Improving XLSXForms

Document Summary

tldr; This documents the process of improving XForms for better mapper efficiency and stability.
Read time; 15mins
Technical Depth: Medium
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Background

XLSXForms are used by OpenDataKit (ODK) to define the input fields for multiple mobile data collection apps. They have a rather complex syntax, since the XLSXForms are edited as a spreadsheet. Most of the XLSXForms I've collected don't utilize more than the basic functionality of this format. While there are a few web based front ends for creating and editing XLSXForms, they don't support many of the more advanced functionality of XLSXForms. The current only way to access this functionality is to use a spreadsheet program. To use the XLSXForm with a mobile app it gets converted using a utility program, *xls2xform,* to the XML based XForm used by the apps.

There are two primary mobile apps used at HOT, OpenMapKit (OMK), and OpenDataKit (ODK). OMK uses the same XLSX format as ODK, so any comments apply to both. KoboToolKit also supports XLSXForms. This document explains how to improve XLSXForms for more efficient data collection. Efficiency lets you collect more good data in less time.

OpenDataKit

OpenDataKit (ODK) is both a mobile app (ODK Collect) for Android, and a server (ODK Central). Most of the functionality of the OMK app has been migrated to ODK Collect, although it works differently. This document also explains how to modify old XForms from the OMK app to ODK Collect. ODK Collect is actively maintained, and the organization behind it offers various support services.

OpenMapKit

OpenMapKit (OMK) is a Red Cross sponsored project for collecting data. It comprises both a server and a mobile app. OMK is an android based mobile application, referred to onward as OMK. Use of OMK is being deprecated, as it has been unmaintained for several years, and its functionality has been added to ODK. OMK used special field called **osm** in the **survey** sheet (first page of the XLSX file), it then looks at an additional sheet called **osm** that replaces the existing **choices** sheet. The values in the **osm** sheet are designed to be more closely matched to the tagging scheme used by OpenStreetMap (OSM).

XLSXForm Syntax

An XLSXForm is the source file for OMK and ODK based tools. This is edited in a spreadsheet program like LIbreCalc or Excel. There are also online build tools, but they fail to utilize the full functionality of XLSXForms. The python program *xls2xform* converts the spreadsheet to the format used by ODK Collect. You can also upload the spreadsheet to the ODK Central server, and it will convert it.

Sheet Names

The sheet names are predefined to have specific functionality as follows, and the column headers are used to determine the functionality of the value in the cells of the spreadsheet. The sheets are Survey, Choices, and Settings. A few columns are required to exist in each sheet, the rest are optional.

- Survey
    - This sheet contains all the questions used for collecting data, and refers to the actual values for each question which are on the *choices* sheet.

  These are the mandatory column headers in the survey sheet:

    - **Type** - The type of question, the most common ones are **text**, **select_one**, and **select_multiple.** The second argument in the type column is the keyword used as the **list_name** in the *choices* sheet for selection menus

    - **Name** - Refers to the name of the choice keyword that would be the *tag* in the output OSM file
    - **Label** - Refers to the question the user sees

  The **name** and **label** column headers also support different languages by using a postfix of **::[language](abbreviation)** appended to it, for example **label::Nepali(np)**.

  These are the optional column headers in the survey sheet:

    - Hint - Optional value display with the question with further information
        - The **hint** column also supports different languages by using a postfix of **::[language](abbreviation)** appended to it, for example **hint::Nepali(np)**.
    - Default - Optional default value for a selection.
    - Required - If the value is 1 or *yes*, this field must have an answer. If the value is 0 or *no* or blank, then it's optional.
    - Relevant - Allows to set up conditional display of questions based on other fields.
    - Appearance - This changes how input fields are displayed on the screen.

- Choices

  The choices sheet is used to define the values used for the **select_one** and **select_multiple** questions on the **survey** sheet.

  The mandatory column headers are:

    - **List_name** - This is the name of the list as specified in the **select** type in the *survey* sheet.
    - **Name** - This becomes the *value* for the *tag* in the OSM output file.
    - **Label** - Refers to what is displayed in the **select** menu.
        - The **label** column header also supports different languages by using a postfix of **::[language](abbreviation)** appended to it, for example **label::Nepali(np)**.
- Settings
    - This is a simple sheet that contains the version of the sheet, and the title of the input form. The version is used by the server and the mobile apps to track changes in the data format, so it should always be updated after changes are made.

