

# **Heuristic Evaluation**

## **CitSci.org Datasheet Creation Form**

Team 7 CitSci Form

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## **1. Design Description**

The CitSci.org datasheet creation form is a tool embedded within the project interface on CitSci.org which project creators and managers must use to create the project data parameters. Data collection is mediated through the output of the datasheet creation form and, since a fundamental goal of every CitSci.org project is to enable independent volunteers to gather data, successful implementation of the datasheet creation form is critical to the success of any given project.

After a project is created on the website, the user must generate a datasheet to allow for data submissions using the datasheet creation form. During this process, the user makes several decisions which impact the output of the form, including the datasheet name, instructions for volunteer data collection, whether to accept data from locations predefined by the manager or from locations input by the volunteer, types of data allowed, and units of measurement for each data type. Once the user is finished, the form outputs a datasheet that is visible to project participants and ready to collect data submissions.

## **2. User Interface Domain**

The datasheet creation tool is form-based and hosted as part of a web application, therefore it occupies a cross-sectional domain of web and form interfaces. Web interfaces accept input and provide output to the user through the display of web pages within browsing applications. In this case, the interaction is mediated through a form. Forms generally ask for specific types of input from the user, with varying levels of guidance, and generate output based on that user input.

### 3. Applicable Heuristics

We developed the following list of heuristics using Jakob Nielsen's 10 heuristics for user interface design and research on best practices in form design (see references).

1. Visibility of system status—The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
  - a. Form progress indicator
  - b. Clear feedback for submissions or save actions/disable multiple submissions
  - c. Status of datasheet (e.g. saved, in process, error, published, change of interface)
2. Match between system and the real world—The system should follow user expectations for language and usage.
  - a. Vocabulary should be appropriate for user
  - b. Smart defaults (location, common data types)
3. User control and freedom—Users should have avenues to correct mistakes and exit the system.
  - a. Keyboard, tabbing, screen-reading, voice input accessibility
  - b. Redo/undo, edit after submission
4. Consistency and standards—The system should be labeled consistently and behave in a manner consistent with user expectations.
  - a. Fields should follow a consistent naming scheme
  - b. Field tabbing should follow form order
  - c. System should behave consistently across devices
5. Error prevention—Eliminate error-prone conditions or check for user errors.
  - a. Hint boxes, sub-labels, hover text
  - b. Confirmation before submitting
  - c. Clear notation of required fields
  - d. Limit "required" fields to what is truly required
  - e. Seeing user input (e.g. typed information)
  - f. Dual-code color differences
6. Recognition rather than recall—Where possible, guide the user by making actions, objects, and options visible or easy to retrieve.
  - a. Calls to action are visible and intuitive

- b. Keywords and vocabulary accessible to the audience
  - c. Field labels always displayed
  - d. Include hint boxes, sub-labels, hover text
  - e. Seeing user input (e.g. typed information)
- 7. Flexibility and efficiency of use (accelerators)—The system should allow expert users avenues to expedite their task while giving novice users extra assistance.
  - a. Minimize the number of forms or clicks between forms
  - b. Use predictive search for fields with predefined options
  - c. Retaining the user's field focus
  - d. Multi-step forms with conditional logic
- 8. Aesthetic and minimalist design (eg. simplicity, concision)—The system should only include relevant information.
  - a. Unused information should not be visible
  - b. Retaining the user's field focus
  - c. Top-left aligned labels
  - d. One-column layout
  - e. Fields should be sized appropriately for input
- 9. Help users recognize, diagnose, and recover from errors—Error states should be obvious and explained plainly, with options for error recovery.
  - a. Validate and correct errors as you go
- 10. Help and documentation—If necessary, the system should provide resources for the user to find solutions to system issues.
  - a. Help content should not disrupt form completion (i.e. content should load in another tab/window)
  - b. Include hint boxes, sub-labels, hover text

