Electronic Data Entry Software Options for IEP Surveys

IEP DUWG 'e-Device' Sub-group led by Karrin Alstad

2023-05-04

Contents

Chapter 1

About

This is a *sample* book written in **Markdown**. You can use anything that Pandoc's Markdown supports; for example, a math equation $a^2 + b^2 = c^2$.

1.1 Usage

Each **bookdown** chapter is an .Rmd file, and each .Rmd file can contain one (and only one) chapter. A chapter *must* start with a first-level heading: `# A good chapter`, and can contain one (and only one) first-level heading.

Use second-level and higher headings within chapters like: `## A short section` or `### An even shorter section`.

The `index.Rmd` file is required, and is also your first book chapter. It will be the homepage when you render the book.

1.2 Render book

You can render the HTML version of this example book without changing anything:

1. Find the **Build** pane in the RStudio IDE, and
2. Click on **Build Book**, then select your output format, or select "All formats" if you'd like to use multiple formats from the same book source files.

Or build the book from the R console:

```
bookdown::render_book()
```

To render this example to PDF as a `bookdown::pdf_book`, you'll need to install XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): https://yihui.org/tinytex/.

1.3 Preview book

As you work, you may start a local server to live preview this HTML book. This preview will update as you edit the book when you save individual .Rmd files. You can start the server in a work session by using the RStudio add-in "Preview book", or from the R console:

```
bookdown::serve_book()
```

Chapter 2

Introduction

All chapters start with a first-level heading followed by your chapter title, like the line above. There should be only one first-level heading (`#`) per .Rmd file.

2.1 E-device Working Group Overview

2.1.1 Goals

In general, the goal of the electronic data entry sub-group of the DUWG is to research field data entry software and hardware devices ("e-devices"), and to generate resources that support IEP survey leads in selecting and deploying digital data-entry procedures. This sub-group does not intend to suggest a single solution or software choice for all IEP surveys; rather, the sub-group aims to provide specific application reviews and testing, some methods development, and the start of an IEP e-device users network in effort to facilitate the independent decisions and potential transition of each IEP surveys to electronic data collection methods..

2.1.2 Approach

A general approach to the exploration of e-device applications was outlined and agreed on at the initial e-device meetings.

First, an e-device information gathering questionnaire (survey) would be distributed within IEP which specifically collects response data from: 1. Experienced e-device users, 2. Those who are currently researching e-device solutions for their survey applications; and 3. Those who have determined e-devices will not work for them.

Second, following leads from the responses to the survey, this distribution is expanded to include external associates (ICF, NEON, CDFW Marine). Follow-up interviews of the experienced e-device users and vendors are conducted, and demonstrations are arranged for the most promising e-device options.

Third, group members will potentially test specific e-devices apps by making use of free trial licenses, and these trials reported back to the group (SFBS & Yolo By-pass were early volunteers for trial forms development exercises). Potentially other e-device methods will be researched and developed for demonstration purposes (e.g., collection and integration of external sensor data into e-device applications).

2.1.3 Scope of group activities and intended products

The initial e-device questionnaire was used to identify the most common e-device apps used within IEP (Table 1), the key questions/concerns about using e-devices (section below), as well as the key criteria that will be used to evaluate each software options explored by the working group (Tables 2-7). The main categories considering include options within the forms building tools, including QC related factors such as constrained choices and rules that guide subsequent fields. Other categories include IT security protocols, photo integration, cost of different product options, and factors related to the business model of each vendor, including the longevity of the company and the level/cost of customer/technical support.

Chapter 3

E-device Survey

An Electronic Field Data-Entry Device ("e-Device") Survey was distributed to IEP survey leads in July of 2022. The goals of this survey were: 1. To get an understanding of the current level of use of electronic field data entry devices among IEP Survey Staff; 2. To seek information from expert e-device users about both hardware and software considerations, and 3. To the learn specific roadblocks for those who are hesitant to consider shifting to electronic data entry methods.

Three groups were targeted for this survey:
1. Experienced e-device users (internal IEP and external agencies),
2. IEP Survey Staff who are researching e-devices for field application,
3. IEP Survey Staff who don't believe electronic field data collection will work for their application.

3.1 Survey Respondents

The IEP e-device survey was run for approximately a month and received 24 responses (Figure **??**. A link to the original survey and to the compiled survey responses is included in the Appendix 2.

