanding of the situation, saying that this happens "a lot" and that "people can put you off for ages" or they say, "I forgot you were coming."

Also motivated by social responsibility

Some Diary Keepers say they take part in the NTS and complete the Travel Diary out of a social responsibility.

> "I did it to help make things better for children in the future."

> "Well I hope that it will help them understand the traffic we experience on the roads, the roadworks that delay journeys. To be honest I don't know if it did achieve something."

3.2.5 Diary Keepers are potentially over confident in the accuracy of their journeys

Diary Keepers believe they had a high level of accuracy in recording their journey distances.

Of the 89 Diary Keepers who completed the survey of a scale of 0-100 (0 not accurate -

100 accurate), they scored an **average of 82** for both time accuracy and distance accuracy.

Interestingly, when asked 'how did you estimate your journey distances and journey times' some Diary Keepers explained their confident estimating.

> "I'm fairly meticulous about things by nature and on the basis that it takes 20 minutes to walk a mile, I worked it out accordingly."

> "I've got a good idea of what distance journeys are and kinda keep an eye on mileage."

Using technology to assist with estimating distances

The most common behaviour by Diary Keepers was to use technology and /or digital tools to assist them in completing the diary, most often a vehicle milometer, clock and online mapping tools.

Diary keepers were confident in their estimates whatever method or tool was used. One Diary Keeper said that he and his wife estimated the distance for the bus journey, but didn't check the distance on a map since:

> "We have been driving that route for 19 years."

A relaxed approach to accuracy

A lesser number of Diary Keepers are more relaxed about the accuracy, either completing every few days or as one Diary Keeper who completed the diary every couple of days said:

> “The fact is my memory is so good, if I was a couple of miles out or the time a bit wrong no one was going to die from it.”

Another Diary Keeper said:

> “I took a complete stab in the dark.”

3.2.6 It’s not a straightforward story about burden

We asked Diary Keepers: ‘How much of a burden was it to complete the Travel Diary?’ (0 being not burdensome and 100 being very burdensome).

The average score was **32**, which **indicates a lower level of burden**.

This corresponds to what we heard in our interviews with Diary Keepers:

> “It was a bit daunting at the start to put the right things into the right boxes. It got a lot easier and quicker as the week progressed.”

> “The actual survey was pretty self explanatory and not difficult to complete.”

The lack of logic and inbuilt validation in the paper version is leading to mistakes and wasted time. One Diary Keeper didn’t realise he had spent 3 days filling in the Day 1 pages until he turned to the Day 2 page (on the fourth day of his diary keeping) - he had to copy out days 2 and 3 onto the proper pages.

Interestingly, 75% of those surveyed in the online Diary Keepers user feedback survey (n=89) said they would **probably or definitely do the Travel Diary again**.

This response further indicates a **low level of burden** to keep the Travel Diary.

Interviewers mention recurring themes around the burden of the Travel Diary:

Theme #1: Confusion, loss of motivation, forgetting

> “People get confused with the 3 pages for the first day, and sometimes put day 2 on the second page. Not everyone needs a halfway visit. The main problem can be the delay between the interview and the start date of the diary.”

> “It's frustrating spending so much time trying to explain how the diary works. It's not easy to follow.”

Theme #2: Too complicated for ability level

> “It’s too complicated to do for some over a period of 7 days.”

> “Some people still manage to do them very well, but the majority, where I work [a deprived urban area] will need assistance in one way or another and this takes up a lot of time.”

Theme #3: Too time consuming / time commitment

> “In my years of experience as an Interviewer 20 years plus; I see people have less and less time with more and more things to do!”

> “It's a big ask to ask someone to keep a diary, especially for kids as well, after they have already completed a lengthy questionnaire, especially if a large family and with multiple vehicles.”

The burden is falling on the Interviewers

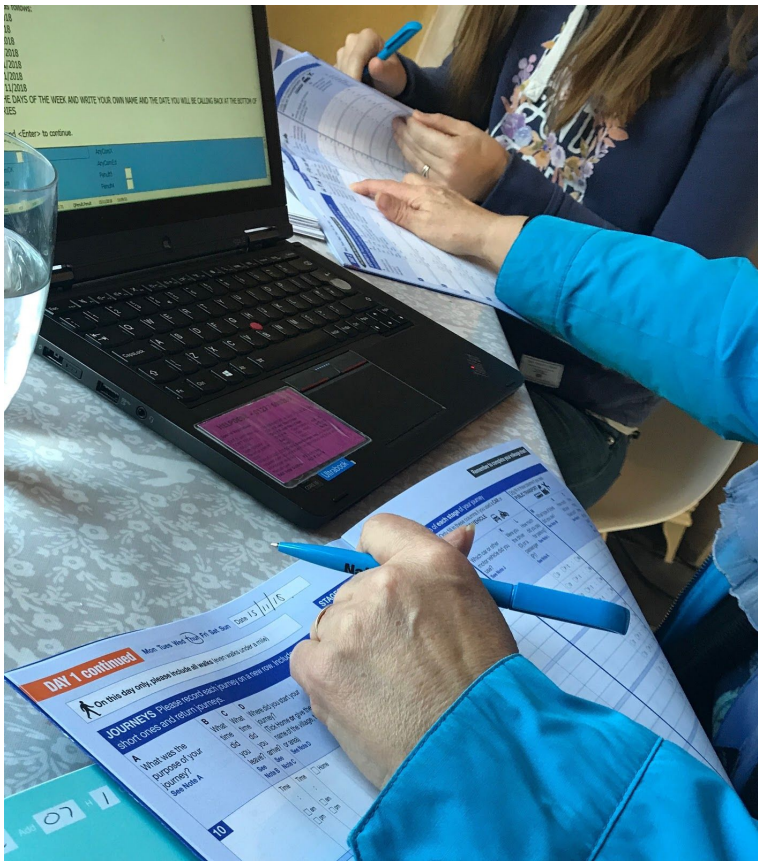
Interviewers are shouldering the responsibility for the following reasons:

- ➔ Offering a personalised, one to one service
- ➔ Assisting and completing diaries
- ➔ Flexing around Diary Keepers
- ➔ Working anti-social hours

Interviewers refrain from mentioning the Travel Diary until they have carried out the interview. Some households refuse to complete it because it was not mentioned before the interview begins.

Nor is keeping a week's Travel Diary explicitly mentioned in the advanced letter to sampled households or the pamphlet.

The photograph below is an example of the burden that an Interviewer experiences when introducing the Travel Diary.



The Interviewer explains the Travel Diary to the Diary Keeper, whilst using the Blaise software of the laptop to write start date and details, as well as modifying the Travel Diary to make it easier for the Diary Keeper to populate.

The Interviewer was aware of the time constraints of the Diary Keeper, who had asked if the pick up interview would take a similar amount of time.

> “Will that be the same amount of time as today? Only we’ve been here an hour and 20 already.”

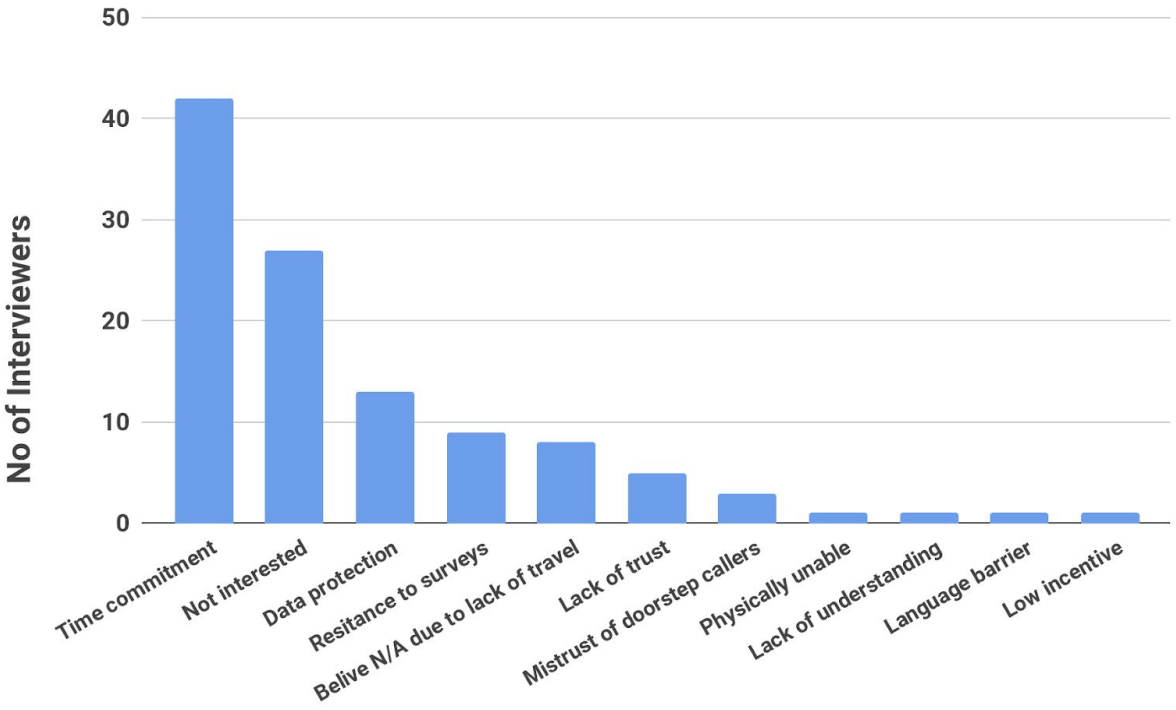
There was evidence in body language and tone of voice of frustration by the participant. The principle householder worked at home and had a family with two young children, so working time was limited.

3.2.7 Households refuse or partially complete the Travel diary because of other commitments on their time

We surveyed Interviewers to better understand the reasons why Diary Keepers:

1. Refuse to take part in the NTS
2. Take part in the interviews, but refuse to take part in the Travel Diary
3. Fail to complete the diary (after agreeing to do it)

Why do people refuse to take part in the NTS?



Source: Interviewers Reasons Households Refuse or Partially Cooperate (n=42)

Time commitment needed to take part in the NTS is the most common reason heard by Interviewers for refusing to take part in the NTS, either they are too busy and/or perceive the diary will take up too much of their time.

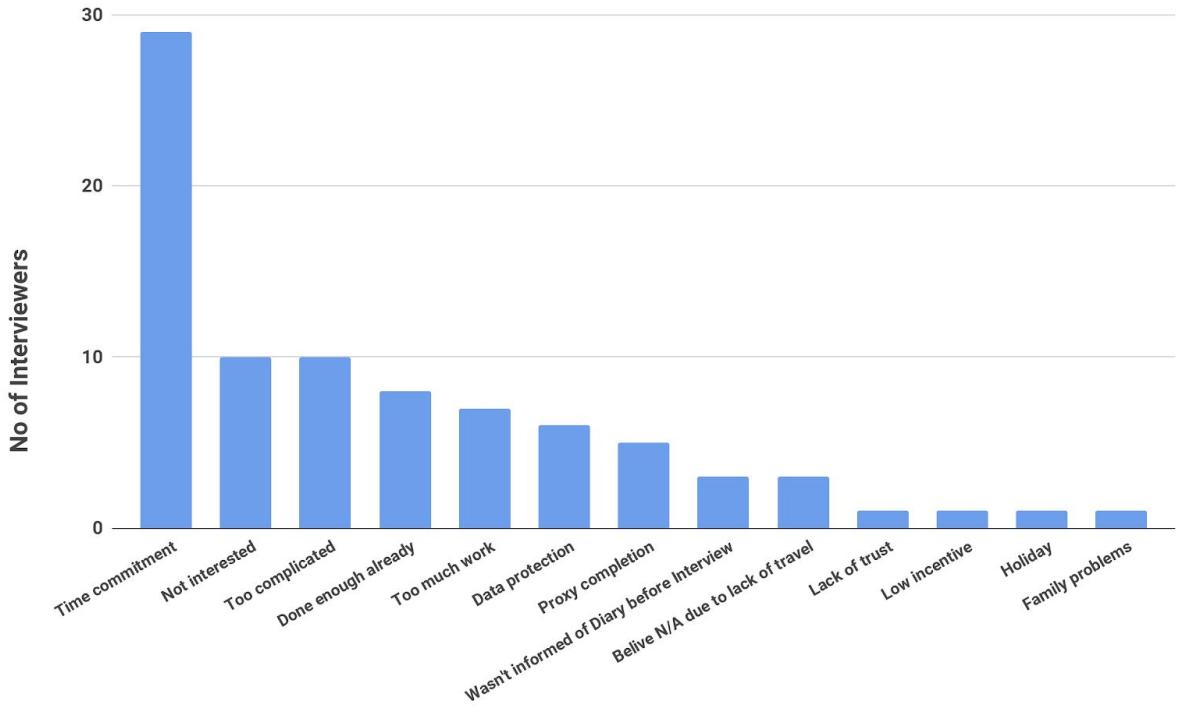
Interviewers say that households are not interested in taking part in the NTS because they are "not interested" and "can't be bothered."

There is some concern over **data protection** and what will happen with data they provide, "I don't give anyone any personal information." Perhaps linked to this concern over privacy is other feedback that Interviewers hear from households about a resistance to surveys and that they: "don't do surveys."

> "As an Interviewer you just have to stress that all info is confidential and that they diaries give very useful info that can't be got any other way."

Some Interviewers say that households have a mistrust of doorstep callers and that some households, particularly the elderly, won't open the door when it's dark.

Why do people refuse to take part in the Travel Diary?



Source: Interviewers Reasons Households Refuse or Partially Cooperate (n=42)

The most common explanation for partial cooperation by households is due to a **lack of time**. This number is a significant increase from households that **refused** to take part due to time commitments.

> "People are busy, and a proper completion of a diary requires time and concentration. Many people simply do not bother."

Interviewers say that households feel that the Travel Diary is "too complicated", "they've done enough already" and it's "too much work".

> “Elderly people seem to find the diary very complex, so I may have to fill it in for them on the follow-up interview, and one lady.”

Some Interviewers say that householders are not completing the Travel Diary because they have not been informed of the diary before the interview. Other Diary Keepers believe the Travel Diary isn’t relevant to them because they “don’t travel.”

> “Most people will complete the diary if they start it. The bigger problem is getting every household member to do it in large households.”

> “My experience with Travel Survey is that collecting diaries for all household members is too onerous for the participants in busy family households - or people don't really want to do it. They feel that they have given enough time to the study by taking part in the interview.”

Some Interviewers say that “it never happens” or that it is “very rare” for a participant to take part in the interview and refuse the diary.

> “I always try my best to persuade [Diary Keepers] whatever the reasons for refusal. I don’t very often get a refusal for diaries once I’ve done the interview.”

Why do people fail to complete the Travel Diary?

The most common reason given is due to the **time commitment** needed to complete the Travel Diary.

The second reason, a similar response to the two previous survey questions, is because households are **not interested**.

Just under half of Interviewers say that households fail to complete the diary due to an **unexpected emergency event** and/or their “personal circumstances suddenly change.”

> “It’s a rare event - usually a family crisis has happened.”

Some Interviewers say households fail to complete because they ‘forgot’ or family members refuse to complete their Travel Diary.

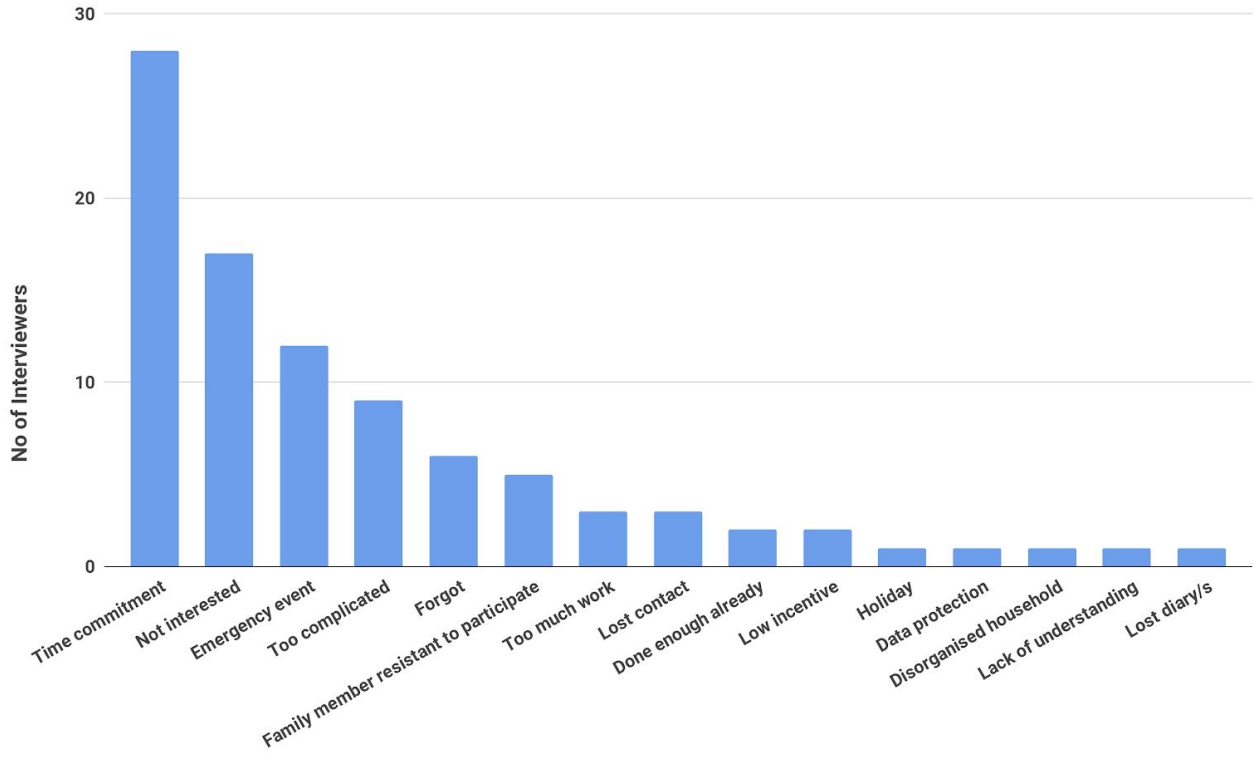
There is some mention of the Travel Diary being ‘too much work’ or the Interviewer was unable to make contact again with the household. Some households tell Interviewers that they ‘have done enough already’ by taking part in a lengthy interview.

> “[Some householders] can't be bothered after the lengthy face-to-face survey… [they’ve] done enough.”

Some Interviewers say the **incentive is too low**.

> “People tend to be time poor nowadays and l think the incentive is too small to engage them.”

> “I think the incentive should be for the individual as not all members will complete the diaries and it is unfair on members who have completed their diaries. An additional incentive is needed for a fully completed household.”



Source: Interviewers Reasons Households Refuse or Partially Cooperate (n=42)

Notes about research recruitment

It would have been beneficial to interview household members who refused to participate in the NTS, however this was not possible as these people did not sign up for further research and therefore could not be contacted.

Attempts were also made to interview household members who participated in the interview but refused to participate in the Travel Diary. The numbers of these participants who also signed up for further research are small and were not made available.

3.2.8 There are a spectrum of attitudes towards an online version of the Travel Diary

What did Diary Keepers say?

Some Diary Keepers expressed opinions that a digital/online version of the diary would improve the diary keeping experience.

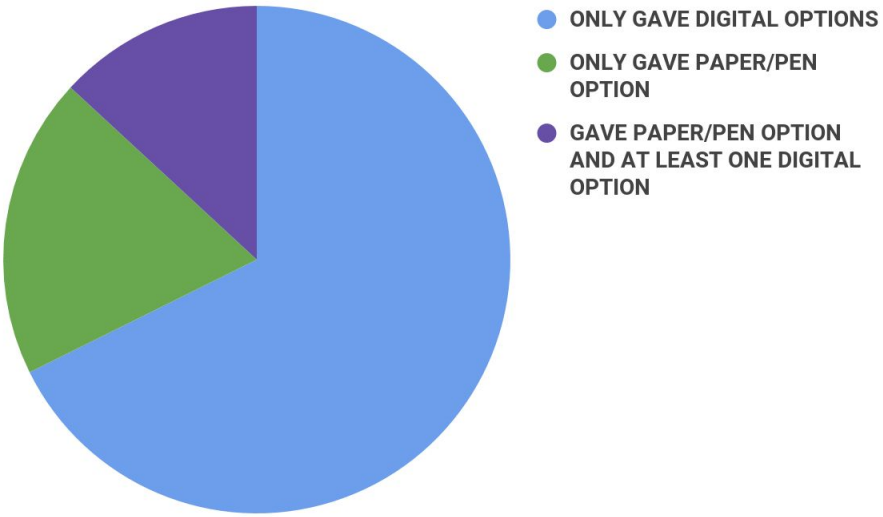
> “When I saw literally hundreds of boxes on that paper, I thought this is 2018, there must be an easier way than this?”

> “The interview part was fine, but the diary would have been easier if you didn’t have to carry it around… say if I could go to a website and record it there.”