#### 4. List of Usability Problems

| Problem   | Heuristic          | Discussion   |
|---|--------------------|--|
| Initial Project Creation  |                    |  |
| Inconsistent data parameters  | [4]                | Instructional text for “Description” reads “Minimum of 6 characters”. While typing, different text shows up below the box with “Minimum of 10 characters”. (10 is the actual minimum).   |
| Project Main Page   |                    |  |
| Download button purpose unclear                                       | [5]<br>[10]        | It is unclear what the “Download” button is going to download. There is hover text but it does not always show up.   |
| Inconsistent or Broken Download Tracker                               | [1]<br>[4]         | While data download is complete, status reads “completed”, but progress reads “0.00%”.   |
| Missing Hint Text   | [5]<br>[10]        | In the Manage Project Members page, “Invite People” and “Assign Members” have a space for a pop-up hint box, but nothing comes up.   |
| Terminology which is potentially problematic                          | [6] [10]           | To a non-scientist, “Submit Data” might be something that is used to import data. “New datasheet” might be field-specific. It is assumed that most physical scientists (bio, geo, physics, materials, chem) will know what a datasheet is. What about social scientists? Educational researchers? Highschoolers?   |
| Next step to create a datasheet not obvious, too many clicks to start | [1]<br>[5]<br>[10] | In our discussions with Dr. Newman, we have learned that creating a datasheet is the next most important task a project coordinator must do in order to collect data. Currently, there is no indication of this on the page after setting up the project. It is on the second tab called “Submit Data” which is a little misleading. There is also an indication in the help files that are emailed to the project creator shortly after creating the project. |
| Datasheet Creation  |                    |  |
| No explanation of unfamiliar acronym                                  | [10]               | There is no information on the difference between location types. Latitude/Longitude is well known, but UTM is unfamiliar and has no explanation attached. This can be true of many different acronyms which are field specific.   |

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|---|-------------------|---|
| No explanation of observation types                         | [10]              | There is no information on possible observation types. Most are not well known so it is not obvious what to use, even for a basic project.  |
| Add Organism popup screen too large                         | [3]<br>[7]<br>[8] | The “Add Organism” popup box does not fit on the screen. As a result, the user must scroll down to see the “close” option, which is not immediately clear.  |
| No explanation of difference between buttons                | [10]              | “Add Organism”, “Add Predefined Organism Picklist”, “Add Any Organism Picklist”, and “Add Site Characteristic” are lacking any information about their purpose and differences between them. It is difficult to understand what the three “organism” buttons do. How are they different? A user may click them to infer how they might help their project.  |
| No requirements shown                                       | [5]<br>[10]       | “Add Any Organism Picklist” requires the “point” data type, but this information is only shown after trying to add the picklist if “point” was not already chosen.  |
| Not able to add an organism                                 | [3]               | Although a user can add a “measurement” of an organism, and likewise can add a “Site Characteristic”, they are unable to add an organism. What if the organism is unavailable? How is this database generated? These questions are answered only by watching a 22 minute video.   |
| Repeated organisms/meas urents/site characteristics in list | [7]<br>[8]        | Many organisms in the list are repeated with no apparent difference between them. For example: the site characteristics list has 1,839 possible options already. Of those, 195 (or 11%) are duplicates of 1 or more other options. The most duplicated option is “Air Temp” of which there are 11 duplicates, and an additional “Air Temperature” option bringing it to 12. There is no easy way to distinguish the difference between these options. |
| Requirements for submission/saving unknown                  | [1]<br>[5]<br>[9] | There is no indication of what parts of a datasheet are required to be able to save it. Only once you click “save” or “preview” does the system give an error message listing what else is required.  |
| Little feedback from saving a datasheet                     | [1]<br>[7]        | When saving a datasheet, for some users there is a popup notification stating “Your datasheet has been saved!”, but it keeps you on the same page even though you are presumably done editing the datasheet.  |
| Outdated video call-to-action icon                          | [2]<br>[4]<br>[6] | The call-to-action icon leading to an instructional video for Datasheet Creation is small, dated, and does not relate to most video icons used today. (appears on <a href="https://www.citsci.org/CWIS438/Contribute/DataEntryForms/F">https://www.citsci.org/CWIS438/Contribute/DataEntryForms/F</a>   |

|  |                   |   |
|--|-------------------|---|
|  |                   | <a href="#">orm_Edit.php</a> AND next to the “New Datasheet” Button. The video has been viewed approximately 180 times over a 4 year period (not a very high hit rate for a help video) |
| Outdated lengthy video of poor quality offers little help      | [2]<br>[4]<br>[6] | The instructional help video is rather lengthy (22 minutes) and offers no help in navigating the video to find its key instructions.  |
| Other  |                   |   |
| No type matching from previous selections (preview data entry) | [4]<br>[5]        | When selecting location, clicking the map always uses Latitude and Longitude, even if UTM was selected as the location type.  |
| Extra steps/page transitions for “Manage Tabs”                 | [7]<br>[8]        | While managing tabs for a project, the page refreshes for every change. This adds extra steps and loading time.   |