Among the 24 respondents, half of these were IEP associates and external contacts that are already using e-device applications for their survey data collections. Five (20%) of the respondents were IEP associates who were currently seeking e-device solutions for their survey data collections. Two of the respondents indicated that they have already determined that electronic data entry would not work for their IEP survey application, and 5 respondents did not answer the question about their e-device use experience/status. An experienced e-device user resource list has been initiated, including contact names, soft-

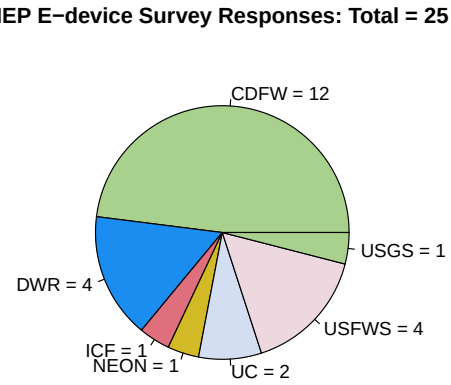

Figure 3.1: The distribution of of e-device survey responders by agency association. Most of these respondents were CDFW staff, but USFWS and DWR responses were also represented. Two external agencies (NEON and ICF) were specifically asked to participate after survey responses pointed to these expert resources.

ware type, and type of survey application; this list will be expanded as possible (Appendix).

Chapter 4

ESRI Survey123

4.1 Survey123 Overview

From ESRI documentation: ArcGIS Survey123 is a complete, form-centric solution for creating, sharing, and analyzing surveys. Use it to create forms with skip logic, defaults, and support for multiple languages. Collect data using web or mobile devices, even when disconnected from the internet. Upload data securely, and analyze results on the web or in an ArcGIS app. https://doc.arcgis.com/en/survey123/reference/whatissurvey123.htm

From G2 Business Software Review: Survey123 is included with ArcGIS, and provides powerful features to help you leverage the power of location to boost your productivity while capturing data and analyzing the results of your surveys. https://www.g2.com/products/arcgis-survey123/reviews

4.2 Survey123 Forms Options

Surveys123 Survey Forms are created and stored through the ESRI web interface (see Figure 1); access requires a current ESRI license. Survey123 forms can be downloaded to tablets, iPhones or iPads, and data collection can be made while the device is offline. Survey results are uploaded to cloud storage next time the device is on-line.

There are two main options for designing a Survey123 survey form: the Web Designer or Survey123 Connect tool. The Web Designer is a web-based menu-driven GUI that does not require learning any specific coding to set up a basic survey form. Survey questions and response types can be specified using a drag and drop tool.

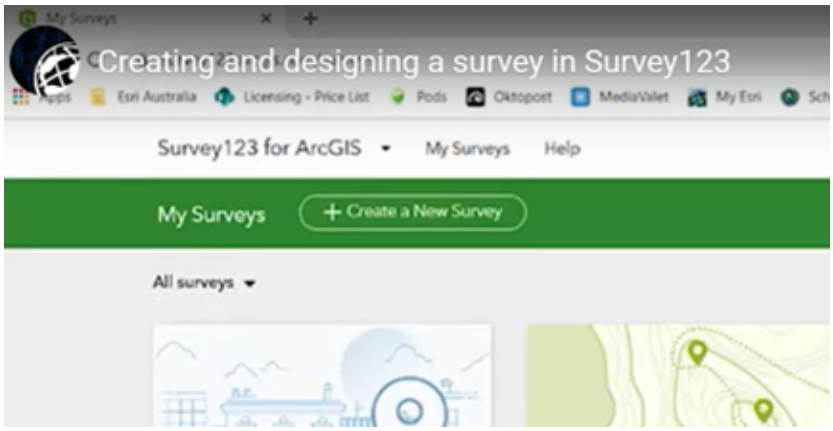

Figure 4.1: Screen capture of the ESRI web interface for Survey123 and the option to Create New Survey.

Figure 4.2: Screen capture of the ESRI web interface for Survey123 highlighting the two main options for designing a Survey123 form: the web designer or the Survey123 Connect tool.

Survey123 Connect is an option for more advanced survey form design, such as a nested structure or calculated responses using user inputs. The Survey123 Connect approach requires defining the more advanced form properties within an 'XLSForm spreadsheet' using the XLSForm coding language. ESRI documentation for both Web designer and Connect can be found at: https://doc.arcgis.com/en/survey123/browser/create-surveys/createsurveys.htm XLSForm formatting language is described at: https://xlsform.org/en/.