During the Diary Keeper’s survey when asked: **‘What could make it a better experience for you to complete the Travel Diary? - 40% of users suggested an online/digital version** (Source - Diary Keepers User Feedback Survey (n=89)).

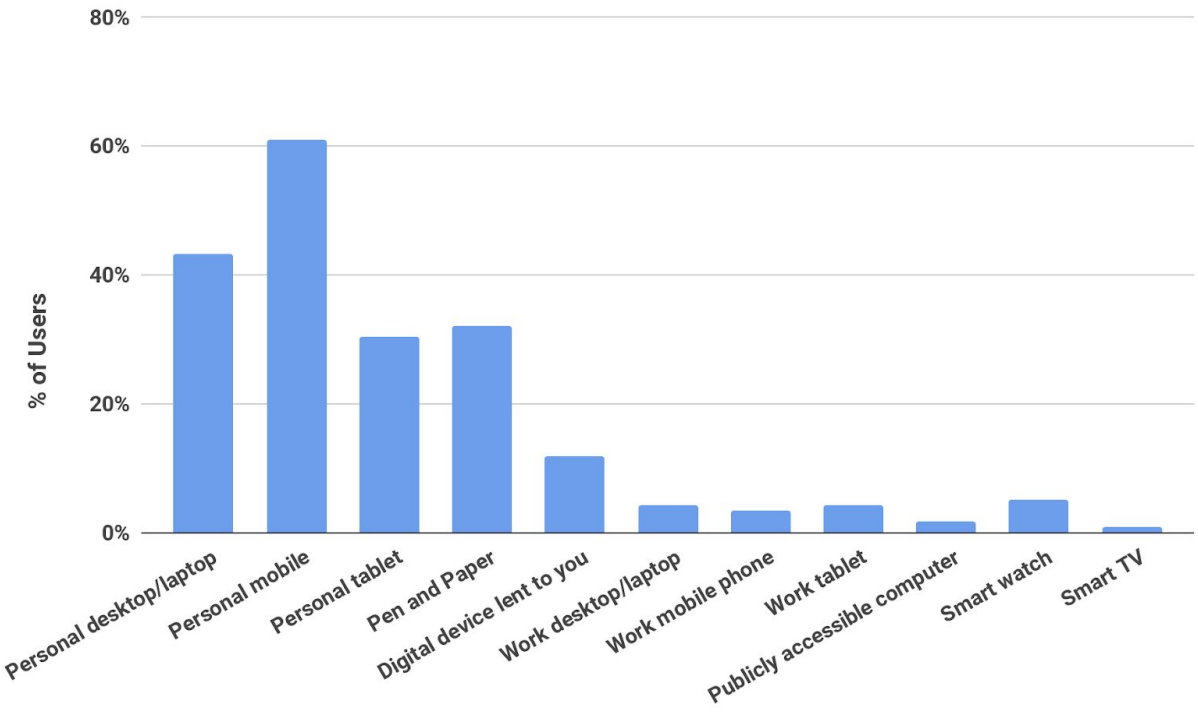
Attitudes towards a digital version are mixed and interestingly there are some digitally literate people that would still prefer a paper version - 23% of Diary Keepers who were able to complete an online survey would probably or definitely prefer a paper diary over an online diary.

The chart below shows how Diary Keepers would prefer to record their journeys. The most popular option was pen/paper with at least one digital option.



Source: Diary Keepers User Needs Survey (n=118)

The chart below shows a further breakdown of Diary Keepers' prefered options to record journeys.



Source: Diary Keepers User Needs Survey (n=118)

The Diary Keepers' preferred option for recording their journeys is by **personal mobile phone** (over 60%) and then **personal desktop/laptop** (42%).

> "An app on a mobile phone would be perfect as everyone has a mobile."

> "Completing digitally is a less onerous task than filling out endless forms on paper."

In the 2017 NTS pickup interviews, Diary Keepers (specifically the lead householders) were asked: 'Thinking about the diary you completed, which of these options would you have preferred?'

They were given the following options:

1. *A paper version of the Diary (the same as the one that you completed)*
2. *An online version of the Diary, which you could complete on the computer, phone or a tablet*

69% of the lead householders [Diary Keepers] said they would prefer the **paper version** of the diary

17% said they would prefer an **online version** of the Diary

10% of respondents had no preference*

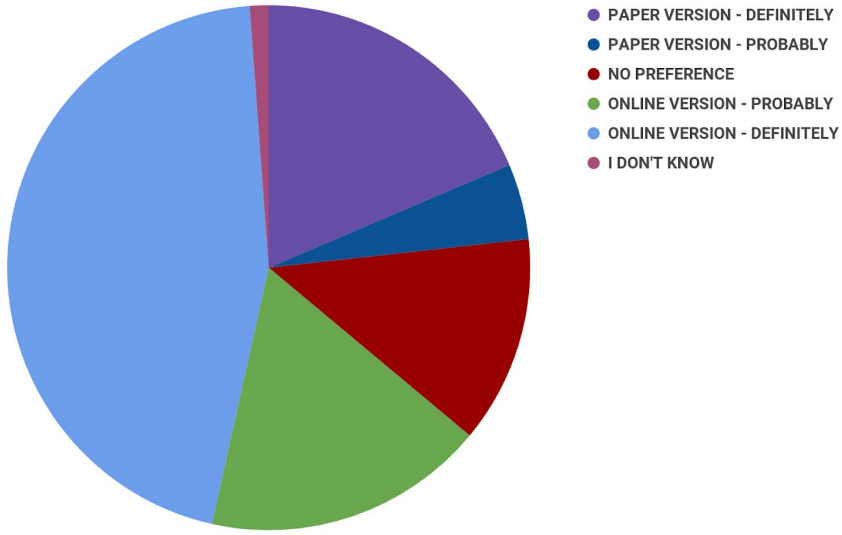
4% said some household members would prefer paper and some would prefer online*

Note: the last two responses were **not offered as answer options, but were recorded if given as the answer.*

The most common response from Interviewers was that most Diary Keepers would prefer a paper version of the Travel Diary.

Interestingly, this Discovery has produced evidence contrary to this, i.e. showing that Diary Keepers **do** have a preference for an online version.

The chart below shows that **61% of Diary Keepers** (who completed our online Diary Keepers User Feedback Survey) would *definitely* or *probably prefer* an online version.



Source: Diary Keepers User Feedback Survey (n=89)

There is a marked difference between this 61% of Diary Keepers who would definitely or probably prefer an online version (from the User Feedback Survey) and the 17% of Diary Keepers who would prefer a digital version of the diary (from the 2017 NTS pickup interviews).

There maybe several factors to explain the apparent discrepancy between the sources:

- ➔ Differences in the sampling composition. People who agree to take part in follow up research tend to be attitudinally and behaviourally different to those who don't agree to follow up research
- ➔ The User Feedback Survey was an online survey, therefore Diary Keepers with low digital literacy or lack of access to the Internet would not be represented (approx 14-21% of the population)
- ➔ The pickup interview questions were asked only to the main householders [Diary Keepers] - these people are typically older people in the household and presumably underrepresenting younger people

- ➔ The pickup interview questions were asked soon after the experience of keeping a paper diary - our User Feedback Survey was conducted after the event (at least 3 months after)
- ➔ The questions were not identical - the question in the User Feedback Survey offered a graded response and including 'no preference' (picked by 12% of respondents), whereas the pickup interview question only offered a binary, two answer response.

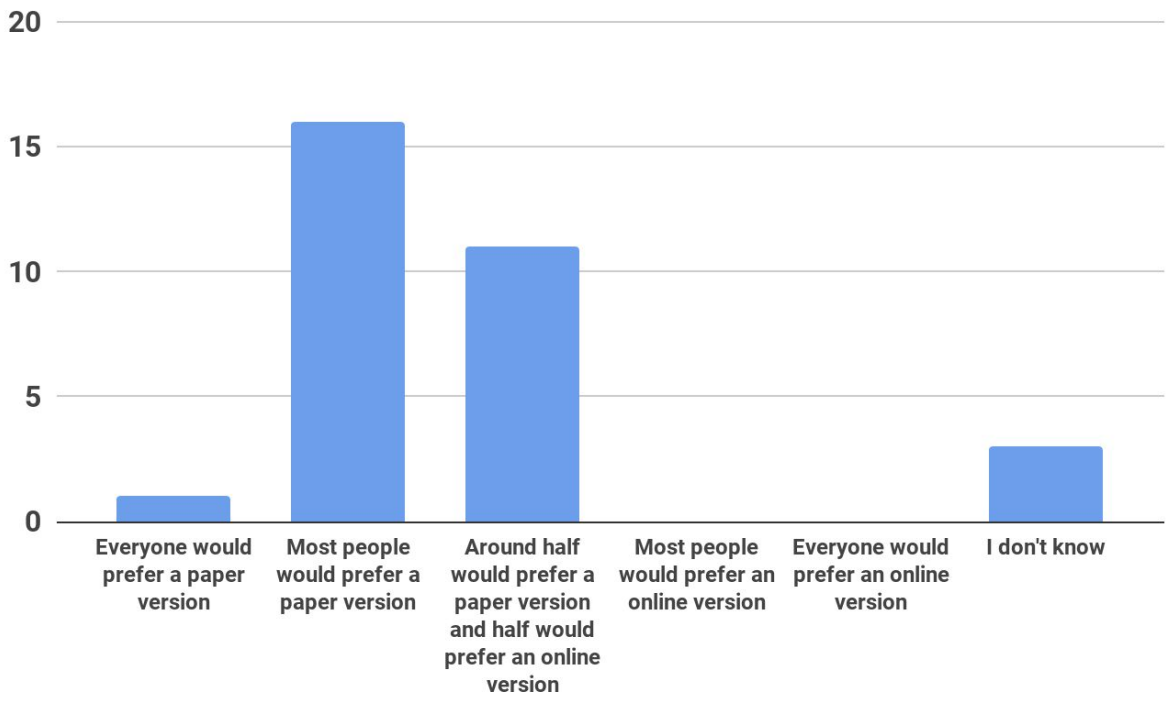
What did Interviewers say?

Interviewers recognised that some Diary Keepers would prefer to complete the Travel Diary online and that some households will not fill in the Travel Diary unless it is online.

> "If those who want to could do it online (such as on their phones) while letting the others in the household do it on paper."

> "Have an app for a mobile phone so the information can be put in as they go without pen and paper. This should also tell them what is not needed (e.g. walking criteria after 1st day / put in both diaries if travelling together) and it would be easier to complete the diary properly transferring the data."

This chart shows a breakdown of responses from Interviewers:



Source: Interviewers User Feedback Survey (n=34)

Interviewers are understandably concerned about access to technology.

> "Some respondents have no internet access not IT literate, therefore exclude elderly and less affluent and able."

> "Young people are happy to write on a piece of paper when they can use technology but older people who can't use technology don't have this option."

Interviewers think that around half of Diary Keepers would prefer a paper version and half would prefer an online version.

Some Interviewers can appreciate the value of online/digital for some Diary Keepers and that an online diary would be preferable and the only option for some participants, particularly younger generations.

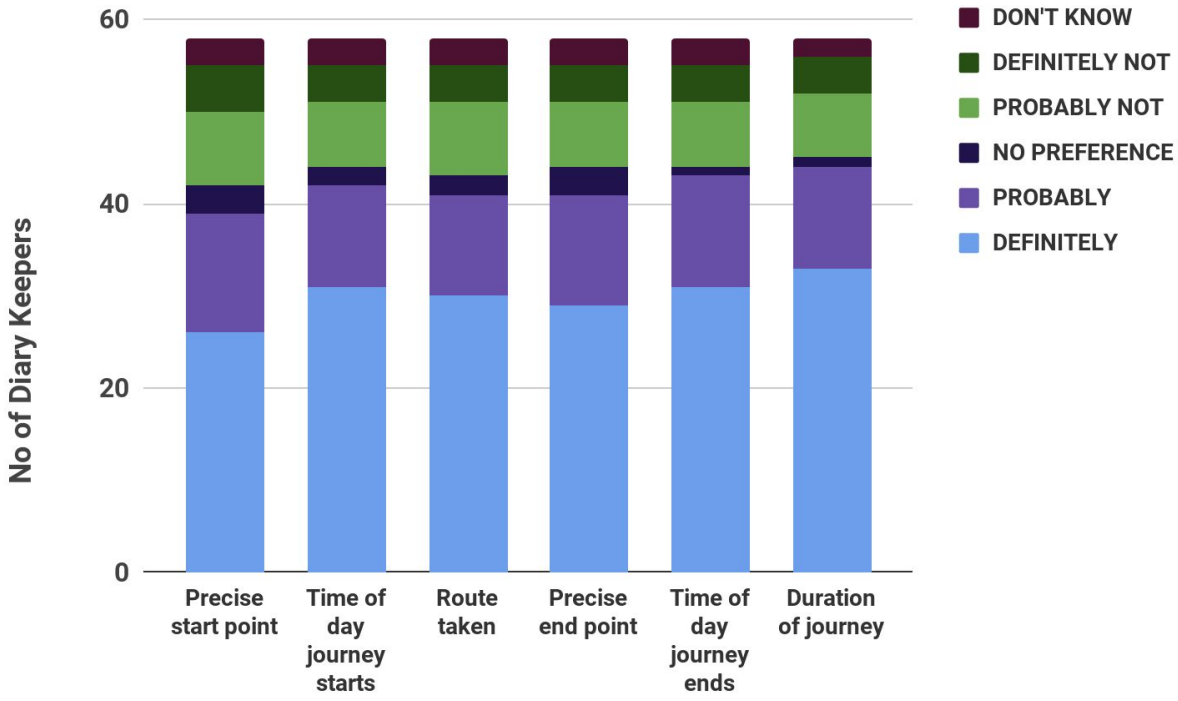
> “They can add the day's journey if they are away from home on business. Some people just prefer to do everything online. It would only be a positive if you could do it on a smartphone.”

> “[People] generally have an online device to hand. Younger respondents are much more familiar with using electronic devices nowadays.”

> “There is a faction of people that unless it’s linked to internet ‘it’s not worthy’. Mostly younger people.”

3.2.9 Around two thirds of Diary Keepers would probably or definitely be willing for technology to play a part in recording their journeys

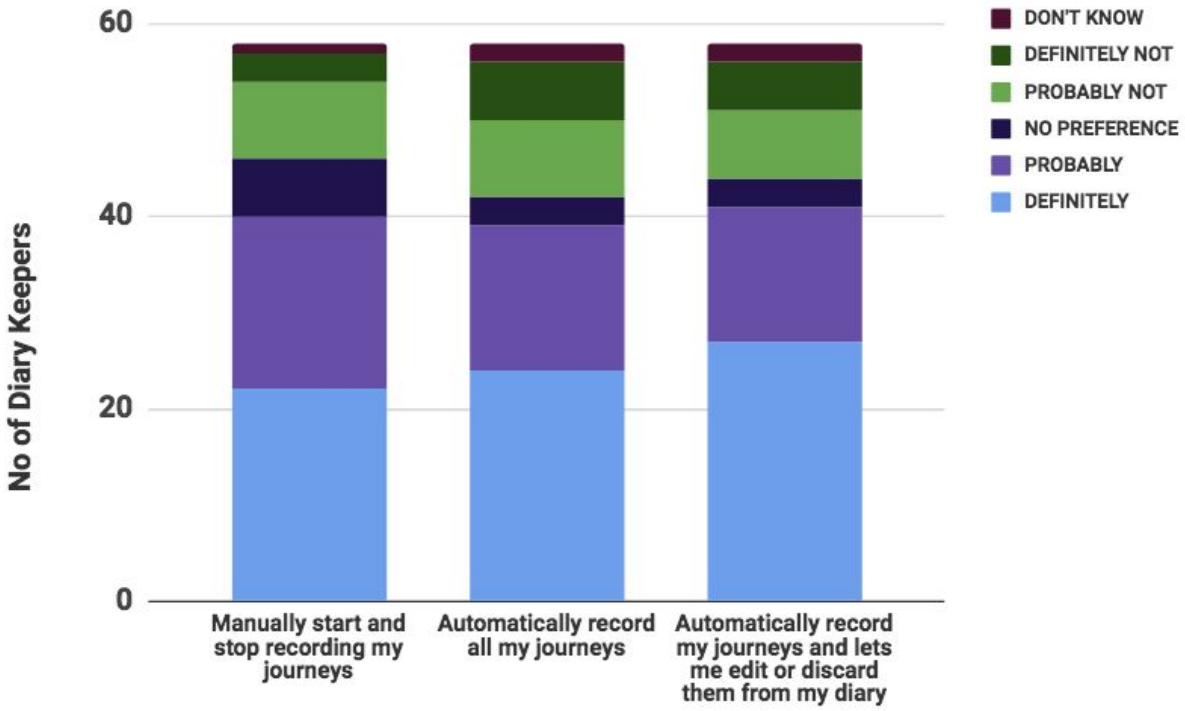
The graph below shows how willing Diary Keepers would be towards technology recording particular details [data points] about their journeys.



Source: Diary Keepers Attitudes to Technology Recording Journeys Survey (n=58)

Diary Keepers are slightly less willing for technology to record their precise start point than other journey data.

Diary Keepers are probably or definitely willing to accept technology recording their journey if they can manually start and stop recording their journeys.



Source: Diary Keepers Attitudes to Technology Recording Journeys Survey (n=58)

About two thirds of Diary Keepers are accepting of technology recording their journeys, with a slightly higher acceptance from Diary Keepers in an automatic function but being able to edit/discard journey from their diary.

Diary Keepers in favour of their journey being recorded by technology say:

> “I would be happy for my journey details to be tracked with minimal effort from myself.”

There are some Diary Keepers who are not comfortable with technology recording their journeys in this way, or simply don’t have those technologies:

> “I would not appreciate big brother watching."

> “I don't have mobile with GPS, or a SatNav.”

3.3 VALIDATING THE USER NEEDS

Diary Keepers and Interviewers were invited to validate the list of 24 user needs identified from the user interviews, stakeholder interviews and user needs workshop.

174 users completed the user needs surveys:

- ➔ 55 were NatCen Interviewers
- ➔ 118 were Diary Keepers

3.3.1 Analysis method and outputs

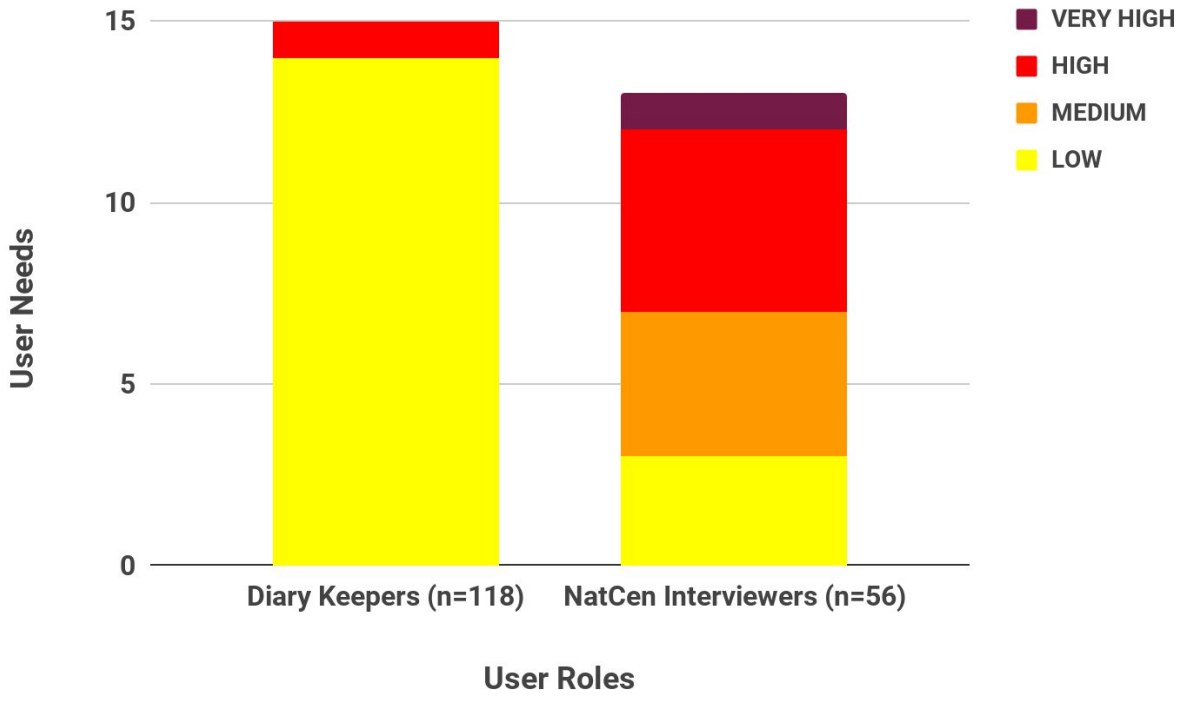
24 user needs were scored by users on a range from ***0 - I have no need*** *to* ***4 - I definitely need*** *the Travel Diary to…*

(Example) … *Record my journeys when I'm away from home*

Each need was then categorised into **Very high**, **High**, **Medium** and **Low** **priority user needs** depending on the average score of the responses.