## 5. Critical Usability Concerns

It is not obvious that a datasheet needs to be created in order to have a working project. A project creator could think they are done and leave the site without realizing they need a datasheet. Dr. Newman indicated that this happens often.

Datasheet creation lacks helpful feedback. It is not obvious what sections are required for the creation or when the datasheet is considered complete. This could lead to unnecessary confusion and frustration for the user.

The “Add Organism” popup window is larger than the regular screen. You can't see the “close” button without scrolling down and it is not obvious that you are able to scroll down. This could lead to a project creator getting stuck and thinking they need to close the whole web page rather than just the popup window.

You are unable (or it is very hard to figure out how) to add a new organism to the master list. If a project creator wanted to study something which isn't on the list, they wouldn't have any options.

Potentially problematic terminology or options that lack adequate information. Certain observation types and data types may not be known by the user and there is no additional information on the difference between them. Similarly, there are acronyms and

abbreviations which may be unfamiliar or have different meanings between fields. This can make the user confused and overwhelmed by so many unknown options.

## 6. Critical Concern Scenarios

### Successful CitSci Project Datasheet Creation Scenario



Photo by [Meghan Holmes](#)  
on [Unsplash](#)

**Professor Janelle Smith** - She is an Environmental Engineering professor who has a long history of funding to do research on invasive plant species in Ohio. Dr. Smith is 55 years old, married to her husband Tom, and has no children besides her two rambunctious Weimaraners. She is very passionate about the the growing problem of invasive species and is looking for high-quality data. She uses the internet around 4 hours a day and is very comfortable with technology.

As the owner of CitSci project "Monitoring the Invasive Plants of Ohio" Professor Smith, a primary stakeholder in the CitSci.org initiative, would like to update her project by creating a new data sheet to monitor the prevalence of Japanese Honeysuckle. She visits the site often and has created a datasheet in the past. To begin, Professor Smith clicks the shortcut to CitSci.org in her favorites bar on her browser. She then logs into her account and navigates to her project. Knowing that she wants to edit her project she quickly locates and clicks "Edit Profile" and without making changes, scrolls down to continue by clicking "Edit Project". Once in view, Professor Smith clicks "New Datasheet" to start making her new datasheet. She is then directed to a new screen and prompted to name her datasheet and enter instructions to those she expects to make observations. She names her sheet, "Observation: Japanese Honeysuckle in Ohio" and instructs data collectors to, "Please record the following information regarding a recent observation of Japanese Honeysuckle in Ohio. Infested area by the plant should be estimated in square feet. Please include pictures of your observation. Provide any unusual observations in the comment section." Professor Smith then clicks "Add Organism" and types in the species name, *Lonicera japonica*, *Celastrus orbiculatus*. Lucky for her, this species exists in the database, and she selects it for her datasheet. She clicks to "Add Measurement" and once the window has appeared, searches "area" under which she finds and selects "Infested Area". She then clicks "units" to designate "square feet" as the unit she would like to use. Next, Professor Smith would like observations to include the county in which the plant was found (there are still some counties in Ohio unaffected by Japanese Honeysuckle). To do this, she clicks "Add Site Characteristic" and in the window searches "county". She finds the category and selects to add it to her datasheet. Feeling as though she is done with her datasheet, she scrolls to the top and clicks "save". She is then reassured in a pop-up message her datasheet has been saved. To see her completed datasheet and verify it looks correct, Professor Smith



clicks "To Project Profile" above the "save" button and is navigated to her main project screen where she can now enter data using her new datasheet.

### Error-laden CitSci Project Datasheet Creation Scenario



Photo by [Samantha Sophia](#)  
on [Unsplash](#)

**Erin Hardie** - Erin is a retired painter who spends a lot of her free time bird watching in Northern Michigan. She is interested in the bird population. She notices the migration patterns and the size of flocks as they fly through her area and visit her backyard. Erin wants to encourage others to get out and experience bird watching as well. She has very little experience with technology and relies on family and friends to help her navigate the little technology she uses.