Input Types

The Survey sheet has several forms of selecting answers. These allow the mapper to enter a number, text, or select one or multiple items from a menu.

Mapping Answers to OSM

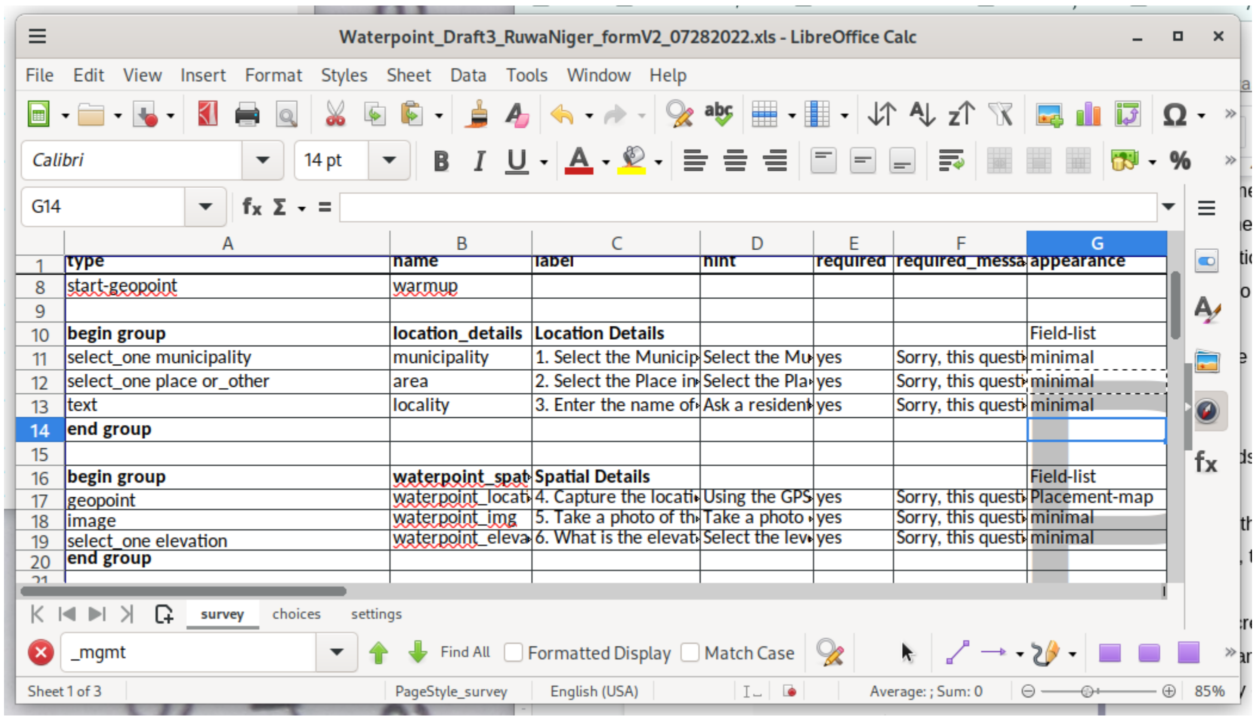
When designing an XForm whose data is for OSM, the two key columns that determine the tag & value scheme used in the OSM XML format are **name** in the *survey* sheet, which becomes the tag, and **name** in the *choices* sheet, which becomes the value.

Screen Layout

ODK supports multiple options to change the layout of the input fields on the screen. In the XLSXForm, this is under the **appearance** column. There's many possible options available to change the layout, but here's a summary of the primary ones.

- **Minimal** - Answer choices appear in a pull-down menu.
- **Field-list** - Entire group of questions appear on one screen
- **Parameter-map** - Use a basemap to pick the location
- **Quick** - Auto-advances the form to the next question after an answer is selected

For example, the below screenshot shows the result of the **minimal** attribute set in the **appearance** column.