Key: **yellow = Low need**, **orange = Medium need**, **red = High need**, **purple = Very high need**

The levels of user need per user role group are shown in the table below.



Some user needs were specific to Diary Keepers, some specific to Interviewers and some were across both user roles.

Diary Keepers have lower levels of user need

Only one user need was scored as **high**: *Repeat / reuse a journey I've already captured in my Travel Diary e.g. my commute*. The rest were scored as **low**.

This is not surprising for a voluntary service.

We were able to segment the Diary Keepers data into those who expressed pen and paper as a preference and those who expressed a digital option as a preference. Segmenting the data this way had no effect on the level of needs for Diary Keepers.

Interviewers have the higher levels of user need

The levels of user need for Interviewers ranges from very high to low.

- ➔ 1 user need was scored as **very high**: *Get alerts [as an Interviewer] if participants are not completing their Travel Diary*

➔ 5 user needs were scored as **high**

➔ 4 user needs were scored as **medium**

➔ 3 user needs were scored as **low**

3.4 PRIORITISING THE USER STORY BACKLOG

The evidence from this survey and other user research was used by the NTS Team to directly inform their initial round of **user story prioritisation** (November 2018), setting a user-centred approach.

Story ref	User story	Theme / component	Priority of Story
US20	As a Diary Keeper I can get reminders during my travel week so I remember to record my journeys	Alerting	**MUST**
US21	As a Diary Keeper I can get a reminder that my travel week is approaching so I don't forget to start recording my journeys	Alerting	**MUST**
US19	As a Diary Keeper I can check and edit my recorded journeys so I can provide accurate info	Editing	**MUST**
US35	As a Diary Keeper I can be provided with incentives so I record my journeys for the entire travel week	Incentivising	**WON'T**
US36	As a Diary Keeper I can learn why my household was selected so I know why I've been asked to take part	Incentivising	**WON'T**
US37	As a Diary Keeper I can get feedback on how my travel data was used and valued so I know how my contribution mattered	Incentivising	**WON'T**
US38	As a Diary Keeper I can find out how my travel data will be used so I know why my contribution matters	Incentivising	**COULD**
US15	As a Diary Keeper I can access a Travel Diary in my prefered language so I can record my journeys	Multilingual	**COULD**
US39	As a Diary Keeper I can practice adding a journey in my Travel Diary so I am confident how to do it	Onboarding	**SHOULD**
US01	As a Diary Keeper I can record journeys in my Travel Diary whilst off-line so I can fill it in anytime, anywhere	Recording	**SHOULD**
US02	As a Diary Keeper I can record journeys in my Travel Diary when I'm away from home so I can fill it in anytime, anywhere	Recording	**MUST**
US03	As a Diary Keeper I can automatically record journeys so it	Recording	**MUST**

	captures details about the journey as I make it		
US06	As a Diary Keeper I can record journeys in my Travel Diary when I am using more than one mode of transport eg walk, bus, walk	Recording	**MUST**
US07	As a Diary Keeper I can record some details about a journey so I can complete the rest later	Recording	**MUST**
US08	As a Diary Keeper I can enter details of journeys I am expecting to take so I can add/edit details after making the journey	Recording	**COULD**
US09	As a Diary Keeper I can record why I decided to use a certain mode of transport for a journey so my journey has context	Recording	**COULD**
US10	As a Diary Keeper I can say how satisfied I was about a journey I recorded so my journey has context	Recording	**COULD**
US11	As a Diary Keeper I can pick from my favourite places when recording a journey (e.g. home, gym) so I can save time	Recording	**MUST**
US12	As a Diary Keeper I can repeat / reuse a journey I've already captured in my Travel Diary (e.g. commute) so I can save time	Recording	**MUST**
US14	As a Diary Keeper I can record journeys on behalf of other people in my household so there is a record of their travel	Recording	**MUST**
US26	As a Diary Keeper I can record my car mileage at the start and end of the week so it can be included in the NTS	Recording	**COULD**
US27	As a Diary Keeper I can pick a start and end point for each journey on a digital map so it can record places and calculate distances	Recording	**SHOULD**
US30	As a Diary Keeper I can pick from local public transport ticket types in my local area so I can quickly answer questions about ticket types and costs	Recording	**SHOULD**
US32	As a Diary Keeper I can see how I travelled during my travel week so I get insights into my travel behaviour	Reflecting	**COULD**
US23	As a Diary Keeper I can seek help to ensure I record my journeys correctly	Supporting	**SHOULD**
US34	As a Diary Keeper I can get reassurance during my travel week so I continue to successfully record my journeys	Supporting	**COULD**
US13	As a Diary Keeper I can tag other people in my household who completed the same journey so they don't have to record it too	Syncing	**MUST**

4 JOURNEY SERVICE MAPPING

During the Discovery we mapped out the end-to-end journey for the NTS collection to better understand how the Travel Digital diary component fits into the wider NTS process and ecosystem.

We used our user and stakeholder research and review of technical documentation to map out the distinct steps in the process.

We captured what happens at each step, who is involved, what technologies and sources of data are involved, and highlighted pain points and risks.

4.1 HEADLINE NUMBERS

- ➔ There are **37 steps** in the process (from sampling households to publication on GOV.UK and UK data service)
- ➔ **13 distinct actors / roles** in the journey, e.g. NatCen Interviewers, and Diary Keepers
- ➔ The Interviewers are involved in up to 13 steps - often admin tasks such as posting and arranging calls
- ➔ 29 technologies and sources of data involved
- ➔ ~100 identified potential points for improvement

4.2 KEY FINDINGS

4.2.1 The paper diary is already in the middle of a digital journey

There are numerous other digital services, tools and sources of data before, during, and after the Travel Diary part.

The most significant are the Blaise CAPI laptop software used by the NatCen Interviewers for the household, individual and attitudinal interviews.

Plus the Diary Entry System (DES) used to input and manage data from the paper diaries.

Interestingly there are several points in the process when already digitised data is printed out to be worked on and then reentered digitally, e.g. the Run Ed validation steps.

Important: any digital version of the diary will have to co-exist in an eco-system with survey software (whether that be the current or different software) and is likely to have a major impact on it.

4.2.2 Not realising the true potential of digital

Despite there being digital elements in the journey, the absence of a *digital* diary is a major limiting factor to the common benefits of digital:

Speed and efficiency

Over 200k journeys were recorded in the 2017 NTS.

Each of these journeys was initially handwritten into the paper Travel Diary by the Diary Keeper or a proxy (that is sometimes the Interviewer).

Those details are then keyed into the Diary Entry System (DES) by the team of NatCen Remote Coders.

This is duplicated effort.

Collaborative, real-time access

Key actors cannot see diary data at points when it could be beneficial.

For example: Interviewers cannot physically see the journey details until they pick up the diaries which means they miss the opportunity to spot issues and intervene during the travel week.

Also, if Interviewers are later queried in the journey about a particular diary or journey, they no longer have access to look at it (as they posted it back to NatCen).

Precision

Data accuracy is reliant on legible handwriting being entered in the right places. These are avoidable errors in a digital method, e.g. no confusion between an ‘8’ and a ‘5’.

Contextual user experience

Prior knowledge (e.g. from the Interview questions) is not used to automatically *tailor* the diary elements to improve the user experience.

Auditing

It is not actually possible to see when data was recorded in a paper diary and who by.

Remote working

For example: once diary data is keyed into the DES it can only be uploaded to the central storage when the remote coder visits the NatCen office.

Accessibility

Well designed digital services actually open up access to users with motor, visual, and cognitive impairments.

Security

The data in the paper diaries is not backed up. There are also instances when the keyed data is only on a single laptop and also at risk of loss.

Validation

More detail on this in next finding.

4.2.3 Data validation is limited

The current (paper) diary does **not** have inbuilt validation and a Diary Keeper can record inappropriate journeys or inaccurate details.

Interviewers are expected to check over the diaries at the pick up and query and correct data issues they spot.

This is a considerable demand on the Interviewers:

- ➔ There is expectation to keep the pick up short
- ➔ They [the Interviewer] are seeing the diary data for the first time (in about 20% of instances)
- ➔ Doing this for all household diaries at the same time
- ➔ Not all householders are present to query journey details with
- ➔ Not always possible to arrange a pick in person

4.2.4 Coding journey purpose is a repetitive, manual task

Example: the Diary Keeper writes ‘Go to Cinema’ in column A of the diary and the Remote Coder interprets and codes that journey as a *#13 - Entertainment / Public social activities*.

The Remote Coder writes a *13* on the paper diary with a red pen and later keys that into the Diary Entry System (DES) with the other journey details.

This happens for every one of the 200k+ journeys each year in the NTS.

Our understanding is there are 4 to 5 Remote Coders doing this.

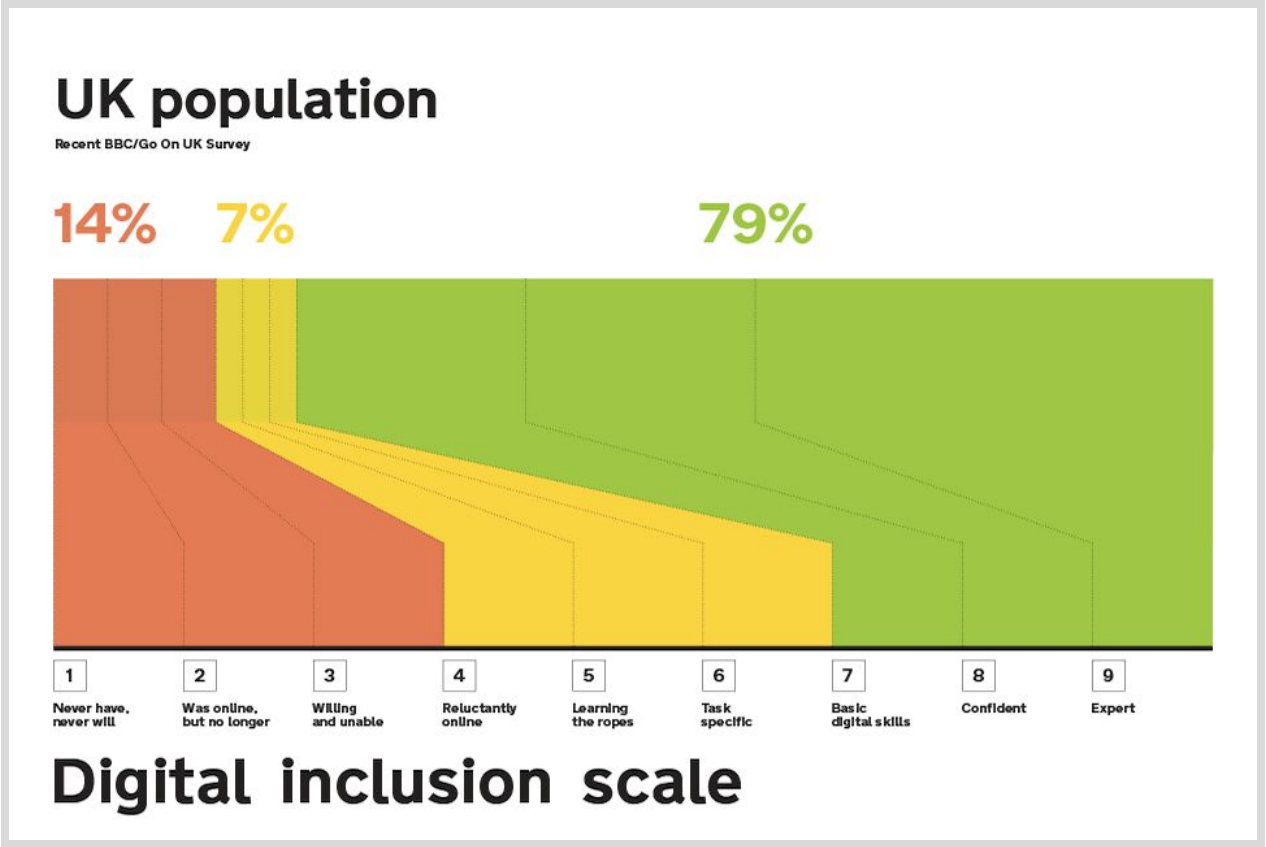
We appreciate that some journeys are not straightforward to interpret and code, but it raises the question if this could be done automatically in most if not all cases.

5 ASSISTED DIGITAL IMPACT ASSESSMENT

5.1 SCALE OF ASSISTED DIGITAL NEED

As households who participate in the National Travel Survey (and thus the Travel Diary) are a stratified, clustered random sample of households across England, there will be an assisted digital need to consider when developing a digitised Travel Diary.

The latest Digital Inclusion Scale figures on the UK population are taken from the Government Digital Inclusion Strategy, updated in December 2014.



This shows that currently 79% of the UK population are 7 (basic digital skills), 8 (confident) or 9 (expert). This group of the population *should* be capable of using any

Digital Service Standard level digital service offered to them to complete their Travel Diary if they have access to the Internet.

A further 7% of the UK population are a 4 (reluctantly online), 5 (learning the ropes) or 6 (task specific).

It is reasonable to conclude that although this group 6 *should* be capable of using a well designed digital service if the Internet was available, they may still have some assisted digital need.

Finally, 14% of the UK population are a 1 (never have, never will), 2 (was online, but no longer) or 3 (willing and unable). This section of the population will have assisted digital need.

5.1.1 The estimated level of assisted digital need for a digital Travel Diary

We can use these figures to help estimate how much assisted digital need you may need to support.

We can say that the level of assisted digital need within the UK population falls between **14-21%** (up to 6 (task specific)), if we use the digital inclusion scale that as a proxy for people that do not have the digital literacy / ability for such a service

The 2017 NTS had **14,541 completed diaries** which would mean between **2,036 - 3,054** Diary Keepers per year may have assisted digital need.

We have certainly engaged with Diary Keepers that fall into this group:

> “I don’t have a mobile, don’t have a car, I’m very happy as I am. I don’t need it. I’m quite happy to use a pen. I would like a quiet life and I’m a quite happy living in my cave.”

> “Some respondents have no internet access and are not IT literate, therefore an online version would exclude the elderly, less affluent and able.” - Interviewer

Note: It is recognised that this estimate is determined from data which is 4 years old and includes the whole of the UK. However this gives a good initial estimation of scale to work towards.

5.1.2 Consider the lack of access to the Internet for some Diary Keepers

A recent report by the Office for National Statistics: Internet access - households and individuals, Great Britain 2017 states that 'In 2017, 90% of households in Great Britain had an Internet connection.'

The 10% of households without Internet connection may add to the estimated range of 14-21% or Diary Keepers with assisted digital need. However, it is reasonable to assume that there is a strong correlation between low digital inclusion scores and access to the Internet.

5.2 HOW TO MEET ASSISTED DIGITAL NEED FOR THE TRAVEL DIARY

If a digital version of the Travel Diary was to remain as a 7 day Diary, there will be many interactions with the Diary over the 7 day period. This may be after each journey or at the end of each day. This increases demand on Diary Keepers with low digital literacy.

To comply with the GDS Service Standard, a entirely paper based option of the diary could not be offered as an alternative, i.e. the data must be submitted into the digital service.

However the current paper memory joggers issued to Diary Keepers could be a key part to the assisted digital approach.

Assisted digital method would need to be implemented, i.e. somebody else records the Diary Keepers journey details into the digital diary. The standout options at this point are:

5.2.1 Other householders

Householders already complete the diaries by proxy for other householders, e.g. for their children.

Digitally confident householders could do it on behalf of assisted digital level users in their household.

5.2.2 Interviewers

They could do this in person or over the phone.

Interestingly, a similar form of support is already given by the Interviewers to Diary Keepers who find it difficult to fill in the paper version of the Travel Diary.

5.2.3 Central support desk

Potential to introduce a central phone number that assisted digital Diary Keepers could call to report their journey for the call taker to record into their digital diary on their behalf.

Such a support desk could support all Diary Keepers with queries about recording journeys.

5.2.4 Estimated resource to support assisted digital users

Scenario: the 21% of assisted digital level Diary Keepers call the Interviewers or the support desk once a day to share their journey details (to be recorded in their digital diaries).

Estimated average call time: 5-10 mins.

Resource required would be between **238 - 475 working days** a year (based on 7.5 hour days).

5.2.5 Next steps

These ideas would need to be explored further during the development phases.

Including the question of how often this support is given to the Diary Keepers, e.g daily, or every 2-3 days?

6 TECHNOLOGY REVIEW

Note: this review was made through the lens of the Technical Code of Practice and Digital Service Standards outlined by GDS.

Specific recommendations to come out of this review are made in the Recommendations (section 8).

6.1 KEY FINDINGS FROM THE TECHNOLOGY REVIEW

6.1.1 Data Entry System (DES)

6.1.1.1 DES is a bespoke NTS system based on old, proprietary technology

The client and server parts of the DES both run on a Windows environment. For the client, that means Windows on a laptop, for the server that includes MS SQL Server and MS Access.

The codebase itself is written in Visual Basic 6, originally released in 1998, which retains runtime support on newer versions of Windows (meaning it will work) but has no Integrated Development Environment (IDE) support since 2008. It has been superseded by VB and C# .NET.

We could **not** recommend investing in continued development in this technology since it is effectively legacy.

6.1.1.2 The interoperability of the DES is minimal

The DES surfaces no APIs. Remote Coders have to be on site to transmit information to the backend which suggests there is no remote way of interacting with the system.

This, combined with its use of legacy technology, makes it a poor candidate to add this capability to.

6.1.1.3 Security and backup of the DES information is reasonably well considered

During the diary coding process, both household/personal and travel information are stored together on the Remote Coder's laptop, which is a potential risk. That said, the paper surveys themselves are less secure.

The **Remote Coder's laptop** has a number of security measures:

- ➔ PGP encryption of the information
- ➔ Secure accounts and logins managed via Microsoft Active Directory
- ➔ Enforced password changes every 30 days

On the **server side**:

- ➔ Access to the server is limited to the IT Development and Infrastructure teams only
- ➔ There is a scheduled backup on the server in Brentwood and data is replicated to the NatCen London office which provides a good level of continuity
- ➔ Development is carried out in accordance with ISO27001 for Information and Security Management
- ➔ SQL Server, correctly setup, is a robust and highly secure database

6.1.1.4 There is no multi-disciplinary product team behind the DES and product changes are on a yearly cadence

The team behind the DES is development and support focused.

From a product perspective, requirements come from NTS and the changes are usually tested and deployed around once a year by NatCen.

6.1.1.5 NatCen believe they own the Intellectual Property (IP) of the DES

NatCen have stated that the DES is an internal tool created to process the diary and therefore they own the IP. The data also resides on a NatCen owned server.

This will impact what access a new product team will have to the code base and data structures as a basis for creating the Digital Diary. If NatCen aren't the technical supplier for the Digital Diary, based on our experience of similar situations, they will not be legally required to grant access, and entitled to charge to do so.

6.1.2 Blaise (CAPI software)

Blaise is used by the NatCen Interviewers for the household and individual questionnaires during the placement call. It is also used in the pick up interview.

6.1.2.1 NatCen / NTS are on version 4.8 of Blaise which is 'serverless' and so data transfer happens on-site

Blaise 4 stores data in a database locally on the machine on which it's installed. There is no Client-Server architecture with a remotely accessible server and database.

Data exchange happens when data is transmitted via a local NatCen office network. It's currently unclear where and in what format the information is stored after that process.

However, this means, in the current setup the only pathway for Blaise's interview data to be consumed in near real time by the Digital Diary would have to happen on the local machine.

Blaise 5 seems a better candidate for interoperability, however it seems unlikely that this option is available. See below.

6.1.2.2 NatCen own a corporate licence to Blaise which is used amongst multiple clients

This mean NTS doesn't have their own instance of, or licence for, Blaise which could impact any changes that are required to accomodate a Digital Diary, such as upgrading or adding bespoke extensions.

6.1.3 Data Strategy

6.1.3.1 Multiple systems are leveraged to produce the final survey data, but interfaces are not using *open standards*

In addition to Blaise and the DES, the diary ecosystem also consists of the Sample Management System (SMS), the Fieldwork Allocation System (FAS) and Pure360 (Email system).

The movement of data between systems seems to be largely, if not entirely, based around file exchange and on-site interactions, rather than open standards and web-based APIs.

6.1.3.2 Data is closed and not accessible until final delivery

The data from the DES is not available in an interim way before final file is generated. While we understand that there are steps, for example to weight the data across the entire survey, that cleaned data does not gradually become available during the entry process sits in strong contrast to the DfT's strategy of open, shared and accessible data.

6.1.4 Technology Strategy

6.1.4.1 Ecosystem balances bespoke and existing tools

The data collection process utilizes a number of software packages including:

- ➔ Blaise – off the shelf
- ➔ Diary Entry System (DES) – bespoke, NTS only, created by NatCen
- ➔ Sample Management System (SMS) – bespoke, created by NatCen
- ➔ Fieldwork Allocation System (FAS) – bespoke, created by NatCen
- ➔ Pure360 – off the shelf

Overall, this balance between bespoke and off-the-shelf tools makes sense. The diary is used by Blaise and the DES, although has almost no relationship with other parts of this ecosystem.