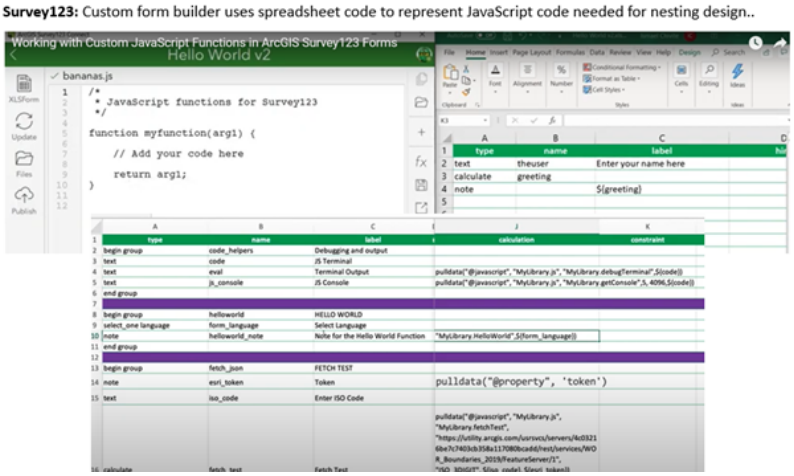

Figure 4.3: Screen capture of ESRI Survey123 Connect software demonstrating the use of the XLSForm spreadsheet-based coding language and the ability to directly edit the JavaScript code that is linked to XLSForm parameters.

4.3 Survey123 Forms Criteria Table

Figure 4.4: Screen capture of ArcGIS website description of the XLSForm features: https://gis.idaho.gov/wp-content/uploads/2021/03/ArcGIS-Apps-for-the-Field-State-of-ID.pdf.

Chapter 5

Footnotes and citations

5.1 Footnotes

Footnotes are put inside the square brackets after a caret `^[]`. Like this one [1].

5.2 Citations

Reference items in your bibliography file(s) using `@key`.

For example, we are using the **bookdown** package (**?**) (check out the last code chunk in index.Rmd to see how this citation key was added) in this sample book, which was built on top of R Markdown and **knitr** (**?**) (this citation was added manually in an external file book.bib). Note that the `.bib` files need to be listed in the index.Rmd with the YAML `bibliography` key.

The `bs4_book` theme makes footnotes appear inline when you click on them. In this example book, we added `csl: chicago-fullnote-bibliography.csl` to the `index.Rmd` YAML, and include the `.csl` file. To download a new style, we recommend: https://www.zotero.org/styles/

The RStudio Visual Markdown Editor can also make it easier to insert citations: https://rstudio.github.io/visual-markdown-editing/#/citations

[1] This is a footnote.

Chapter 6

Blocks

6.1 Equations

Here is an equation.

$$f\left(k\right) = \binom{n}{k} p^k \left(1-p\right)^{n-k} \tag{6.1}$$

You may refer to using `\@ref(eq:binom)`, like see Equation (**??**).

6.2 Theorems and proofs

Labeled theorems can be referenced in text using `\@ref(thm:tri)`, for example, check out this smart theorem **??**.

Theorem 6.1. *For a right triangle, if c denotes the* length *of the hypotenuse and a and b denote the lengths of the* ***other*** *two sides, we have*

$$a^2 + b^2 = c^2$$

Read more here https://bookdown.org/yihui/bookdown/markdown-extensions-by-bookdown.html.

6.3 Callout blocks

The `bs4_book` theme also includes special callout blocks, like this `.rmdnote`.

You can use **markdown** inside a block.

```
head(beaver1, n = 5)
#>   day time  temp activ
#> 1 346  840 36.33     0
#> 2 346  850 36.34     0
#> 3 346  900 36.35     0
#> 4 346  910 36.42     0
#> 5 346  920 36.55     0
```

It is up to the user to define the appearance of these blocks for LaTeX output.

You may also use: `.rmdcaution`, `.rmdimportant`, `.rmdtip`, or `.rmdwarning` as the block name.

The R Markdown Cookbook provides more help on how to use custom blocks to design your own callouts: https://bookdown.org/yihui/rmarkdown-cookbook/custom-blocks.html