Waterpoint_Draft3_RuwaNiger_formV2_07282022.xls - LibreOffice Calc

G14

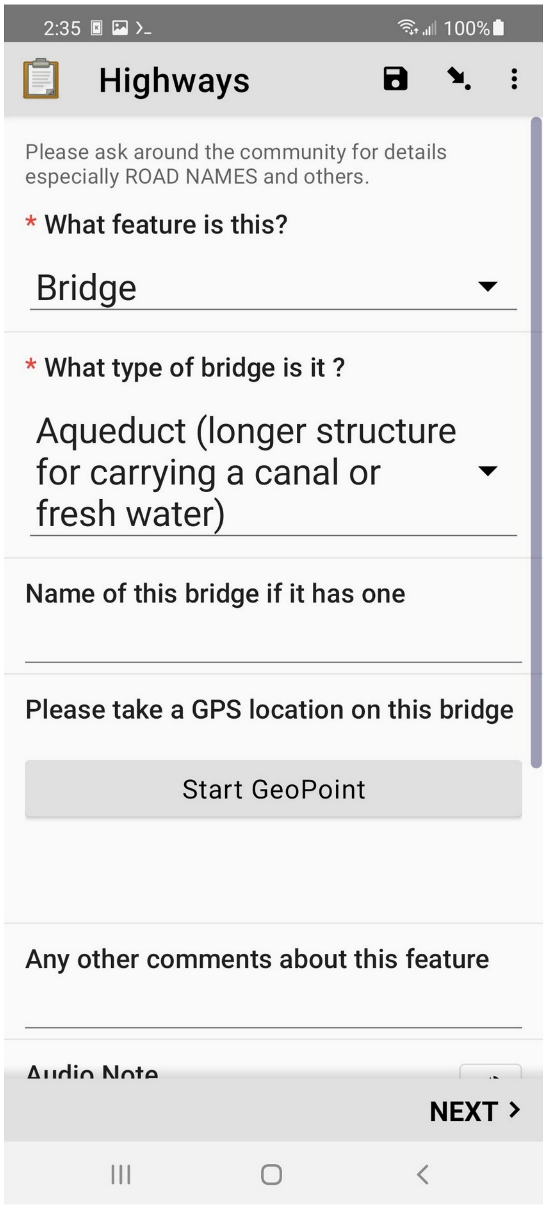
	A	B	C	D	E	F	G
1	type	name	label	hint	required	required_messa	appearance
8	start-geopoint	warmup					
9							
10	**begin group**	**location_details**	**Location Details**				Field-list
11	select_one municipality	municipality	1. Select the Municip	Select the Mu	yes	Sorry, this questi	minimal
12	select_one place or_other	area	2. Select the Place in	Select the Pla	yes	Sorry, this questi	minimal
13	text	locality	3. Enter the name of	Ask a residen	yes	Sorry, this questi	minimal
14	**end group**						
15							
16	**begin group**	**waterpoint_spat**	**Spatial Details**				Field-list
17	geopoint	waterpoint_locat	4. Capture the locati	Using the GPS	yes	Sorry, this questi	Placement-map
18	image	waterpoint_img	5. Take a photo of th	Take a photo	yes	Sorry, this questi	minimal
19	select_one elevation	waterpoint_eleva	6. What is the elevat	Select the lev	yes	Sorry, this questi	minimal
20	**end group**						

survey | choices | settings

_mgmt

Sheet 1 of 3 | PageStyle_survey | English (USA) | Average: ; Sum: 0 | 85%

Which then looks like this when the XForm is opened.



2:35 100%

Highways

Please ask around the community for details especially ROAD NAMES and others.

* What feature is this?

Bridge

* What type of bridge is it ?

Aqueduct (longer structure for carrying a canal or fresh water)

Name of this bridge if it has one

Please take a GPS location on this bridge

Start GeoPoint

Any other comments about this feature

Audio Note

NEXT >

- All fields are grouped together to maximize screen space.
- When the **field-list** attribute is set for **begin_group**, then multiple questions are on the same screen.
- The screen can be scrolled if there are more input fields than fit.

Conditionals

ODK can optionally display input fields for questions based on a selection. Using conditionals allows for a more guided user interface, than just presenting many questions, some of which aren't relevant to the current mapping task.

Using Conditionals:

- Conditionals go in the **relevant** column on the **survey** sheet.
- A conditional has two parts, the variable from the **name** column of a question, and the value to test against, which is one of the select values.