6.1.4.2 The technology leans heavily to Microsoft and Windows

Overall this makes sense – the Microsoft ecosystem is robust, with excellent security and ability to scale. Indeed, at the time this system was originally created it was likely the only reasonable choice.

We mention it for a few reasons:

Firstly, GDS and the DfT Digital Strategy push for open source technologies (which are not Microsoft based). A new digital diary would likely be based on open source and therefore have to integrate with some form of Microsoft technology. Given the lack of open standard, this could present some challenges.

Secondly, the technology landscape has changed significantly during the lifetime of the technology used in the diary ecosystem. Understanding the licencing costs, any future development costs and overall value for money is worthwhile during the technology transition which is about to happen.

6.1.4.3 The current set of tools and technologies will struggle to deliver a modern user experience, at scale, in a cost-effective way

While the current set up has got the job done up until this point, its capability to deliver on modern expectations of user experience, unlock data flows and provide the basis on which to create the next generation of tools, is low.

The characteristics of such an environment include:

- ➔ A set of services, integrated at a technology level
- ➔ Processes with minimal manual intervention and high levels of automation
- ➔ Fast, easy exchange of data
- ➔ Up to date technologies that leverage modern approaches and capabilities
- ➔ Cloud-first hosting with flexible cost-structures and scalability

As noted in the technology findings up until this point, the current ecosystem is behind the curve in each of these areas.

7 LANDSCAPE ANALYSIS

7.1 CASE STUDY #1 - NATIONAL NUTRITION SURVEY

The Food Standards Agency's National Nutrition Survey has notable similarities to the NTS. It is a national survey with a diary and Interviewer led elements.

Diary Keepers record everything they eat in a paper diary, and receive support from an Interviewer at a placement and a pick up interview. Significant effort then goes into the coding of handwritten diaries.

The FSA are expecting to replace the paper diary (screenshots below) with a digital diary in the near future, although they have not yet selected a solution. This process is being led by the current supplier, NatCen, on behalf of the FSA and Public Health England.

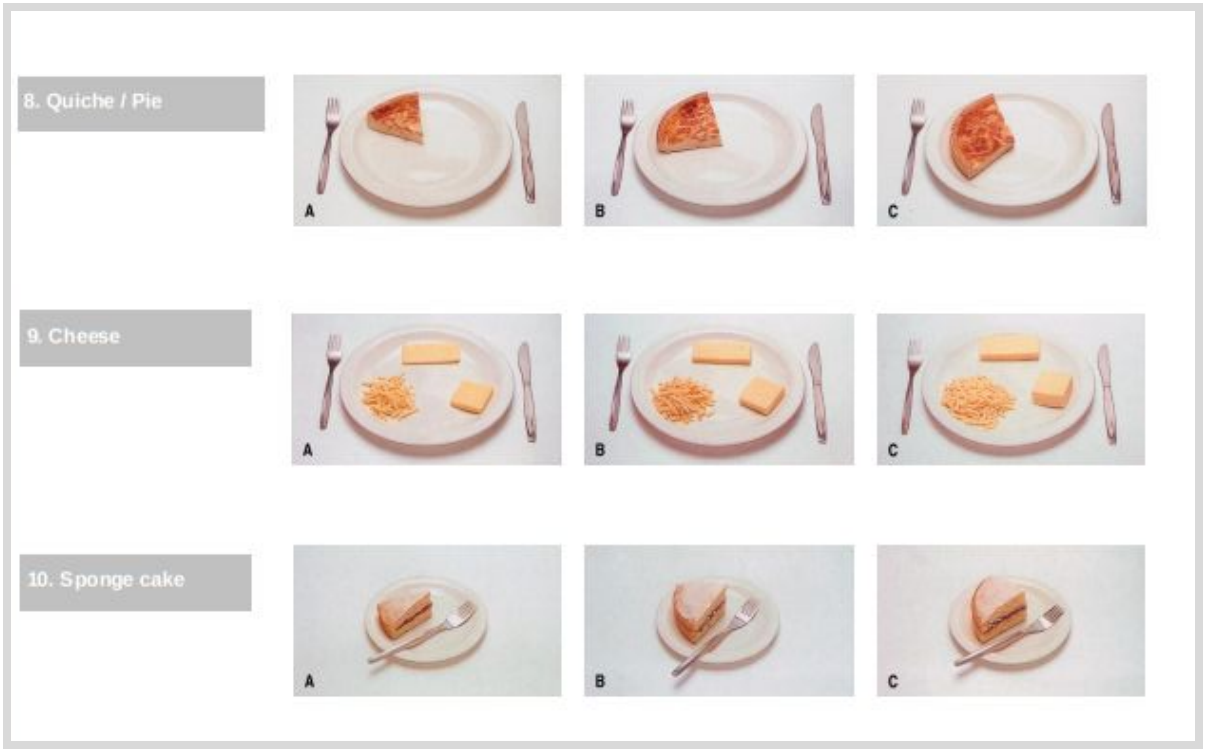


Image: the digital diary will use visual prompts alongside questions, such as portion sizes, to help Diary Keepers accurately record their activity.

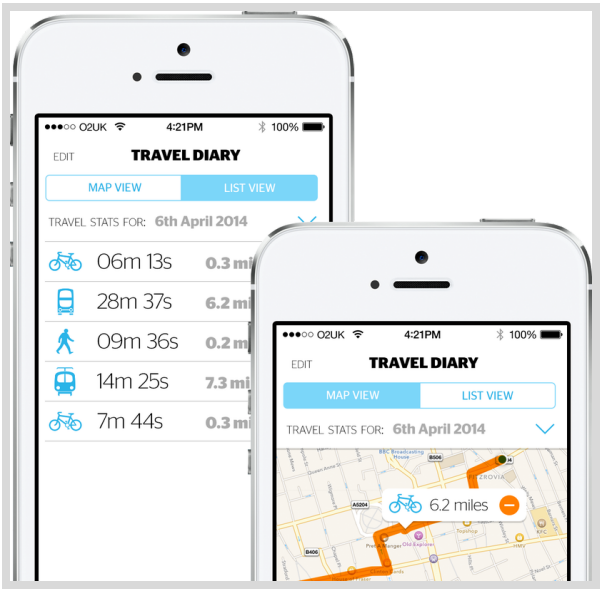
7.1.1 Insights and lessons

- ➔ The main motivation to seek a digital solution is to reduce cost and workload, but they also hope to realise other benefits by shifting to a digital solution
- ➔ The diary has already reduced from 7 days to 4, to address respondent fatigue
- ➔ The move to a digital solution is also expected to change the diary to recording non-consecutive days
- ➔ The digital solution is expected to help with:
    - ◆ The presentation of complex questions, e.g. breaking down the ingredients of a sandwich
    - ◆ Prompting the Diary Keeper to add details that might otherwise be missed, e.g. 'Did you have any other snacks?'
- ➔ The coding of the diary is expected to be built into the collection method, reducing the need for retrospective coding
- ➔ The pick up interview will be replaced with prompts by phone
- ➔ FSA accept that a shift to digital methods will mean a break in the time series, but expect to get increased accuracy of results ("we want to know how much people actually eat.")
- ➔ The solution will be chosen based on agreed criteria, and they then expect to switch from paper to digital diaries without further testing or parallel running

7.2 CASE STUDY #2 - TRAVELAI CATCH!

Hertfordshire County Council conducted a small scale test (5 employees) of a smartphone GPS tracking app with a view to using it as part of their county travel survey.

Transport planners in Hertfordshire worked closely with TravelAI to test the app, which is available for both Android and Apple phones.



7.2.1 Insights and lessons

Pros

- ➔ The app is very easy to use. Once a user has downloaded the app, they don't need to take any further action to capture journeys
- ➔ Participants in the test reported that 80% of journeys were recorded entirely accurately
- ➔ The app was able to recognise complex multi-modal journeys
- ➔ The developers have received funding from Innovate UK so far, and are open to further developing the app for particular uses for a relatively small cost, e.g. to validate journeys with the user, or to add a journey purpose

Cons

- ➔ Without further development, the app cannot:
  - ◆ capture anything about the purpose of a journey

- validate journeys with the user

➔ The app relies on network coverage, and the testing showed that it worked less well in crowded and remote areas

➔ Participants reported that the Apple version of the app was battery heavy, using up to 20-30% additional battery life

➔ The app sometimes mistook modes of transport (e.g. recording fast cycling as driving) and struggled in non-standard landscapes (e.g. on rivers)

Hertfordshire County Council have not progressed beyond this limited trial, but remain confident that with some investment, this type of app could be used to supplement other methods to survey mobility.

7.3 CASE STUDY #3 - NEW ZEALAND HOUSEHOLD TRAVEL SURVEY

The New Zealand Ministry of Transport have used several different methods to collect information about travel patterns and choices, as part of their Household Travel Survey.

The current method uses GPS tracking devices, combined with personal interviews, to collect a **2 day Travel Diary** from **1,900 households**.

Points to note about the current solution:

➔ Households are sampled, sent a letter, followed by a visit and then an interview

➔ The diaries are kept on assigned days, with the interview taking place shortly afterwards

➔ The Interviewer completes the diary on behalf of the participant, based on the journey information from the GPS tracker and CAPI questions (minimising the need for retrospective coding)

➔ 88% of participants use the GPS device, and journeys captured by the GPS tracker account for 77% of the journeys captured in the survey. Participants who choose not to carry the GPS device rely on their memories during the interview.

- ➔ The survey contract is syndicated, so it is possible for local government to purchase a sample boost in their area

The Ministry has settled on the current solution after trying several alternative methods of collection. Between 2015-2018 Diary Keepers were given a GPS device and asked to validate their journeys and answer further questions using an online form, with phone support if required.

Points to note from previous methods:

- ➔ Self completion of the diary online, without an interview, led to a significant reduction of completed diaries: “Self completion online looks easier, but you find you get a significant drop in quality”
- ➔ 75% of people completing the online diary needed to use the phone support service
- ➔ Only 25% of people were willing to put an app on their phone. Reasons for refusing included: privacy concerns, and concerns about data and battery use, or space on their phone.

The current solution is an attempt to **combine the automation of journey tracking, with a personal interview** to gather high quality data.

> “Personal interviews are expensive but they give you good quality data.”

It has significantly reduced the burden on the participant, only requiring them to carry a GPS device, and then take part in an interview.

8 RECOMMENDATIONS FOR A DIGITAL TRAVEL DIARY

8.1 THE CONTEXT FOR OUR RECOMMENDATIONS

8.1.1 A consensus to largely preserve the stable NTS question bank and method

The NTS question bank and method has been stable for a long time and this is regularly cited as a strength by data users.

The diary component also needs to continue to produce the same quality of data to meet the UK Statistics Authority's standards for National Statistics.

Our recommendations anticipate (and support) the ongoing need for Interviewers to facilitate aspects of the full version of the NTS experience.

8.1.2 Desire to increase sample size

Several recommendations are intended to meet the NTS Team's goal to increase the sample size to better *meet the needs of NTS data users*.

However, a digitised version of the Travel Diary that largely fits into the existing NTS process will **not** increase the sample size anything close to the significant increase desired by some data users and stakeholders.

Some of the recommendations therefore explore how digital methods could allow the NTS to *also* be conducted in a different way, to open up the potential for a much larger collection in an efficient and cost-effective approach.

8.2 OVERARCHING RECOMMENDATIONS

8.2.1 Proceed to an Alpha phase for a Digital Travel Diary

Put simply, you satisfy the criteria to continue to an Alpha phase.

Firstly, there is sufficient and demonstrable user need from data users that a National Travel Survey should continue to meet.

There is also sufficient evidence, expectation, and value that it is now appropriate to shift from a paper based Travel Diary to a digitised capture / collection.

To summarise previous evidence in this report: the paper diary collection already sits in a wider digital journey, and is holding back the potential of digital to find efficiencies, improve data accuracy, and to scale.

8.2.2 Build the foundations to realise the potential of digital, but be mindful to taking on too much at once

Shifting from a paper version of the diary to digital version of the diary is a big step. It will have implications on user experience and other parts of the NTS process, including data validation, storage, coding, exporting, and analysis.

Yes, there is potential for a range of technologies to be adopted, but we caution that it will be challenging enough to implement a 'simple' web browser survey version of the current diary that a) complies with the GDS Service Standard, and b) does not jeopardise the well respected data quality of the NTS.

See recommendation below about embracing the Alpha phase to experiment and validate proof of concepts for these technology options.

Minimum Viable Product (MVP) Digital Travel Diary

The step up from paper to digital is considerable so it is essential to focus on what must be delivered to meet prioritised user need. An MVP is that line in the sand.

At this point we would expect a digital Travel Diary MVP to:

- ➔ Be a web browser based form capable of collecting everything that the paper version can
- ➔ Build APIs to allow the storage and retrieval of diary data based on current data structures
- ➔ Able to record journeys on desktop, tablet and mobile

- ➔ Support return and repeated journeys
- ➔ Remember who a Diary Keeper is (and their journeys) from one device to another
- ➔ Support referencing of diaries and journeys within a household
- ➔ Automatically code the purpose of each recorded journey

Whether this should be in an MVP will be better know upon the completion of the recommended experiment into the suitability of machine learning to perform the journey purpose coding step within the actual service.

Interestingly, coding purpose is also an objective for digitising the diary in the FSA's National Nutrition Survey.

- ➔ Capture metadata about the journey data, e.g. timestamp when a journey was recorded in the diary
- ➔ Tailoring of the diary experience based on context

Initially this may be some configuration options that the Interviewer has when placing a household's diaries. In time this could be part or fully automated by the data captured in the household and individual interviews and shared from the Blaise CAPI tool.

- ➔ Enable offline use, e.g. can still add journeys when disconnected from the Internet
- ➔ Meet the priority user needs of Interviewers (see recommendation below)

Such an MVP alone will is expected to deliver immediate benefits, e.g. decrease time from collection to data readiness.

The vision for an enhanced Digital Diary

This Discovery has identified potential *enhancements* beyond an MVP, such as the automated recording of journey data.

Important: these are potential options of how a digital diary could meet identified user needs. They are *not* a spec list.

- ➔ Introduce alerting mechanisms (e.g. “you haven’t recorded a journey for 2 days”)
- ➔ Enable live recording of journeys (by manual start stop, and / or by automatic detection of a journey in progress)

Based on current technology and the experience of the New Zealand transport survey it is likely that journeys automatically recorded in the background will still require the review and correction of a human, e.g. the Diary Keeper and / or the Interviewer.

- ➔ Introduce native mobile device functionality into the journey recording experience, e.g. using GPS to capture route details such as type of road, or accelerometers to detect stationary periods

Rather than create platform specific native mobile apps, which multiply development and support costs, and are more difficult to frequently iterate in the early stages of developing the product, we recommend adopting a Progressive Web App approach which will work in the browser, but can also extend to giving a more native app experience.

- ➔ Build on the core digital diary platform APIs to introduce further ways to capture journey data, for example via voice controlled devices or wearables (if they genuinely meet user need)

With a good foundation layer it will be possible to run experiments to test further digital channels for recording journeys. For example: you may want to explore the potential of Diary Keepers to also use increasingly popular voice enabled devices.

- ➔ Integrate data from the household and individual interviews to automatically tailor (configure) individual diaries
- ➔ Experiment with introducing artificial intelligence to ‘interpret’ the details of a journey, e.g. predicting journey purpose, the stages of a journey, modes of transport

8.2.3 Use the Alpha as a genuine learning experience (rather than as a first phase of development)

We recommend packaging the Alpha phase as a set of proof of concept prototypes for the MVP and enhanced methods detailed in the recommendations.

You could prototype some or all of these before decided which (if any) to progress to a Beta phase:

- ➔ A modern NTS Travel Diary Platform capable of storing NTS diary data - this should include APIs to allow data submission and extraction **[MVP]**
- ➔ Web browser form experience capable of collecting and submitting everything that the paper version can **[MVP]**
- ➔ Interviewer tools **[MVP]**
- ➔ Supervised learning experiment into automating journey purpose coding **[MVP]**
- ➔ Live recording of active journeys **[Enhanced]**
- ➔ Native smartphone functionality, inc. GPS and motion detection **[Enhanced]**
- ➔ Further methods of capturing journey data, e.g. by voice **[Enhanced]**
- ➔ Automated diary configuration (with inputs from other sources such as the CAPI interview system) **[Enhanced]**

This may mean a longer Alpha phase, but it will give you ample opportunity to gauge the potential, suitability, and viability of digital methods in the NTS before progressing to a Beta phase.

The concept prototypes will allow you to gather early feedback from data users and end users (of the actual diary) to inform your future prioritisation and decision making.

The lessons will also help you to redefine the MVP for a Live NTS digital diary. Expect this to change.

Sequencing the Alpha proof of concepts

Sequencing should be a decision for the Alpha Delivery Team but will largely be dependent on which *packages* you prioritise for the Alpha.

You are not trying to build a fully working NTS digital diary in the Alpha which means you can relax about sequencing packages based on dependencies.

It is also feasible to run packages concurrently, but be mindful of the workload.

You may also form more than one Alpha service Delivery Team to focus on different packages, especially if you engage different technical suppliers based on their areas of expertise, e.g. mobile device functionality, or machine learning.

Important: although Alpha phase proof of concepts save time and expense in the long term, they are still intensive, time consuming, and expensive. It is crucial the Delivery Team remain focussed on the validated user needs of Diary Keepers and Interviewers, whilst meeting the needs of NTS data users.

8.2.4 Build towards a second digital only NTS service / tier

The goal should be to build a digital Travel Diary that is user friendly enough for Diary Keepers to successfully record accurate journeys without or with minimal intervention or support from Interviewers (or any other support NTS representatives).

Once you have achieved that you will have a digital service that could potentially be rolled out on a much **bigger scale to increase sample size**, *if* and when you wish to do so. This is a recurring desire for data users.

The Travel Diary component could be augmented to:

- ➔ Ask a subset of the current household, individual, and pick-up interview questions - we recommend researching which interview questions would be most valuable to increase the sample size
- ➔ Handle incentives

Important: this would not be the NTS as we think of it today, but would be the data collection method for the mooted *second tier* NTS.

Preserve the precious time series

In theory, a second tier would allow you to preserve the time series for the ‘regular’ NTS and still open up a larger sample for collecting journey data.

An interesting thought is that you may then be able to scale down the regular NTS if you don't need the current sample size for the full question bank. This would save money.

Unfortunately digital technology is not a silver bullet

The biggest barrier to NTS participation will continue to be its voluntary status.

The New Zealand travel survey example shows that a standalone digital solution does not guarantee participation. Despite introducing a digital collection that also makes use of GPS tracking, they still have to rely on intense facilitation by Interviewers.

Questions about if and how to sample, promote, and incentivise participation will also be key to scaling up the sample size whilst preserving critical, statistical robustness.

8.3 USER EXPERIENCE RECOMMENDATIONS

8.3.1 Offer NTS participants a mixed-mode digital Travel Diary experience

A single mode (or channel) for recording journeys in a digital diary (e.g. a mobile phone App) is *not* recommended or even necessary.

We have learnt how Diary Keepers already exhibit a range of behaviours and techniques that help them successfully record their diaries:

1. Pre-populate
2. Record live journey
3. Record upon end of journey
4. Batch record all journeys for a day

They have also told us they want a range of devices available to them. This adds to previous research about the penetration of different device types across the population, e.g. adoption of smartphones.

Offering a single, one-size-fits all option would be a major threat to completion rates, e.g. only able to record journeys as they happen (or immediately after they finish) on a mobile phone app.