Erin Hardie, a primary stakeholder and new member to CitSci.org, muddled her way through creating a new project, "Birdwatching Delight" (She chose the name as birds give her joy each day). After managing to fill out the "Create a Project" form, Erin is excited that her project will now allow other passionate Birders to log their "backyard friends". After a few days of anxiously awaiting interaction from other members, Erin has not seen any changes to her project. That same day, Erin receives an email from CitSci.org reminding her to create a datasheet so that data can be entered by interested citizen scientists. Feeling silly to have missed a step, Erin is doubtful she will be able to create a datasheet without "screwing it up". After preparing herself, Erin connects to her dial-up internet on her desktop computer and navigates to CitSci.org where she logs into her account and finds her project. Sure enough, there is no data entered, but it is not immediately clear to Erin where she starts a new datasheet. She is not really sure what a datasheet is or what it needs to be. After toggling around a bit, Erin clicks through the tabs and finds that the "Submit Data" tab has a button which says "New Datasheet". It also has a funny shape next to it which, when covered by her arrow, says "watch instructional video". Figuring she needs as much help as possible, Erin clicks the shape and is taken to a new screen with a video. She begins to watch the video, but due to her slow connection and length of the video, struggles to load it properly. The parts Erin was able to watch moved too quickly and confused her, so she set out to try on her own. She toggled back to her project profile, said a little prayer, and clicked the "new datasheet" button. Having filled out online forms in the past, the next screen looked a little familiar. Not knowing what else to name it, Erin named her datasheet "Birds". Under the "instructions" section, Erin hesitated, and then typed, "What little friends have been visiting your backyard today? Share your recent sightings here! Have a great day!" Figuring she was the user, Erin selected for the location to be "Entered by User". She also had no idea what UTM was, so Erin kept the "projection" as "Latitude/Longitude". Feeling a bit more confident, Erin moved to enter in "observation type", but when she clicked on the drop-down menu she found there was no category related to birdwatching,

just a bunch of "mumbo-jumbo". Not wanting to mess up her datasheet, Erin decided to keep the default observation type as "point". Erin notices the buttons at the bottom of the form. She recognizes that organisms can be added, but is not familiar with what a "picklist" is. Toggling around a bit worked in the past, so Erin clicks "Add Organism". She is met with a new window, but the information on the page does not make immediate sense. She sees that there are scientific and common names of organisms, but can only see a few. Feeling like it will show her more options, Erin selects to show 100 entries and scrolls down to see if she can find a bird she recognizes. After scrolling through the first 100 organisms, Erin reads that there are a total of 410,816 species to choose from. She looks at the time and realizes scrolling through all of the organisms will take more time than she has for the day. She closes out of the organism window, and feeling as though finishing the datasheet is a task for another day, Erin saves it by clicking "save" and shuts down her computer. A few days later, and after speaking with her granddaughter, Sophie, about the trouble she had making a data sheet, Erin decides to finish her datasheet. Back into her project, Erin sees the saved datasheet "Birds" and clicks "Edit" hoping that will allow her to pick up where she left off. Erin is redirected to the datasheet creation window. Armed with advice from Sophie to, "search for the species she wants to add", Erin clicks "Add Organism". Right away she sees the "Search" box she somehow missed the first time around. Erin searches "Canadian Goose" and hits "enter" on her keyboard. Her search supplies no results. Thinking she has been too specific, Erin searches, "Goose" and is met with a long list of qualifying organisms. The Canada Goose is not in the first list, so Erin toggles to the next page where she finds "Canada Goose". She selects it and adds it to her datasheet. Following the same keystrokes and clicks, Erin manages to add a few more birds she frequently sees, but is also unable to find some of her favorites. Frustrated that she will not be able to list all the birds she would like to, Erin becomes discouraged and her eyes grow tired. Promising to return to the project soon, she saves what she has and shuts her computer down. Because Erin became frustrated and felt she had little guidance in the datasheet creation process, she chose to continue watching birds on her own and never returned to her project to complete her datasheet.

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