In the XLSXForm, the spreadsheet should look like this. The amenity menu is only displayed if the answer to the "what type of building is this" is "commercial".

type	**name**	**label**	**relevant**
select_one amenity	amenity	Type of Amenity	${building}='commercial'

Using conditionals allows for a more dynamic interface, as only relevant questions are displayed. Some questions may have answers that only require a few more questions before being complete. Other answers may generate more questions, for example a commercial building instead of a residence.

Grouping

ODK supports grouping survey questions together, which when used with conditionals in the **relevant** column, and attributes from the **appearance** column, creates a more dynamic user interface. Groups allow more than one question on the screen, which is more efficient than one question per screen, which is the default.

Using Grouping

- Groups are defined in the **survey** sheet.
- Using the **appearance** column can display multiple questions on each screen, minimizing the actions required to enter data.

Sub groups are also supported. When implemented this way, when the top level group is displayed on the screen, other questions can be dynamically added to the screen display based on what is selected, further minimizing required actions. Using the **appearance** column settings with grouping can create a more efficient user experience. Ungrouped questions appear one on each screen of the mobile data collection app, requiring one to swipe to the next page for each question.

- Begin_group
    - Can use the **relevant** column to conditionally display the entire group of questions
- End_group
    - End the group of survey questions

An example grouping would look like this, and the conditional says to only display this group for commercial buildings.

type	**name**	**label**	**relevant**
select_one	building	What type of building ?	
begin_group	amenity		${building}='commercial'
select_one amenity	amenity	Type of Amenity	
text	name	What is the name ?	
End_group			

In this example, the conditional is applied to the entire group of questions, and not just any individual question. Different questions in the group may have different conditionals.

External Datasets

XLSForms support external datasets, which is useful for common choices that can be shared between multiple XLSForms. CSV, XML, or GeoJson files are supported. The one downside is currently external datasets of choices do not support translations, one language only. Each CSV file needs a header that defines at least the *name* and *label* columns. The name becomes the tag in OSM, and the label is what ODK Collect displays in the select menu. An *id* column is also required. Anything else becomes a column in the XLSForm.

An example CSV data file would look like this:

label	**name**	**backcountry**	**Id**	**ref**	**tourism**	**openfire**
Test 1	Site 1	yes	5483233147	1	camp_site	yes
Test 2	Site 35	no	6764555904	35	camp_site	yes

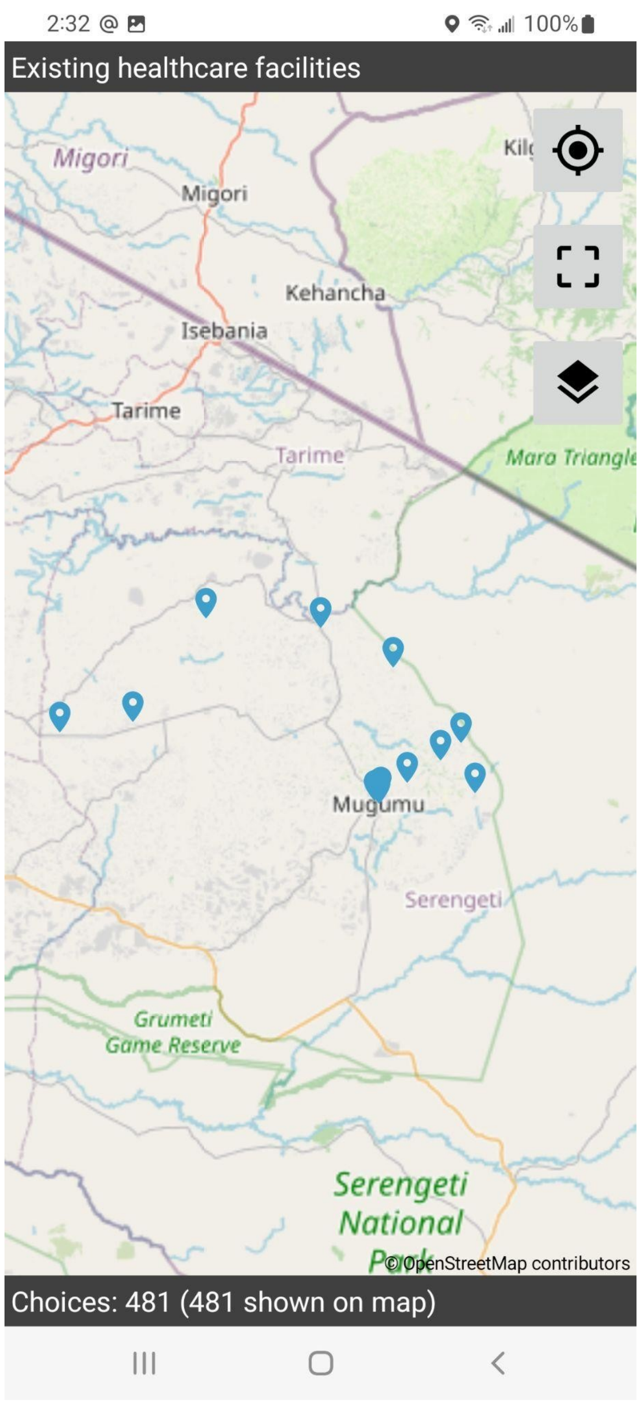
For example, these rows in the survey sheet will load the data from the CSV file. The instance is the name of the data file, minus the suffix. The item is what the XForm has in the name column for the select_one_from_file. Then the last part is the column from the OSM data. Whenever the value of **test** is changed, the trigger goes off, and the value is recalculated and becomes the default value for the survey question.