We can't make assumptions about the correlation relationship of behaviour by type of channel. For example:

- ➔ A batch recording of journeys at the end of a day could be done on a mobile phone on the sofa
- ➔ An *on the go* journey could be recorded on a laptop

Offering options will also make it more likely that a participant can use their own technology to partake in the Travel Diary component:

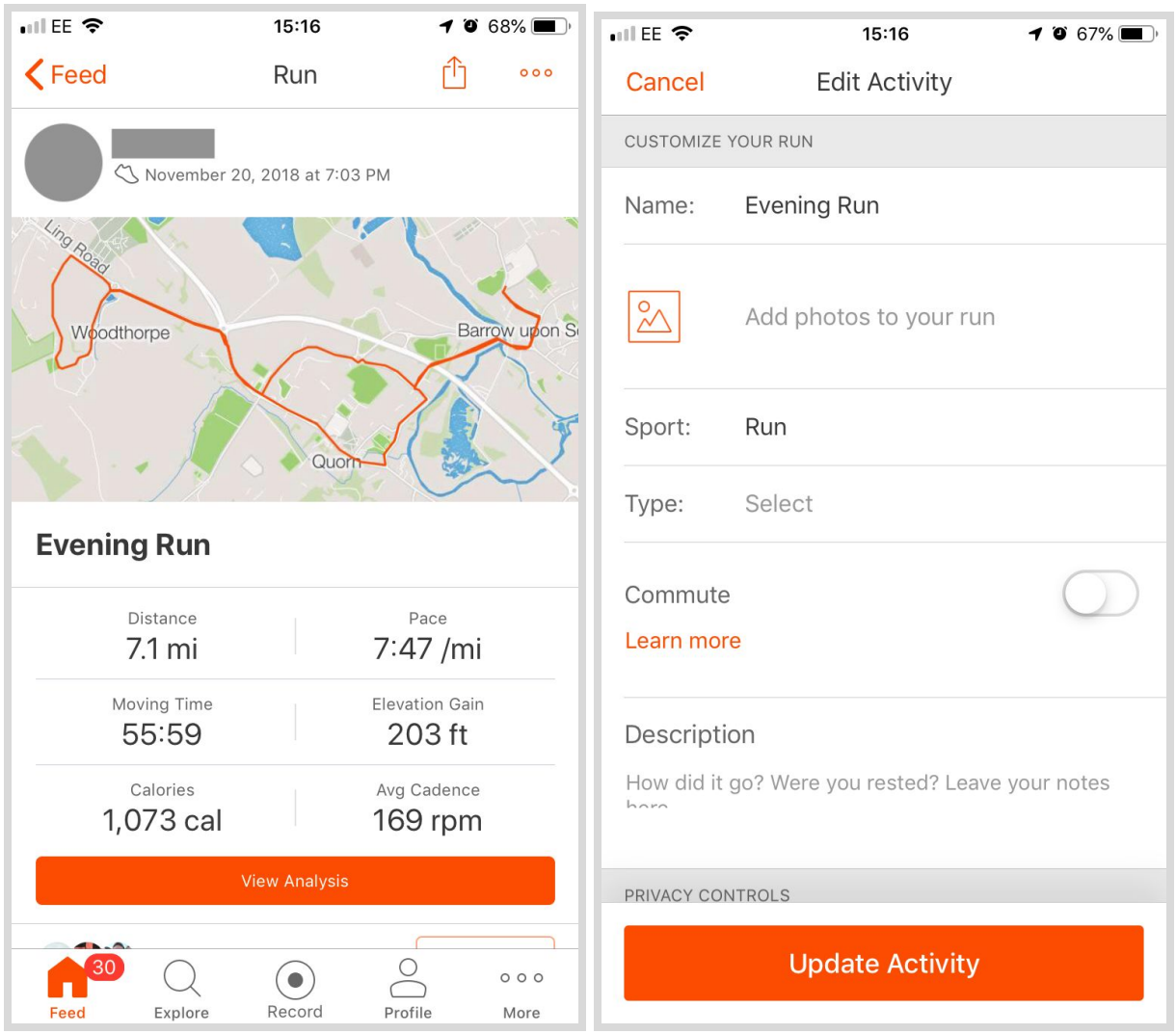
- ➔ More familiar (and comfortable) with their own tech
- ➔ Don't have to remember to fit another device into their life
- ➔ No associated costs for buying, distributing and collecting, loss or damage, or maintaining hardware

Casestudy: How Strava supports mixed mode activity recording

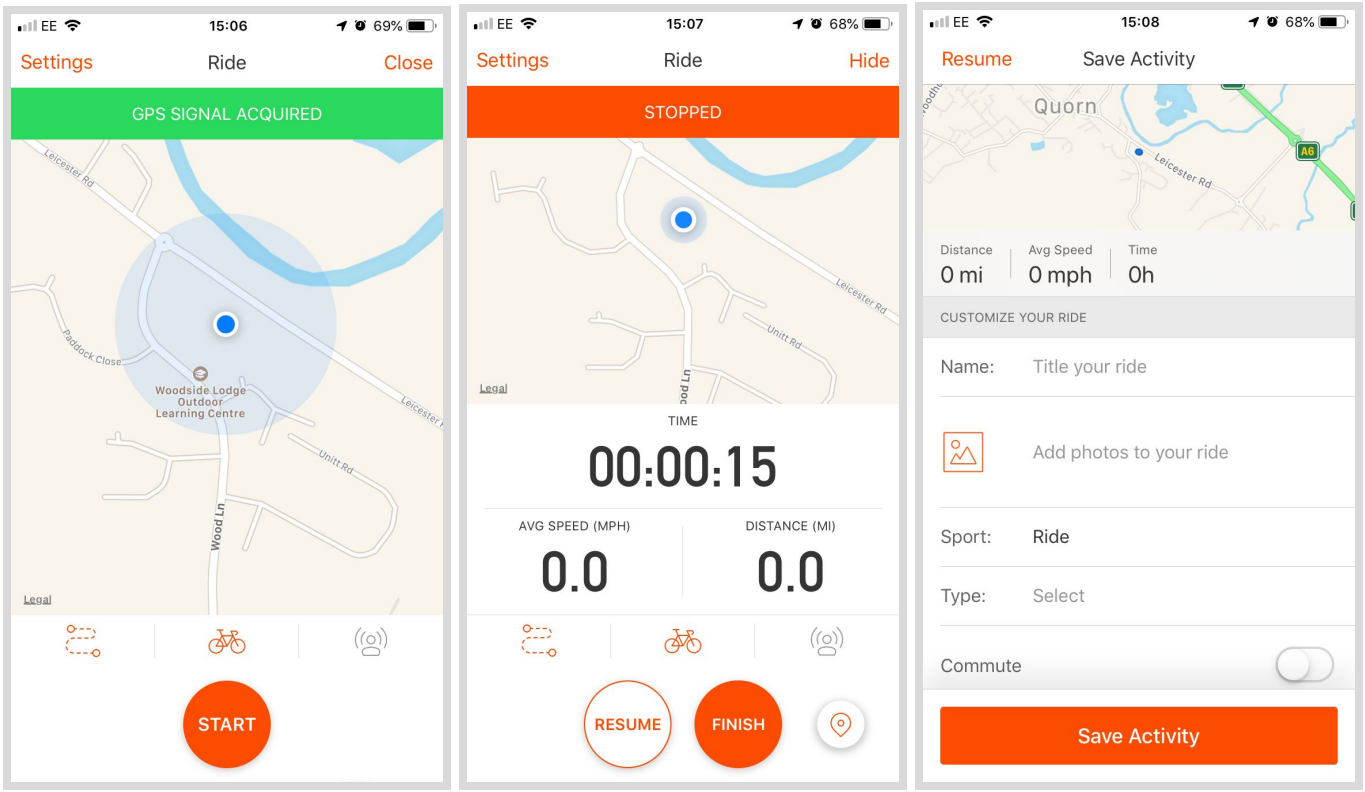
Strava is used by runners, cyclists, swimmers, and others to track their activities.

Similar to the NTS Travel Diary these users exhibit a range of behaviours and preferences of when and how they record their activity details.

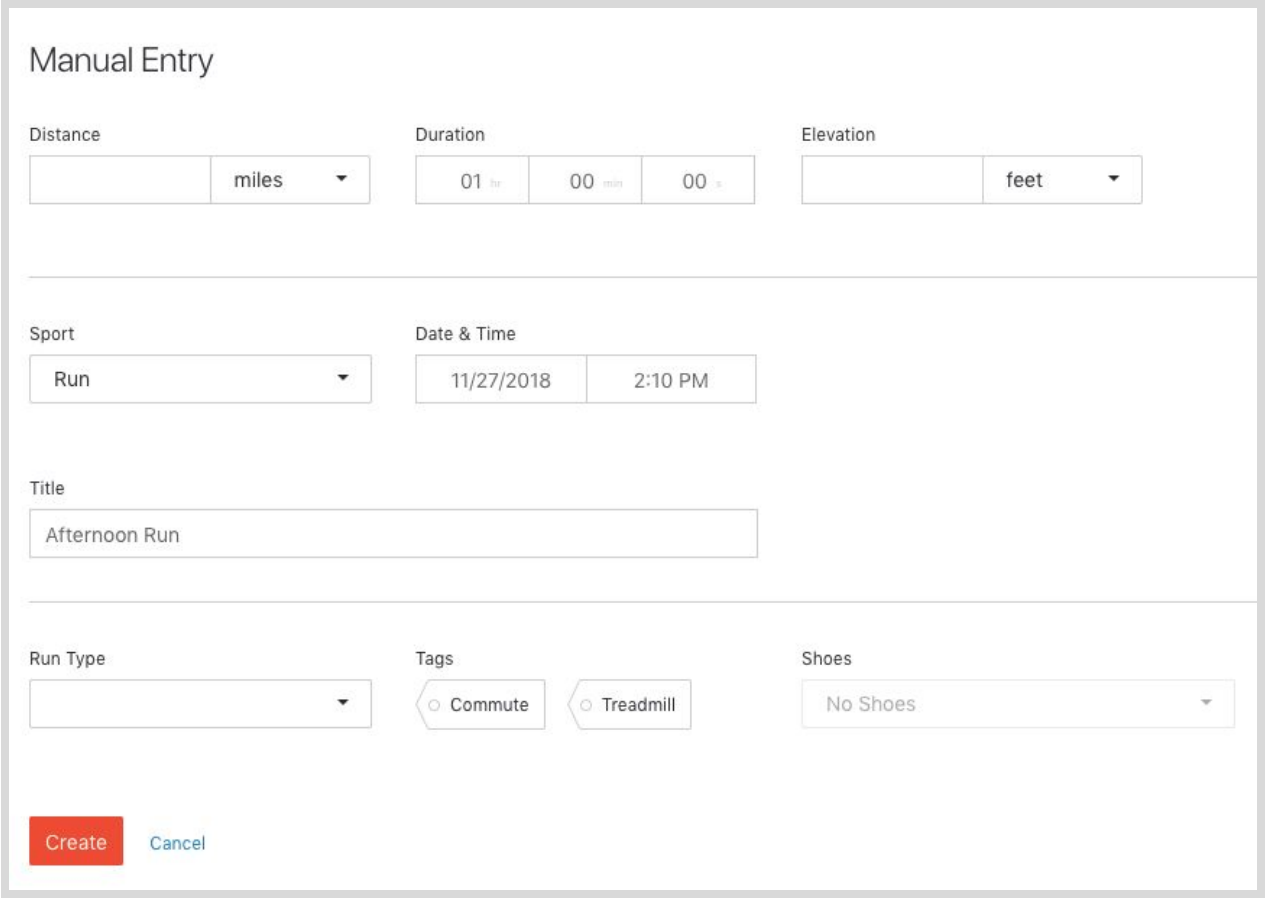
Scenario #1: Data synced from a GPS device to automatically generate an activity instance in the Strava phone and tablet app. The user can then edit and augment the activity in the app or on the strava.com website. They may also decide to delete the activity or hide it from other Strava users.



Scenario #2: Record (start and stop) a journey on the phone app as it happens and then augment extra details afterwards.



Scenario 3: Manually add a previous activity on the Strava phone app or on the strava.com website (as in this example):



Please note: we are not recommending the adoption of the Strava platform for the NTS. We've included it as an example of others have designed for comparable user needs and behaviours.

Legitimate concern about mixed mode solution to collection

There is an argument that supporting different modes of data collection will make the data inconsistent, especially around the level of a Diary Keeper's recall.

However, this is already the case with the range of recording behaviours with the paper diary.

Furthermore, with a digital collection it will be possible to observe and analyse the recording behaviour of Diary Keepers. For example, by timestamping when a journey was recorded in a diary it will be possible to see how long after the journey it was actually recorded.

This in turn can open up opportunities to mark data that is at higher risk of recall inaccuracies.

8.3.2 Do the hard work to make it simple (for the users)

A well designed digitised version of the Travel Diary could certainly improve the user experience and reduce the burden on Diary Keepers.

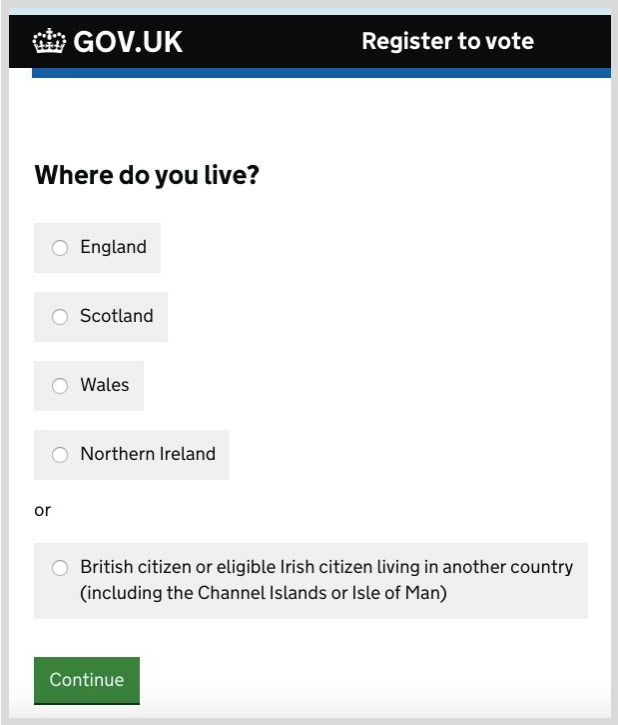
Note: achieving this will help meet the GDS Service Standard of Make sure users succeed first time.

Specific recommendations have been broken down into three groups: reduce cognitive load, save time, and improve recall and accuracy. Most recommendations actually fit into more than one group.

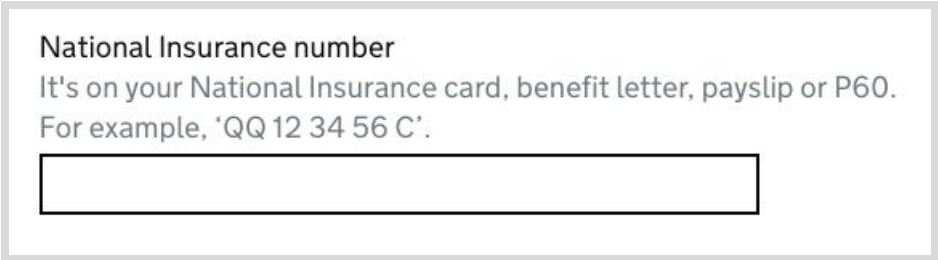
Reduce cognitive load

- ➔ Adopt a *progressive disclosure* model to only show / reveal questions that are relevant to the Diary Keeper based on previous answers, e.g. only show / ask the ticket cost question if they selected a public mode of transport
- ➔ Adopt the GOV.UK *one thing per page* pattern for recording a journey - presenting a user with just one (or two) decisions at time is proven to improve the user experience, even if it means more screens in a journey

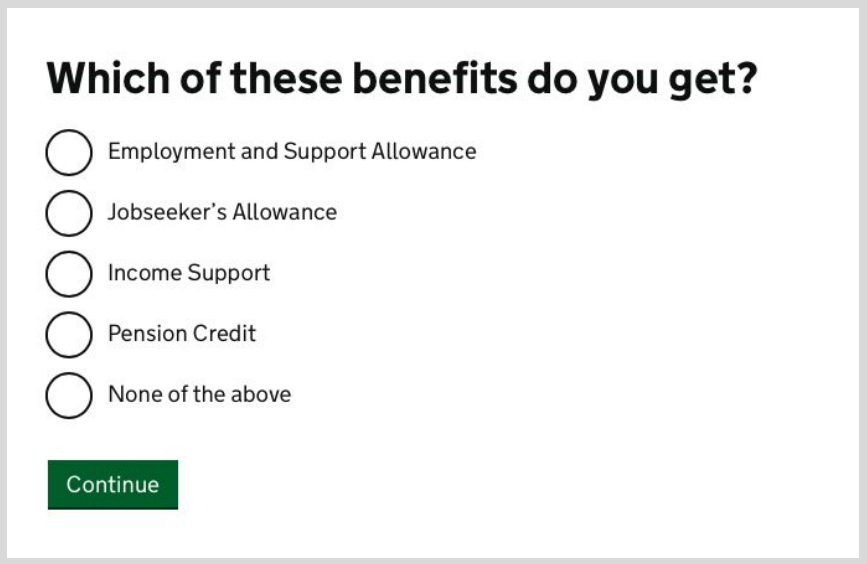
The GOV.UK Register to Vote service follows the *one thing per page* pattern to make it easy for the user to focus on one discreet question at a time (rather than having a long form page):



- ➔ Remove unused question field boxes until they are required, e.g. 'Add another stage'
- ➔ Improve the user experience of building / adding / moving the stages in a journey - the current template is confusing some users and too restrictive with only 3 stages per journey (unless you go to an extra sheet at the back)
- ➔ Adopt the GOV.UK *hint text* pattern to provide in context guidance for form fields (where valuable)



- ➔ Offer predefined lists for questions such as method of travel (e.g. bicycle, train, plane, walking) so the Diary Keeper does not have to type



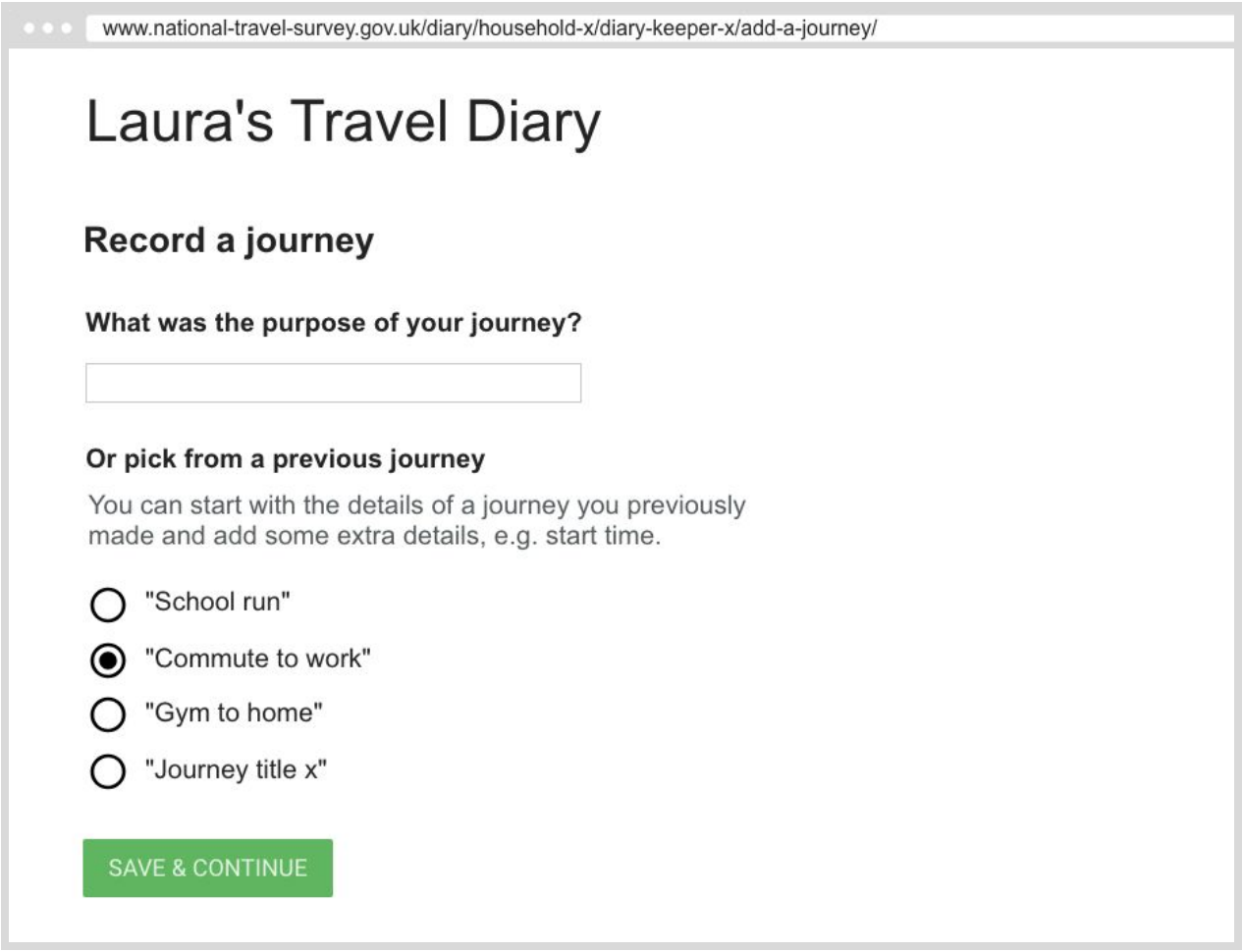
- ➔ Allow Diary Keepers to enter metric or imperial distances (and convert that in the background)
- ➔ Don't ask Diary Keepers to estimate the distance of train journeys - work that out for them in the backend

We recommend you use the GOV.UK Design System as many of these design patterns will be immediately available to develop an Alpha prototype with.