type	**name**	**label**	**calculation**	**trigger**	**choice_filter**
select_one_from_file test.csv	test	CSV Test			true()
calculate	xname	Name	instance('test')/ root/ item[name=${test}]/label	${test}	
text	debug	Name is	${xname}	${test}	

GeoJson Files

An external file in GeoJson format works slightly differently, as it also contains GPS coordinates. This allows ODK Collect to display data on the map as an overlay that can be selected. This lets us make a data extract from OSM data and edit it. In OSM, many buildings are tagged *building=yes*, as that's about all you can do when doing remote mapping off satellite imagery. ODK Collect can't handle polygons yet, so a data extract has to use only POIs. To use a GeoJson file, just change the file name in this example. The only other difference is that since the GeoJson data file contains GPS coordinates, you can get either a map or a normal selection menu. To get the map view, put **map** in the appearance column.

When using a GeoJson data file, after opening the XForm, you'll get a button to select an existing POI. That'll open either the menu, or the map. For the map view, you'll see blue markers where the existing features are, Touching an icon loads that data into ODK Collect. You can access the values in the OSM data the same as the above example.

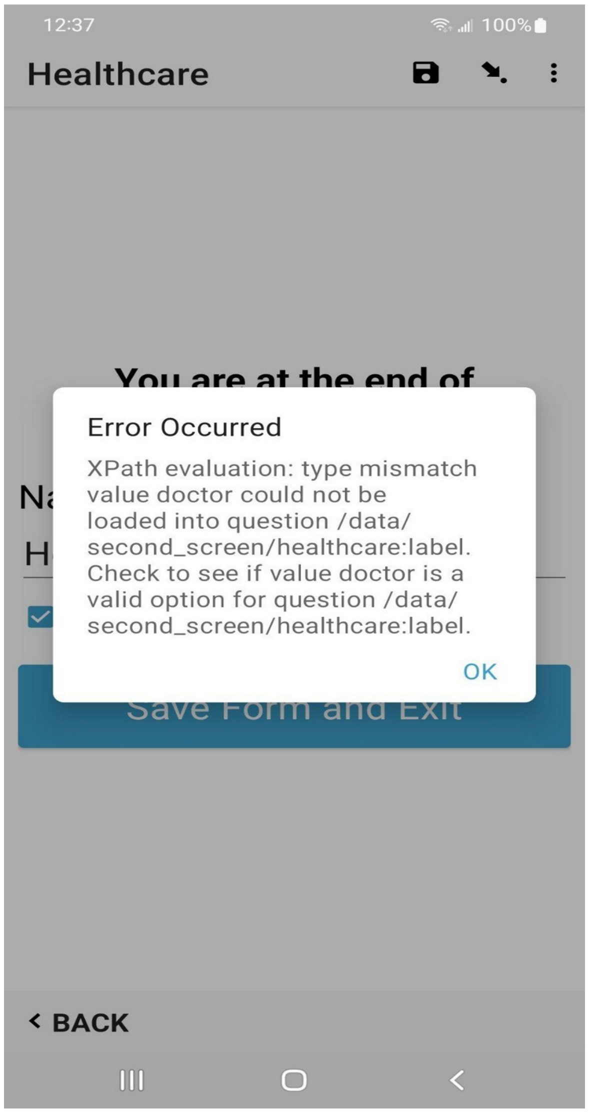

Existing healthcare facilities

Choices: 481 (481 shown on map)