Save time

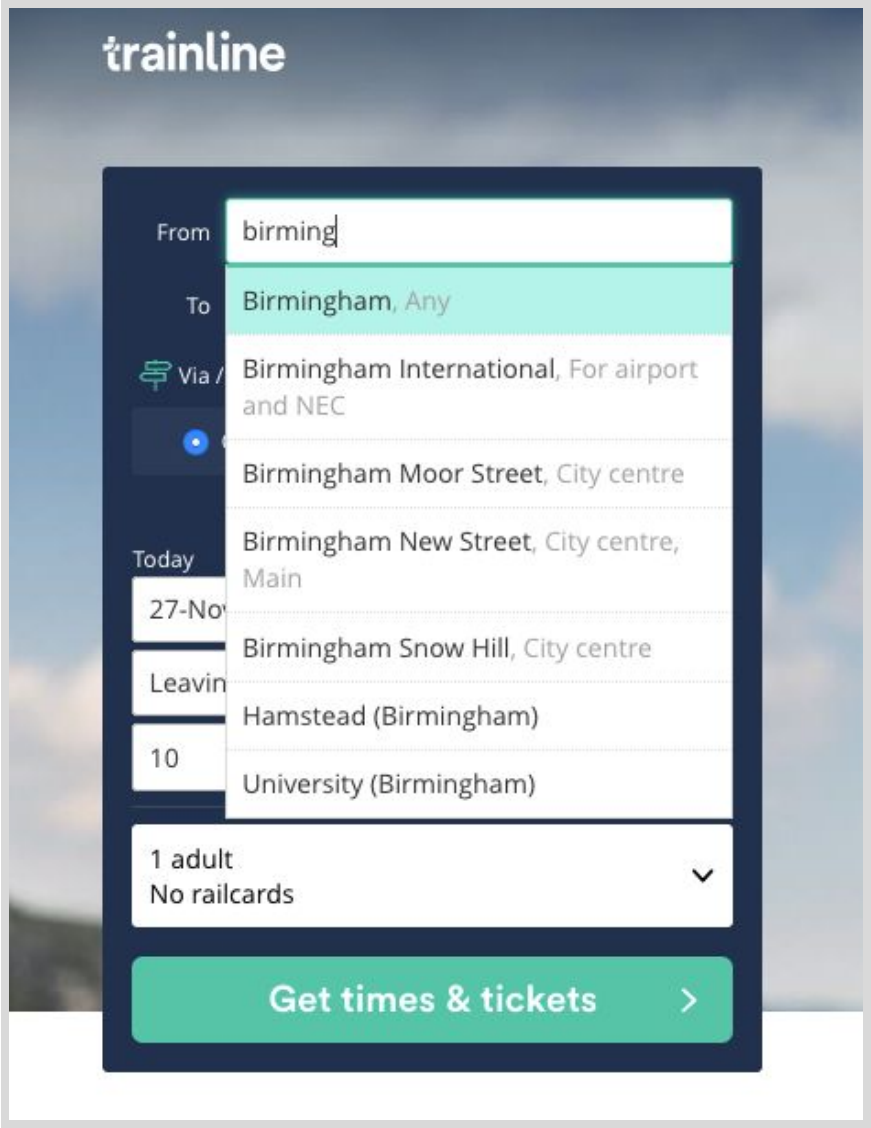
- ➔ Let a Diary Keeper create a return journey based on an outbound journey - pre-populate the details (e.g start and end point, distance, and mode of transport) and leave others blank for completion (e.g. journey start time). It should be possible for the Diary Keeper to edit any details before submitting
- ➔ Introduce *Your favourite places* to store and pick (e.g. my work, kids school, gym) - these could be added before the travel week and / or during the week
- ➔ Allow Diary Keepers to copy a previous journey to another day (e.g. commute to work) - variable fields should be left blank for completion (e.g. journey start time). It should be possible for them to edit any details before submitting

This concept shows how previous and / or favourited journeys could be presented to the Diary Keeper as they start to record a journey:



- ➔ Allow Diary Keepers to tag another householder on a journey so it appears in their diary too
- ➔ Autocomplete places, e.g. start typing 'Bir…' to be presented with accepted areas of the city based on the Gazeteer database - this could eventually be assisted by GPS on mobile phones to suggest nearby places

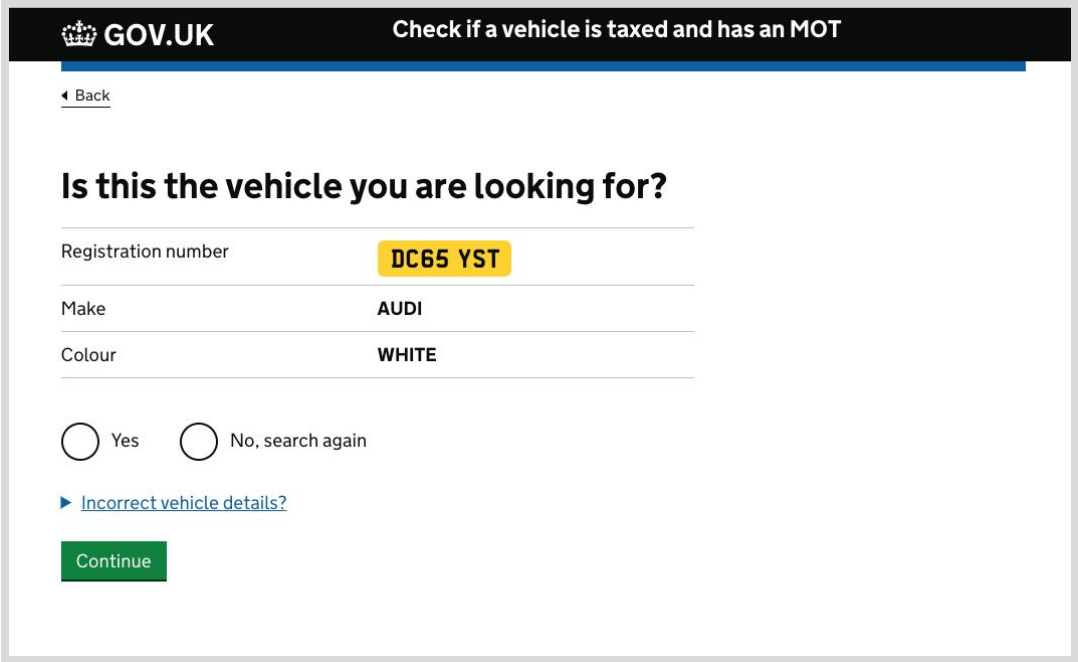
The Trainline website and app uses autocomplete to suggest the train stations in its database. This reduces the cognitive load and burden on the users to know exactly what the stations are called (according to Trainline) or even which stations exist in an area.



Improving recall and accuracy

- ➔ Allow Diary Keepers to record the initial details of a journey as memory jogger / prompt to complete later - handle as a draft, incomplete journey and alert them to complete it later
- ➔ Use established form design patterns and code to remove current issues around legibility (e.g. “Is this a 5 or an 8?”) and uncertainty about what an entry is attributed to (e.g. overlapping two boxes)
- ➔ Trigger reminders to Diary Keepers to record their journeys, e.g. when no journeys have been recorded for over 24 hours

➔ Do a DVLA lookup and auto-populate fields in the diary, similar to this GOV.UK service:

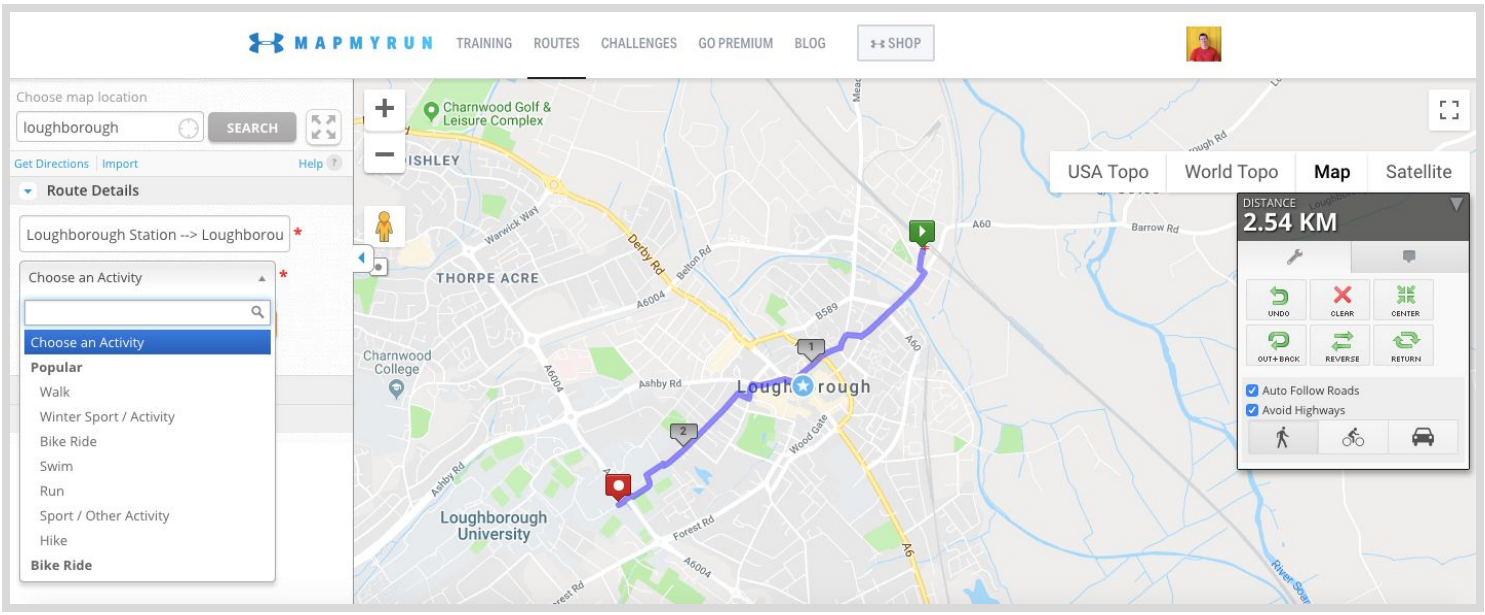


➔ Auto-calculate distance between start and end point of a journey in the back end and either suggest that to a Diary Keeper (with ability to edit) and / or use it to validate the input distance and flag potential mistakes

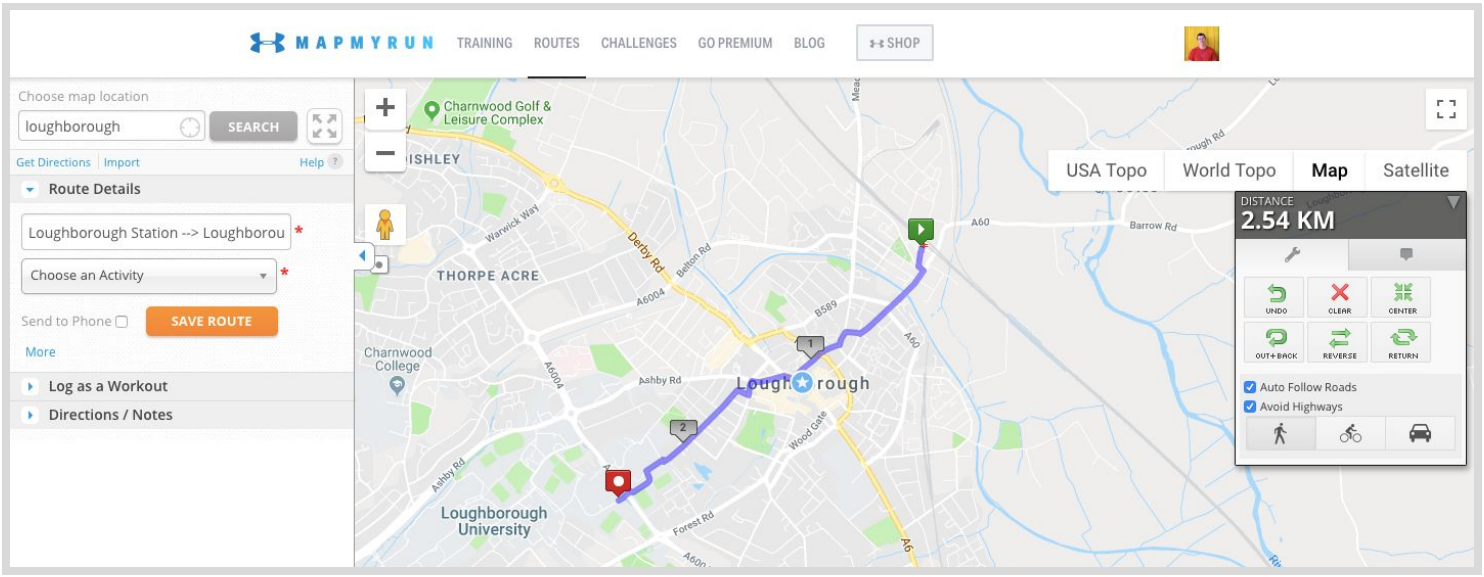
➔ Integrate interactive maps for Diary Keepers to pin journey start and end points to a) improve accuracy, and b) open up more precise location data (some users are already making us of them anyway)

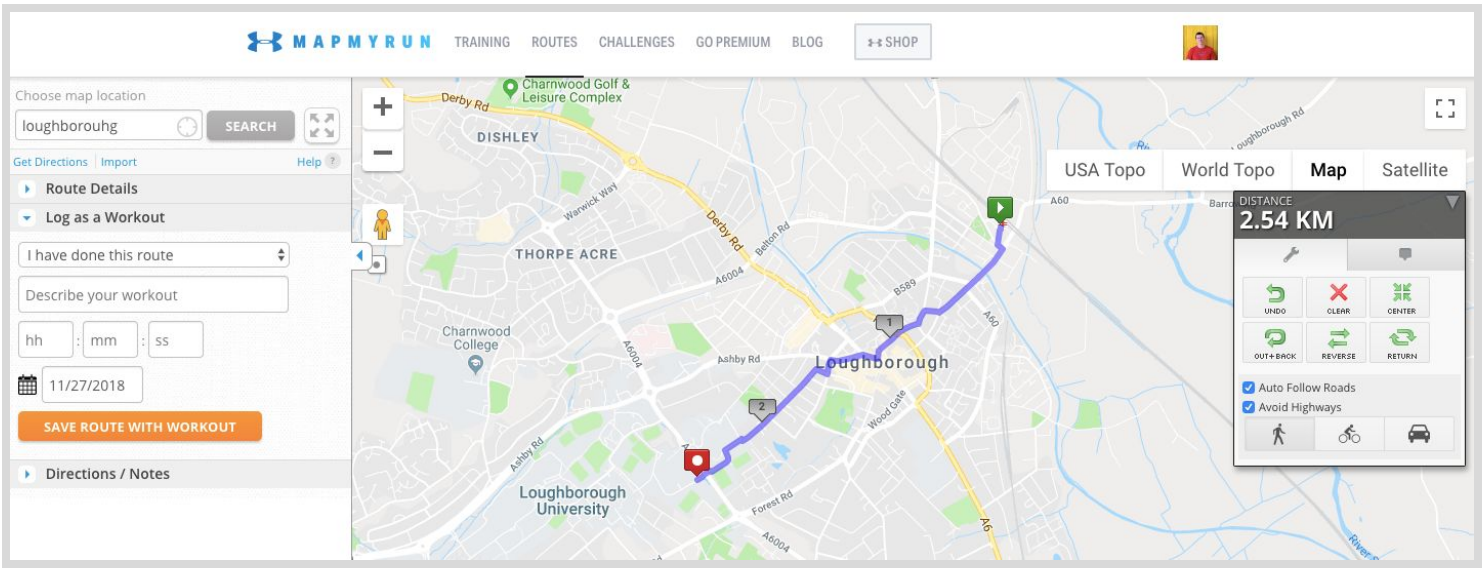
Casestudy: MapMyRun

The MapMyRun website seamlessly integrates Google Maps into the user interface, allowing the user to interact with the map to plot start, way, and end points. These interactions automatically generate data elsewhere in the interface, e.g. the distance field:



The user can then input additional details about their route in the left-hand panel, including type of activity, date and time:





8.3.3 Enable the Interviewers

Interviewers are currently critical to the uptake and completion of the Travel Diaries. Their professionalism, and commitment to the NTS is impressive. Yet it is striking how much of their role does not make use of their skills.

This Discovery has revealed several opportunities for a digital service to a) reduce the administrative burden on the Interviewers, and b) let them spend time doing the skillful parts of their job.

The user needs validation survey also demonstrated that this group have the greater level of user need from a digital diary service.

Specific recommendations:

- ➔ Allow the Interviewer to create and configure travel diaries for *their* households, e.g. add a householder's name to each diary, and relate all the diaries in a household to open up opportunities for cross-referencing journeys
- ➔ Allow Interviewers to remotely and discreetly 'check in' on active diaries - this alone could remove unnecessary midweek check in calls
- ➔ Build in mechanisms to flag to Interviewers unsatisfactory performance from their households, e.g. 'Diary Keeper X has not recorded a journey for 3 days'.

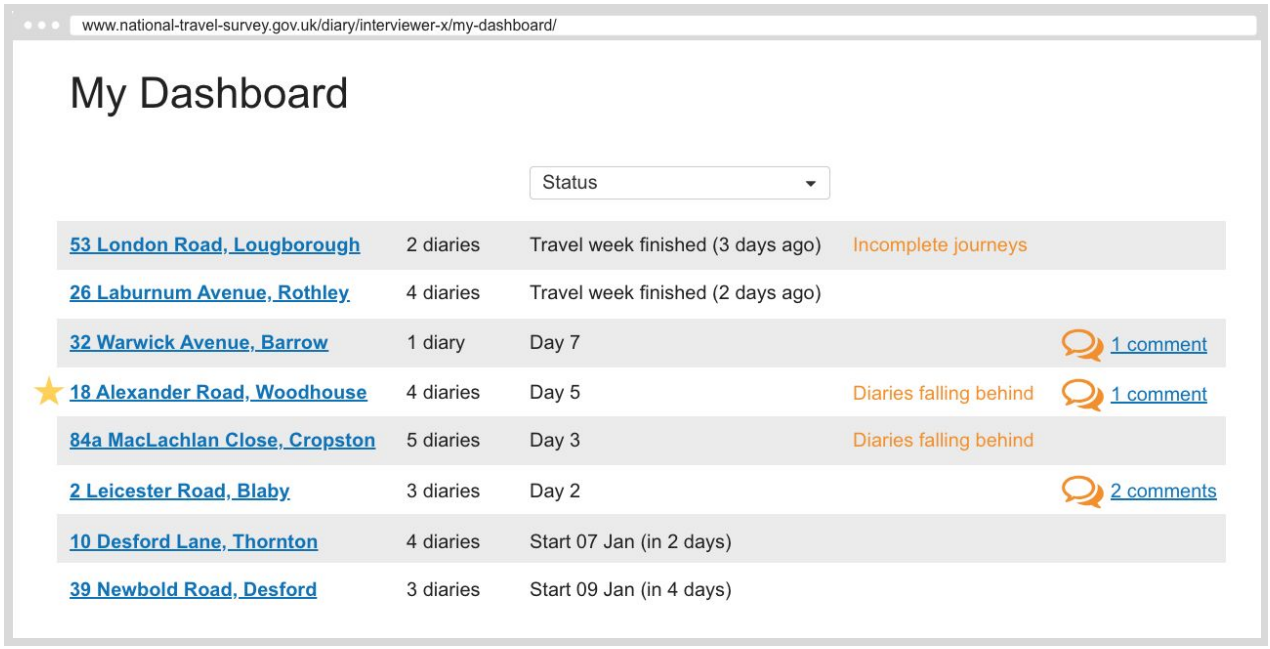
➔ Remove the need for a physical pick up of the diaries (and related paperwork) from the household - saving coordination and travel time

➔ Create the mechanism for Diary Keepers to ask their Interviewer for guidance, e.g. to check if and how they should record a specific journey

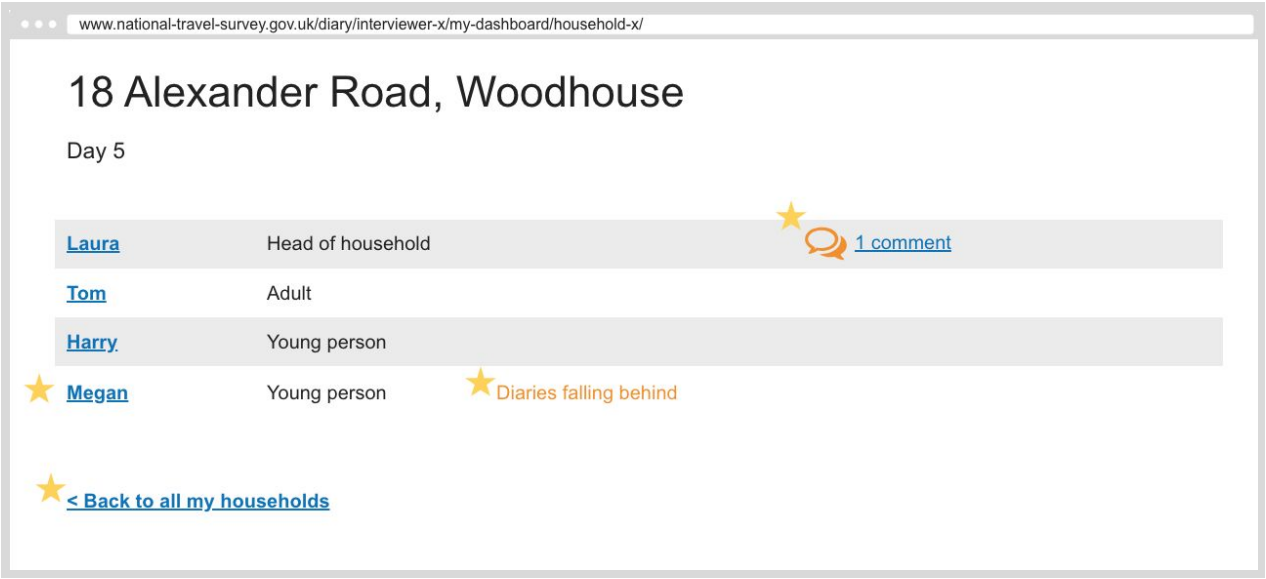
Interview dashboard concept

This concept introduces an Interviewer's view of the Travel Diary. A simple dashboard can present the Interviewer's households with information about the number of diaries been kept per household and alerts to any potential problems or queries.

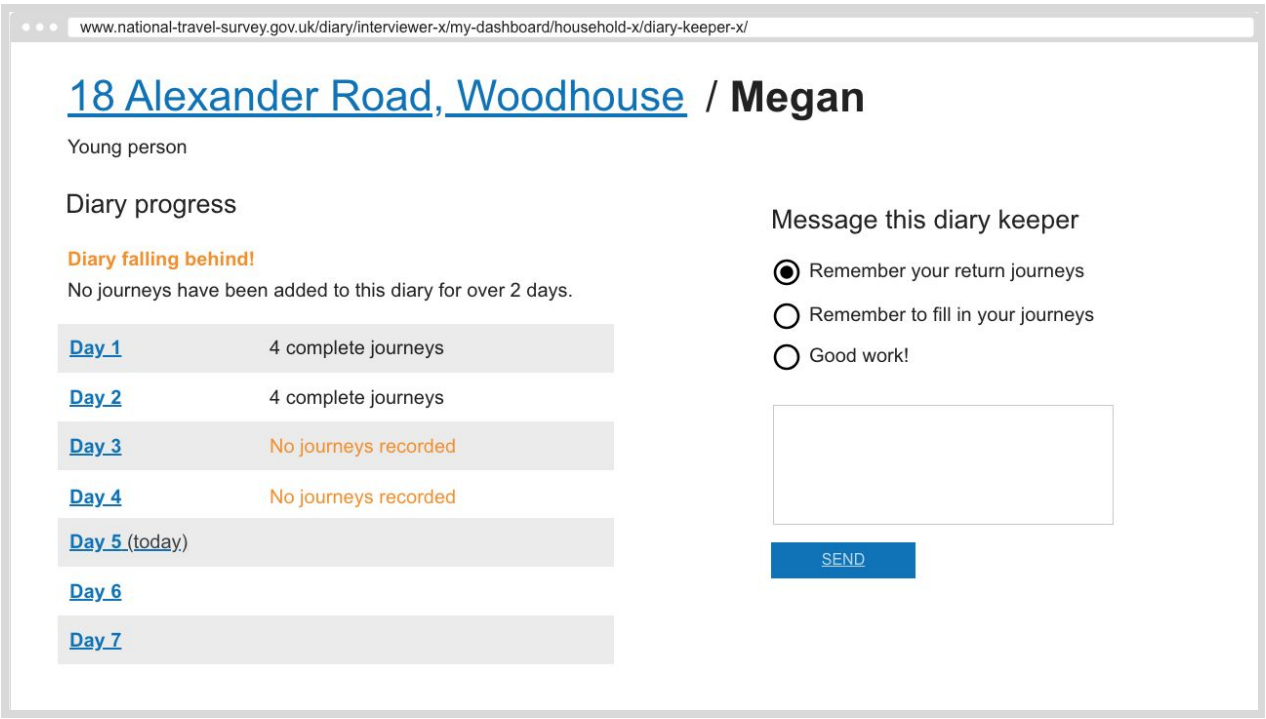
The Interviewer can then drill down to remotely observe progress and engage with Diary Keepers:



Next the Interviewer can drill down to one of *their* households. They can see which diaries have potential problems (if any) and also check if the Diary Keepers have raised any queries.

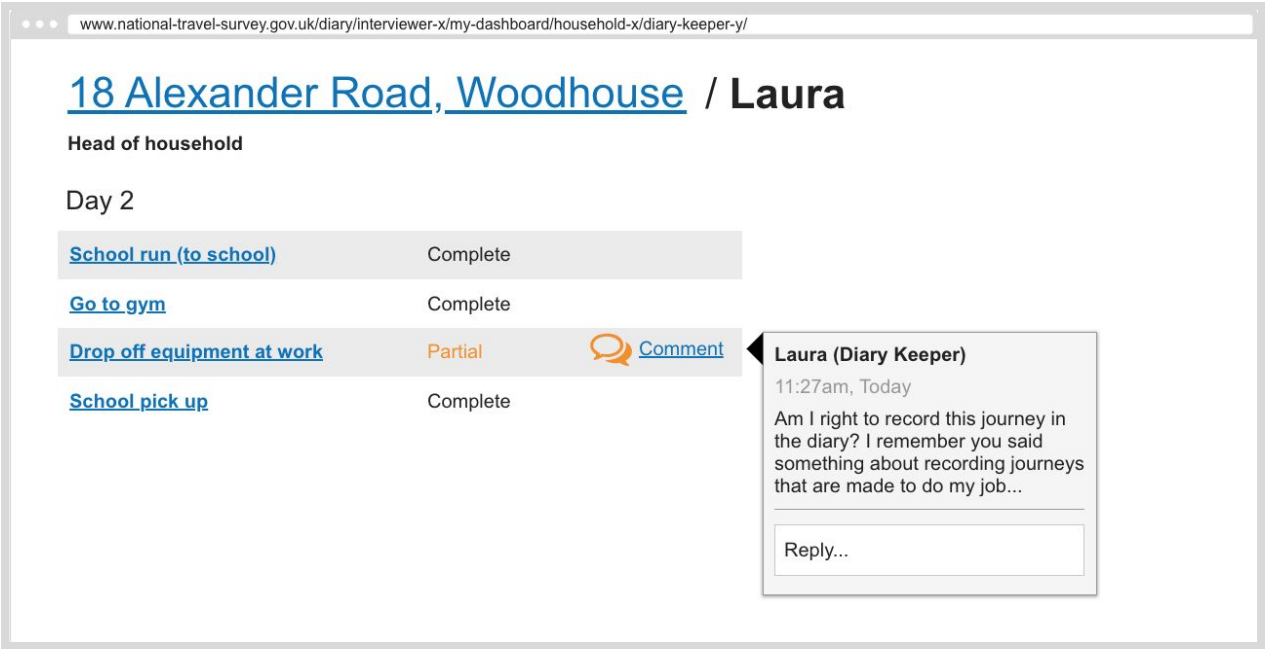


Next the Interviewer can drill down to the individual Diary Keeper's page to see what has been happening (or not). It intelligently highlights potential problem points. It also provides the facility to send pre-set and open text 'nudge' messages to the Diary Keeper.



The Interviewer can also look at a comment from a Diary Keeper seeking clarification. The Interviewer can click into the individual journey to better interpret and advise by

directly replying to the Diary Keeper in context:



Spread the Interviewer's burden

Interestingly, there is further opportunity with a digital solution to spread the burden of supporting Diary Keepers beyond their 'responsible' Interviewer.

For example: a centralised support team could quickly respond to a Diary Keeper's query about how to record a journey.

8.3.4 Enable the multi-Diary Keepers

The Discovery has revealed the significance of burden on individual Diary Keepers that record journeys on behalf of other householders. These individuals are key to the full completion of household diaries.

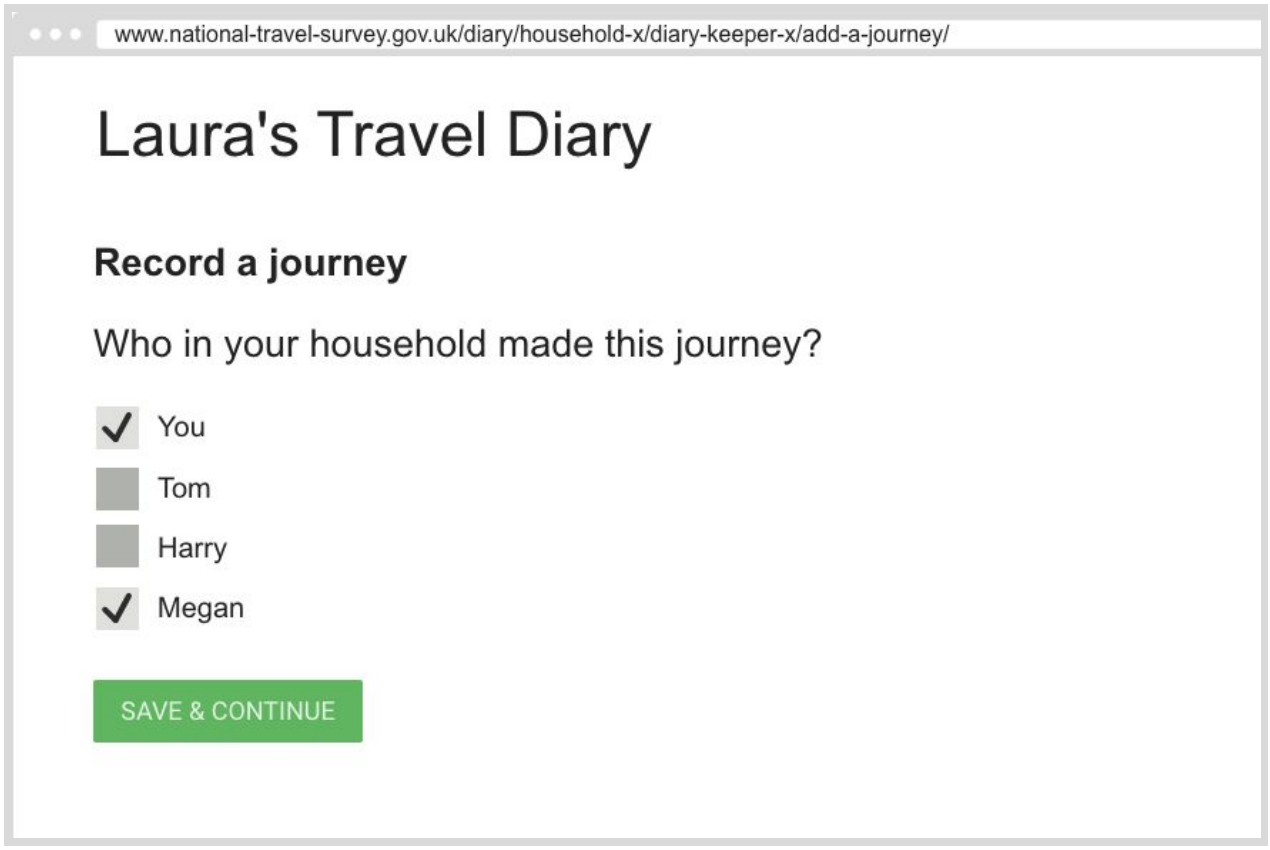
Remember that all diaries in a household have to be completed for any of the diaries to be used in the final NTS.

There are opportunities for a digital version of the Travel Diary to reduce their burden:

- ➔ Set up a nominated householder to have access and ability to record the journeys on another householder's diary

➔ Tag several householders with the same journey to support accurate cross-referencing, and reduce the need for double / triple / quadruple keying the same journey details, e.g. the school run for dad's diary and the children's diaries

This basic concept shows how a step could be added into the *Record a journey* user journey that quickly lets one householder (i.e. Laura) apply or 'tag' the same journey to other people in her family (i.e. Megan]:



8.3.5 Tailor the Travel Diary to the Diary Keeper's context

Interviewers are already tailoring the paper diaries based on their understanding of a Diary Keeper. They fold paper, cross columns, and underline key parts to reduce cognitive load, save time, and increase recall and accuracy.

A digital version of the diary has greater potential for tailoring.

In the MVP (or early iterations) you should design the service to let Interviewers create and pre-populate the diaries for a household with such details as:

- ➔ Location of home
- ➔ Favourite places (inc. work, school, gym) to pick from when recording a journey
- ➔ Preferred modes of transport
- ➔ Preferences for alerts and reminders
- ➔ Household vehicles
- ➔ Travel passes and tickets

The service should also create the necessary relationships between diaries in the same household to enable the recommendations about tagging and cross-referencing several householders to the same journey.

These details can then be used to control various aspects of the user experience including:

- ➔ Which form questions to show and *not* show
- ➔ The order of questions or answer options (to prioritise them for the context of the Diary Keepers)
- ➔ (Part) generate answer lists, e.g. choose from 'favourite places' when entering a journey start location, or selecting the household car used for a journey
- ➔ Control preferences and rules for when and how alerts are made

Explore automated configuration of the diaries

Most of the details listed above are already collected in the household and individual Interviews during the placement call. They are captured in the Blaise CAPI software.

This means the Interviewer will be double keying into Blaise and the digital Travel Diary service.

The desired state is for the digital Travel Diary is to pull the data from Blaise in the backend to mitigate the burden on the Interviewer.

However, given the instances of Blaise (version 4) are hosted on the individual Interviewer's laptop and data is currently transmitted from it via the local NatCen network, a key question remains how that information can be used to configure the Digital Diary in a timely manner.

8.3.6 Nudge Diary Keepers

Even when a household agree to keep a Travel Diary we have learnt how challenging it can be for them to successfully complete the diary for the entire week.

Interviewers have developed various motivational and nudging techniques to ensure completion.

A digital version of the diary can help with this, and would be key to enabling a future second tier NTS (without Interviewers).

Specific recommendations:

- ➔ Acknowledge and reinforce positive activity and progression
- ➔ Feedback and highlight a lack of progression, inactivity, or incomplete elements
- ➔ Explore introducing gamification mechanics into the experience, e.g. create a sense of competition between the householders to keep updating their diaries
- ➔ Present (back) data and insights about their travel behaviour, e.g. ‘You have ridden your bike for 15 miles so far this week.’ (although potential effects on behaviour would need to be taken into consideration)
- ➔ Present their travel behaviour in context for greater insight, e.g. ‘Your household made X journeys by bicycle this week which is X more than the average.’
- ➔ (Re)communicate the purpose and value of participating, e.g. ‘Did you know? Last year decision X was made based on the journeys others recorded in their diary’

Note: some of these options do raise considerations about inadvertently influencing travel behaviour during the week.

8.3.7 Embrace the accessibility potential of digital

Some stakeholders and many Interviewers have expressed legitimate concern that a digital version of the Travel Diary will be less accessible to NTS participants than the current paper version.

Assisted digital users are individuals that lack the digital literacy and / or means of access to engage with a digital service. They are considered in more detail in the Assisted Digital Impact Assessment section above.

The important counter argument regarding accessibility is the potential for a well designed, standards-compliant digital version of the diary to actually make it more accessible to several groups.

Users with impairments

Diary Keepers with visual, motor, and cognitive impairments may find it easier to complete a digital version than the paper version as it allows them to use their assistive technologies to navigate, read, and input. Examples include:

- ➔ Ability to enlarge the interface for legibility
- ➔ Tab from active area to active area, e.g. from one form field to the next

The current paper diary booklet has been carefully designed, but is ultimately limited by its medium and is not an optimum user experience. Previous Diary Keepers have criticised it for the amount of boxes they never need to complete, and making them record journeys with more than three stages on later sheets.

A well designed diary that adopts the (GDS and general UX) design principles will improve these accessibility barriers.

Users with language barriers

Diary participants that do not confidently read or write in English could be presented a version of the diary in their preferred language. The digital diary could be built to support *localisation* to serve the same user interfaces in different languages.

This would raise questions around ensuring consistency in the method, and if and how to handle Diary Keeper data in another language.

That said, a digital version of the diary would open up this opportunity.

8.3.8 Aim to build a digital diary that does not require concierge service from the Interviewers

Diary Keepers are currently offered a *Concierge Service*, i.e. the Interviewer will support them to successfully complete their diaries.

The Discovery has revealed the lengths Interviewers will go to support successful completions, from daily visits, to filling out the entire diary at the pick up interview.

This is a problem on several levels, and a redesigned service is an opportunity to reduce this service level.

In fact, to be compliant with the GDS Service Standard a digital service must Make sure users succeed first time.

Note: there are probably exceptions around Interviewers supporting users with assisted digital needs, but this should not permit a poor user experience.

8.3.9 Remove the need for a physical pick up call

A digital version of the Travel Diary should remove the need for an Interviewer to physically travel and collect the diaries. They can check them remotely and if necessary query anything over the phone.

Initially, the pickup interview questions (inc. new vehicles, mileage details, and new driving licences) can also be asked over the phone and input by the Interviewer into Blaise.

Further along the roadmap the service could be extended to pose those questions to the Diary Keepers after they finish Day 7, and remove the intervention of the Interviewer. This would further mitigate the coordination and time for a *pick up* phone call.

8.4 CORE USER JOURNEYS

Based on the priority user stories, these are the high-level user journeys the prospective digital diary will need to serve:

8.4.1 For Interviewers

1. Set up diaries

Add a household ⇨ Add a diary per householder ⇨ Tailor diary to their context ⇨ Give access to each diary

2. Monitor and facilitate Diary Keeper progress

Get alert of potential issue OR View a household ⇨ Review householder diary ⇨ Nudge / contact Diary Keeper

8.4.2 For Diary Keepers

1a. Record my journey

Create a journey (record) ⇨ Add details (auto save progress) ⇨ Address errors / answer clarification prompts ⇨ Confirm journey details ⇨ Finish & Save

1b. Record a journey (on behalf of another householder)

Access other householder's diary ⇨ Create a journey (record) ⇨ Add details (auto save progress) ⇨ Address errors / answer clarification prompts ⇨ Confirm journey details ⇨ Finish & Save

2. Complete / edit a recorded journey

Access diary ⇨ Locate recorded journey ⇨ Edit / complete detail ⇨ Address errors / answer clarification prompts ⇨ Confirm journey details ⇨ Finish & Save

3. Seek clarification

Access diary ⇨ Write query ⇨ Submit ⇨ Get response

OR

Access diary ⇨ Locate recorded journey ⇨ Write query (in context) ⇨ Submit ⇨ Get response (in context)

8.5 DATA RECOMMENDATIONS

8.5.1 Bring data validation upstream (to the point of entry)

The current paper diary requires considerable manual effort to validate diary data (see service journey mapping findings).

A digital version of the diary opens up significant potential to reduce error and inaccuracies by validating data at the point of entry.

User facing validation

- ➔ Detect and prompt users for missing journey details, e.g. journey made by car, but not entered a number of passengers
- ➔ Detect impossible or unlikely journeys, for example:
    - ◆ The journey's start time is later than the given arrival time
    - ◆ The journey's distance not possible in the given duration of the journey
- ➔ Error messages should be presented in context to explain why the validation error has occurred, and how to remedy and progress
- ➔ Log these validation errors to learn where users are struggling (to iterate the user experience)

Back-end validation and monitoring

- ➔ Detect and flag signals of inaccurate diary data, for example:
    - ◆ A journey recorded in the diary several days after it was made
    - ◆ A rush of recorded journeys at the end of the travel week
    - ◆ Tendency to round everything up
    - ◆ Lower than expected number of recorded journeys - this could be based on aggregate NTS diary behaviour and / or indicators of expected behaviour from the Interview

These signals could be used to report and alert Interviewers or others NTS people to further investigate and / or intervene.

8.5.2 Remove the manual journey coding process as much as possible

Each year, over 200k journeys are recorded in the paper diaries and then *coded* by the NatCen Remote Coders.

For example: *'Go to Cinema'* in column A of the diary would be coded as a ***13*** *[Entertainment / Public social activities]*.

There are 23 codes for them to pick from. The selected code for each journey is annotated in red pen on the paper diary and then input into the Diary Entry System (DES). Note: the original handwritten journey purpose (column A) is not input into the DES.

This is apparently a largely straightforward and repetitive task for the Remote Coders. Yet in some instances the appropriate code is not obvious, and this requires them to *interpret* the purpose of each journey. This sometimes means consulting the paper definition manual they are each issued with.

The individual Remote Coder may learn from this experience and be quicker to interpret future journeys, but the benefit of this learning is not shared by the process or peers.

Considering the scale of the coding task, there appears to be a major opportunity for technology to handle the coding step.

Our expectation is that the coding step could be done accurately, and in the background, at the point of entry in a digitised diary, i.e. at the point the Diary Keeper records the details of their journey.

If the system cannot accurately code all journeys there is potential for such journeys to be flagged for manual intervention.