OpenStreetMap Data

For those of use that are OpenStreetMap mappers, we've often wanted to be able to edit data in the field. This is possible with mobile apps like StreetComplete or Vespucci, but their presets aren't focused on humanitarian data collection. Since many features have been added by remote mapping, there are rarely any tags beyond *building=yes*. Until this functionality was added to ODK Collect, the mapper collected a new POI, and just manually merged the data later using an editor like JOSM. Now it’s possible to load data from OSM into ODK Collect. Using an XForm to improve feature data achieves tag completeness for a feature, as well as limits the tag values to accepted values.

To create a data extract from OSM, you need to use Overpass Turbo or Postgres. Each tag in OSM becomes a column in an XForm. The column names are how you reference the data from within the XForm. If you are using the OSM data to set the default value for a *select_one_from_file*, then every possible value used for that tag needs to be in the choices sheet, or you get this error, which is *doctor* is not in the choices for *healthcare*.



Error Occurred

XPath evaluation: type mismatch value doctor could not be loaded into question /data/second_screen/healthcare:label. Check to see if value doctor is a valid option for question /data/second_screen/healthcare:label.

OK

There’s two data conversion processes required to use OSM in ODK Collect. The first step is producing the data extract. Since my goal is to convert the data from ODK into OSM, I use OSM standard tags in the name column in my survey and choices sheets. When doing a query to Overpass or Postgres, the column name will conflict, as it’s the same as what is in the survey sheet. So the data extract needs to use something else. For Postgres, this is easy as you can use **AS** in the query to rename the column to whatever you want. I’ve taken to using abbreviations or the OSM tags name. Those variable names are only used internally.

Converting from OMK to ODK

The OMK mobile app was used for collecting location data using the GPS on the device, or tapping on a basemap. Because that functionality is now in ODK, the usage of the OMK mobile app is not required, and is not unmaintained and may be unreliable. This section is only useful if you find yourself with an old XForm that you want to edit and reuse, as none of it applies to ODK or Kobo Collect.

Step 1 - Prepare Data

The first step is to copy the contents of the **osm** sheet into the choices sheet, The other option is to delete the **choices** sheet, and then rename the **osm** sheet to **choices**.

Step 2 - Migrate Questions

The next step is to migrate the questions. The **osm** keyword in the **survey** sheet is followed by a variable name, for example in this table, **building_tags** is the variable. When looking at the choices sheet, every row using the **building_tag** keyword now has to become a question on the **survey** sheet.

type	**name**	**label**	**required**
osm building_tags	osm_building	Building Form	yes

In the **choices** sheet, we see this existing data.

list_name	**name**	**Label**
building_tags	name	Name of this building
building_tags	building:material	What is it made from ?

building_tags	building:roof	Is there a building roof ?

Cut & paste these rows from the **choices** sheet, and paste them into the **survey** sheet. Then prefix the variable with selct_one or select_multiple. Drop the prefix used in the **choices** sheet and simplify it.

type	**name**	**label**
text	name	Name of this building
select_one building:material	material	What is it made from ?
select_one building:roof	roof	Is there a building roof ?

Step 3 - Get Coordinates

The last step is replacing the keyword that used to start OMK, with the ODK way. There are three ODK keywords that can be used to get a location.

- Geopoint - Collect a single location
- Geoshape - Collect at least 3 points and the ends are closed
- Geotrace - Collect a trace of a line

By default these keywords only allow you to get the location of where the user is located. If you want to use a basemap and tap on the screen where you want to get the location, add **placement-map** into the **appearances** column.

After doing these three steps, your XLSXForm is converted to not use the OMK app anymore.

XLSXForm Suggestions

Since often mobile data collection is many of the same type of data, setting defaults helps reduce the amount of user actions that need to be performed to collect data. Often data collection is multiples of the same type of data, good defaults can record data where only the location has changed.