Conduct a supervised learning experiment

We recommend the NTS Team run a ***supervised learning*** experiment with existing NTS diary data to see if it could accurately (re)code recorded NTS journeys.

The hypothesis to test: *It is possible for the system to accurately code the purpose of a journey.*

Fortunately there are hundreds of thousands of examples of coded journeys where you know what the output (coding decision) should be.

However, at this point only the codes per journey are input and stored in the data tables. The Diary Keepers' handwritten journey purpose data points are not. The paper diaries are stored for auditing purposes so it is possible to access that data for the experiment.

What will you learn?

The experiment would reveal the overall potential and begin to answer some specific questions:

- ➔ Which sorts of journeys are particularly difficult for a machine to accurately code?
- ➔ What steps are required to further improve the accuracy of the coding?
- ➔ When and how are people (e.g. Remote Coders) still required and valuable in the coding step?
- ➔ Does the service need to ask clarification questions to Diary Keepers about the purpose of their journeys to assist with the coding?

The answers to these questions will inform the decision (or not) to attempt to integrate automated coding into the backend of the digital diary service.

8.5.3 Capture the richer context of journeys

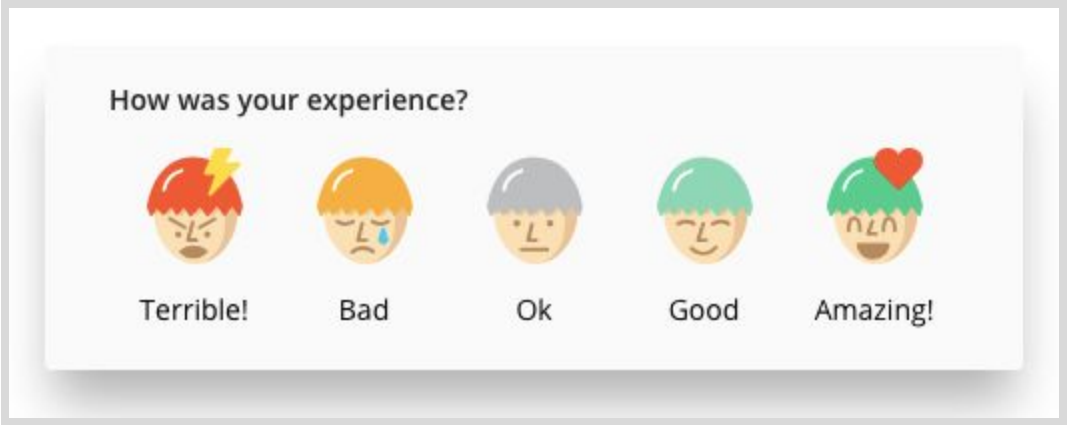
Data users are largely content with the NTS question bank, but there is a desire from some data users for richer context around recorded journeys. The attitudinal interview during the placement call is limited to one householder and not journey specific.

Sentiment / attitude towards a journey

Take the opportunity to ask Diary Keepers to reflect on their feelings towards each journey, perhaps for each stage of a journey.

Interestingly we have learned how some Diary Keepers want to share details on their attitude to the journeys they record.

This could be a simple categorisation, like this example from a browser based service:



This could extend to an optional text field for the Diary Keeper to further expand on their attitude towards a journey, e.g. “The train was late again!” “There was a crash on the motorway”.

This would be immediately digitised and opens up further opportunity for textual analysis.

Remember that a significant motivator for Diary Keepers is the opportunity to have their say. Sharing how they feel would reinforce this.

Note: such attitudinal data would be even more important to collect with the journeys in any second tier of the NTS without the interview component/s.

Decision making in a journey

The current question bank captures the purpose of a journey, but does not reveal if and where decisions were made about how the journey was made.

Some NTS data users have raised their frustration that they cannot get this richer insight.

For example: a family could have several travel options for the morning school run: walk, bicycle, or car.

The digital diary could be designed to enquire if there was a considered or viable alternative travel option for a journey or its stages.

Note: adding these extra questions is not dependent on digitising the diary, although digital's ability to introduce progressive disclosure of questions is a serious advantage.

8.5.4 Create a data strategy that sets clear expectations of how data flows within the diary ecosystem

The DfT Digital and Technology Strategy and the GDS Technology Code of Practice both have good advice in this area. Objectives should include:

- ➔ Facilitate an easy exchange of data between the different systems and services at a technology level in the diary ecosystem
- ➔ Use open standards to provide consistent and well understood interfaces now and in the future
- ➔ Have high levels of automation and minimise manual processes
- ➔ Move as close as possible to real-time data availability so it can be leveraged earlier for its insight gathering and decision making capabilities

8.6 TECHNICAL RECOMMENDATIONS

8.6.1 Focus on the Digital Diary, don't try and replace the whole ecosystem

There are a number of different systems working in concert to facilitate the running of the NTS. It would be high risk technologically, financially and for the organisational impact it would have across NTS and NatCen, to try and replace all of them.

For that reason, where a technology or process currently serves its purpose it makes sense to retain it, at least for now. We recommend this even if some manageable manual processes are required to 'grease the wheels'. Complete automation and more real-time data flows are a longer journey.

Specifically the SMS, FAS and, if possible Blaise, along with any pre-data delivery weighting and cleaning could all be retained at this stage. This would allow you to focus on introducing a digital diary and replacing the DES (see next recommendation).

8.6.2 Replace the DES, don't build on top of it

Building on top of the Diary Entry System (DES) makes neither technical nor business sense for a number of reasons including:

- ➔ It's predominantly a desktop app and the technology does not translate well to modern web architecture
- ➔ The technology is old and while it retains limited support by Microsoft, the tooling is unsupported and no investment is being made in it. It is effectively a legacy technology
- ➔ It limits deployment to Windows computers only
- ➔ The number of developers and agencies with skills to work in it is small

There is however, potentially valuable knowledge contained within the DES, namely:

- ➔ The data structure which could form the basis for part of a digitised diary
- ➔ Validation rules and process that are the codified, accumulated experience of many years

Where appropriate, this knowledge should be considered for its relevance in any new system. There is a caveat here which is whether intellectual property issues will allow that access.

8.6.3 Use the creation of a digital diary to establish a new platform architecture

Creating a digital platform to underpin the digital diary would provide an appropriate foundation for taking the NTS forward into the future.

We recommend starting only with what you need to deliver the digital diary, but architected in such a way that provides a solid first step towards the future state.

The platform would:

- ➔ Contain core business rules and be responsible for data integrity and validation
- ➔ Establish a set of secure APIs using open standards that allow data to flow in and out in a timely manner
- ➔ Be built on top of a modern cloud-based architecture to allow cost effective scaling and usage-based charging

This model will provide the basis that enables multiple specialist providers to be engaged to solve specific problems, and commoditised solutions to be more easily integrated where appropriate.

The intellectual property of the system should be owned by NTS.

8.6.4 The multidisciplinary team needs an experienced Technical Architect to form and execute a longer term plan for the NTS ecosystem

As recommended above, focusing on the Digital Diary is a lower risk approach at this stage. However, longer term outcomes and the evolution of the underlying platform will need further change, and careful technical management to ensure they happen properly.

While it may make sense to use third-party providers and partners to realise the overall vision, the ownership of this needs to live within the NTS team. A Technical Architect will help select the right partners and make sure decisions are made in the best interests of ecosystem, not just short term project goals.

8.6.5 Consider any data migration strategy early

A new digital diary based on new technology will almost certainly require the migration and/or restructuring of data from the existing database or format.

Consider this early and as part of the proof of concept for the digital diary.

8.6.6 The DfT Digital & Technology Strategy should frame the NTS delivery partner's approach to technology that interacts with NTS

Based on what we've discovered, NatCen [the incumbent NTS delivery partner] has an approach to technology quite different from that put forward in the DfT Digital & Technology Strategy.

How NatCen (or any future NTS delivery partner) manage their work is an internal matter for them, but for them to be an effective partner moving forwards, the interface(s) between the delivery partner and any new NTS systems need to be established in such a way that they can deliver to the guiding principles, particularly around open, accessible data, and security.

8.6.7 Approach & Technology

8.6.7.1 Bespoke over commoditised solution for the Digital Diary

The DfT Digital & Technology Strategy rightly looks in the first instance towards commoditised, off the shelf services. While the final decision lies with the team responsible for delivering the Diary, from our perspective we see a stronger case for a bespoke solution.

The digital diary and related platform is a core competency of NTS that will need to evolve based on ongoing user research and testing. Being dependent on a vendor's product priorities and feature timelines is far from ideal, and indeed risks hampering progress.

Bespoke, however, shouldn't mean doing everything from scratch. As covered below, choosing a good base technology with a healthy community, maximises the opportunity to integrate high quality libraries and components, increasing productivity while retaining full control.

8.6.7.2 Considerations for selecting a technology

When selecting an appropriate technology, the technical needs of the system are of course a key driver. However, by selecting a technology you are also selecting the

ecosystem around that technology which can have as much impact on how effectively you are able to execute your vision.

Based on that, these are our considerations for selecting technologies:

1. Overall profile of the system - for example, is it more a data-driven web application or content publishing platform?
2. The significant product needs now and into the foreseeable future
3. Ease of hiring – availability, quality and cost of the developers
4. How actively developed, mature, well maintained and documented the technology is
5. The community around the technology – how widely used and supported it is, and what libraries, resources, etc are available to help speed up development
6. The technical architecture it imposes and how appropriate is that for the needs of the system

8.6.7.3 Open source over proprietary

Firstly, **open source technology is the clear recommendation**. While Microsoft .NET has many excellent qualities, there are no project requirements we can see that only .NET can fulfil, and so there's no justification for its licensing cost or to go against the GDS Open Source first policy.

8.6.7.4 Frameworks

There are a number of high-quality frameworks in different languages that can provide a base for the Digital Diary, for example:

- ➔ **Ruby on Rails** framework – Ruby language
- ➔ **Django** framework – Python language
- ➔ **Laravel** framework – PHP language
- ➔ **Express** framework – Node.js / Javascript language

Framework selection is often driven by in-house language skills. You chose the best framework in the language your developers use. However, since NTS does not

currently have a development team it's a free choice and you can focus on the qualities of the framework instead. This will actually have more bearing on how you approach and implement the project.

While Django, Laravel and Express are generally excellent and would work for this project, Ruby on Rails stands out at the best option since it is the most complete in satisfying key considerations including:

- ➔ Proven for **data-driven applications** such as NTS
- ➔ Proven at a **scale** suitable for NTS
- ➔ **Mature** technology with a very **engaged** community
- ➔ **Actively developed** and the ecosystem has lots of **high-quality libraries** available
- ➔ Built-in handling of **database migrations**, so managing change in that area is easier
- ➔ Supports **RESTful API** creation as part of the framework to enable open standards and data exchange
- ➔ Excellent built-in **security measures** to negate common attack vectors
- ➔ Supports code and integration **testing**

In addition, **GDS are heavy users** so a lot of the libraries they publish are either written in Ruby or are packaged to be easily integrated with a Rails project.

8.6.7.5 Start with the GOV.UK Design System

GDS have already researched, designed, coded, tested, and iterated many of components, design patterns, and style you will need in the digital diary.

The GOV.UK Design System is a framework that allows a multidisciplinary team to rapidly produce working and part-working prototypes of digital services.

As the NTS is already Government branded it makes further sense to use it.

As GDS say: ‘Use this design system to make your service consistent with GOV.UK. Learn from the research and experience of other service teams and avoid repeating work that’s already been done.’

Use the Alpha to test and validate the suitability of the GOV.UK Design System as the basis for your service.

8.6.8 Make sure contracts are set up for the level of ownership you want

For any third-parties and delivery partners you engage it is crucial that you have a well defined purchasing strategy. Again, the Technology Code of Practice has some valuable information here.

Specifically, for NTS consider:

- ➔ Who holds the intellectual property rights
- ➔ Where the ownership of raw, unprocessed and processed data is
- ➔ Who owns the source code
- ➔ Any ongoing support or licencing cost, contract terms and early exit payments

8.7 GOVERNANCE RECOMMENDATIONS

8.7.1 Decide who is going to be responsible for the delivery of the digital diary

It is not straightforward who would take ownership of such a digital diary service (and the platform that underpins it).

GDS largely expect departments and arms length body to take responsibility for the delivery and ongoing ownership of *their* digital services.

However any digital diary service / platform will be largely used by the commissioned NTS delivery partner (currently NatCen). It will *sit* squarely within their process.

Remember: the current service journey mapping has revealed the extent of the wider process wrapping around the Travel Diary elements.

There are three contenders for owning the digital diary service. Each have pros and cons for taking ownership:

#1 - DfT Digital Team

Pros

- ➔ Digital specialists with technical skills and experience
- ➔ Experts in the GDS Service Standard
- ➔ Owners of the DfT Digital Strategy

Cons

- ➔ Relatively small team with limited capacity for technical delivery
- ➔ Not NTS subject experts
- ➔ Not their strategy to own and deliver digital services

We understand that this team expect to play a supporting role on the development of a digital service:

- ➔ Input around spend control, procurement (of technical partners), hosting
- ➔ Interface with GDS
- ➔ Organise service assessments

#2 - The DfT NTS Team

Pros

- ➔ Existing owners and subject experts of the NTS
- ➔ Direct beneficiaries of the service outputs, i.e. the data
- ➔ Have strong, long-term relationships with the commissioned NTS delivery partner (NatCen) and NTS data users, inc. DfT policy makers, local authorities, academia

Cons

- ➔ Not experienced at delivering digital services to the GDS Service Standard
- ➔ Do not have people to fill specialist roles in a multidisciplinary team
- ➔ Existing and competing work commitments

#3 - Commissioned NTS delivery partner (currently NatCen)

Pros

- ➔ NTS subject experts (NatCen since 2002)
- ➔ Their Interviewers will be major users and facilitators of the digital diary
- ➔ This digital diary will need to integrate with their processes and systems
- ➔ Already focussed on the wider delivery of the NTS

Cons

- ➔ Not experienced at delivering digital services to the GDS Service Standard (to our knowledge from this Discovery)
- ➔ Apparently lacking the digital specialists in a multidisciplinary team
- ➔ GDS may have concerns about ownership of delivery resting outside of DfT

Important: if the NTS delivery partner was made responsible for the delivery of the digital diary, it is essential that DfT own the intellectual property. It must also be possible for another party to smoothly take over the ownership and running of the service so DfT remain free to recommission another NTS delivery partner in the future without losing the digital diary.

Conclusions

No single contender is currently in a position to deliver such a digital service to the GDS Service Standard.

We expect all three will have a key role in delivery, but it should be clear who is ultimately responsible for the day-to-day delivery.

That said, even a combination of these contenders will not be enough to populate the required multidisciplinary delivery team.

The delivery team will need to be augmented by one or several of these options:

- ➔ Procure a technical delivery partner - that will provide digital specialists
- ➔ Recruit permanent digital specialists
- ➔ Hire freelance digital specialists for phases of the delivery

Defining ownership is a critical decision to make before proceeding and we recommend you further consult with your service assessors and / or GDS about your options.

8.7.2 Assemble a multidisciplinary team to deliver an Alpha prototype

According to the GDS Service Standard you must: *'Put in place a sustainable multidisciplinary team that can design, build and operate the service, led by a suitably skilled and senior service manager with decision-making responsibility.'*

The service will fail its service assessments without such a team. Read more detail on the GDS Service Manual.

We recommend assembling these roles to be able to design and deliver an Alpha prototype of the digital diary. The table highlights the likely source of each role.

TEAM ROLE	WHO / WHERE FROM	NOTES
Service owner	Senior figure in the DfT NTS Team	
Product manager	From the DfT NTS Team and / or the NTS Delivery Partner	Depending on the guidance from GDS, there may be potential to share the responsibilities of this role across DfT NTS Team and the NTS Delivery Partner.
Technical architect	DfT	See recommendations above about the role of a technical architect.

Delivery manager	NTS Delivery Partner, Technical partner or contractor	To monitor and keep the project on track.
User researcher	Technical partner / contractor	Plan and conduct ongoing user research activities (inc. usability testing.
UX / Interaction designer	Technical partner / contractor	Lead the design and iteration of the interfaces for the development phases.
Content designer	Technical partner / contractor	Crafting the questions and instruction text throughout the development phases.
Senior / Lead Full Stack Developer	Technical partner / contractor	Depending on the experience of this person they may be able to take responsibility for some of the Technical Architect and Web Ops activities during Alpha phase.
Full stack developer	Technical partner / contractor	This person should be hired to complement the skills of the Senior/Lead. For example if the Senior/Lead is weaker in front end development, that should be a strength of this developer.
Assisted digital lead	Technical partner / contractor	AD will be a significant challenge on this service, so assign someone to lead on the ongoing work to better understand and design for users with AD need.
Subject matter experts	DfT NTS Team + NTS Delivery Partner + DfT Digital Team	This will include periods of close collaboration and consultation during the development phases.

Note: GDS will expect to see such a team (or your plans for such a team) to progress through spend controls for an Alpha.

Service ownership

The team should be led by a Service Owner. They would own the vision for the NTS and be responsible for its development and success.

The GDS definition of a Service Owner is: 'someone with the decision-making authority to deliver on all aspects of a project'. They also:

- ➔ Have overall responsibility for developing, operating and continually improving the service
- ➔ Represent the service during service assessments
- ➔ Make sure the necessary project and approval processes are followed
- ➔ Identify and mitigate risks to the project
- ➔ Have responsibility for the service's assisted digital support

The GDS Service Manual further outlines the Service Owner role.

Product management

Such a service needs a dedicated Product Manager to make the day-to-day decisions about the development and iteration of the digital diary platform. This is in line with the GDS Service Manual.

A Product Owner:

- ➔ Ensures their product fits in with the organisation's priorities
- ➔ Defines the goals and 'product vision'
- ➔ Prioritises user stories and ensures their product meets user needs
- ➔ Comments on technical, content and design solutions

The nominated Product Owner should be empowered to achieve this.

View the detailed GDS Product manager: role description and consider attending the three day GDS Digital Academy *Working level for product managers* course.

8.7.3 Learn from other service delivery teams

Engage with other multidisciplinary teams at different stages of their own service life-cycles to benefit from their experiences:

- ➔ Observe their show and tells, sprint planning sessions, and retrospectives
- ➔ Ask for feedback on your approach and work

Start with the two projects GDS have already suggested you speak with.

8.8 ALPHA EXPERIMENTS

The Alpha is largely an experiment or *proof of concept* of the potential service. It is also a big learning opportunity for what Delivery Team is required and how it should operate going forwards.

We strongly recommend the Delivery Team approach the Alpha with a shared set of questions you are attempting to answer (or much better understand) over the course of the Alpha.

Depending on the the recommendations you adopt and the packages you prioritise for Alpha, questions could include:

1. Can Diary Keepers complete the prototype digital diary without onboarding or intervention from an Interviewer?
2. How much will it reduce burden on multi-Diary Keepers?
3. How much will it reduce the burden on Interviewers? E.g. mitigating the need for a pick up visit
4. Will the data be more accurate than the paper diary? Where is accuracy going to be an issue?
5. Does it reduce the levels of manual intervention to validate the data?
6. Can a physical ‘pick up’ be removed from the process?

7. How much can the manual journey purpose coding be removed from the process?
8. What is the actual preference or not towards a digital diary (once prospective users can see what this means)?
9. What will the impact be on sample size (based on the insights from the other questions)?
10. Is there sufficient value to warrant integrating the digital diary with the interview components?

These are in addition to the standard set that GDS recommends using the experience of building prototypes in the Alpha to:

1. Find the problems with the design of your service and decide how you'll solve them
2. Make some estimates about how much your service will cost
3. Identify the biggest risks for the Beta stage, as early as possible

8.9 EARLY EVALUATION PLAN

An initial set of high-level KPIs have been listed to focus the project team on what success would look like for a digitised Travel Diary.

Potential KPIs	Why measure this?	Measuring this
GDS Service Standard metrics		
Diary Keepers rate their level of satisfaction with their interaction as satisfied or very satisfied	It is a good metric to indicate the general performance of the Travel Diary This is a Service Standard metric	Method: a GDS-style satisfaction survey embedded in the Travel Diary Who: Product manager / User researcher Benchmark: TBD
Increase completion rates	*Completion* in this definition could be successfully recorded journey or a fully completed	Method: see GDS guidance on how to calculate

	travel diary	Who: Product manager / User researcher Benchmark: TBD depending on definition of a completion
Cost per transaction	The definition of a transaction could either be a successfully recorded journey or a fully completed travel diary	Method: see GDS guidance on how to calculate Who: Product manager Benchmark: TBD
Digital uptake	Note: this may not be relevant as there are no other channels for this transaction (once the paper version is removed)	Method: see GDS guidance on how to calculate Who: Product manager Benchmark: TBD
NTS specific metrics		
Increase full cooperation rates from sample Increase journey recording rates for days 6 and 7 Increase representation of underrepresented demographics (e.g. young men) Reduce time for pick up interviews		*Benchmarks for these will need to be developed during the Alpha and Beta phases.*