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# Introduction

Open Assistive Technology (Open AT) designs are intended to provide a cost-effective, customizable option for people who need assistive technology. The designs need to be easy to build by a maker, easy to use by a user, and easy to improve upon by a designer. To meet these goals, it is critically important that all the know-how – the documentation, drawings, digitals models, source code, other media, etc., is complete, comprehensive, and publicly available.

# Objective and Scope

This playbook is designed to help someone who is planning to submit an assistive device to the Makers Making Change Library prepare their submission. It will illustrate the minimum requirements and other recommended elements for documentation of the device. Templates have been created to direct the flow of documentation to produce consistent and useful information.

This playbook is intended for a designer, or someone submitting a design on behalf of someone else.

1. Design projects that haven’t started yet. (i.e., Document as you go)
2. Designs that are complete and are ready for submission to the library.

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# Documents

This section is intended to explain how to use the templates in this package. There are documents that are necessary for device submission. There are some required documents that must be created to allow future makers, users, and updaters to understand the project. All other templates should be used if your project requires it. For example, if your project does not require 3D printing then that template can be left out. But the BOM must be included in every submission.

|  |  |  |
| --- | --- | --- |
| Item | Primary Audience | Required/Recommended |
| Device Summary | All | Required |
| Bill of Materials | Maker | Required |
| Change Log | All | Required |
| User Guide | User | Required |
| Device Photos | All | Required |
| Maker Guide | Maker | Required |
| Design Rationale | Designer | Required |

## Open Know-How Manifest

Open Know-How Working Group,

https://standards.internetofproduction.org/pub/okh/release/1

## Design Rationale

**Primary Audience:**

Design Updaters, Device Makers

**Purpose:**

This document is intended to give an overview of the devices design from ideation to complete design. This will give future viewers of this document perspective into the choices that were made in the design process and give future updaters information about the challenges of the design.

**Requirements:**

* Background on device conception
* Objective of the device
* Explanation of other commercial/DIY options if there are any
* Version explanations if iterations were made
* Ideation explanation of components
* Information learned from prototyping
* Breakdown of final design explaining why choices were made
* Areas for improvement
* References/attribution used during design

**Instructions:**

Fill out the design rationale template. This document is intended to capture the design process so it is great to use in the process of designing and capturing prototyping as it happens. Although, if the design has been completed then going through each stage of this template document allows one to review choices made. By filling out the template all requirements should be covered but since every design is different, please add any information you think was valuable within the design process. The template will require you to:

Clearly outline the initial concept of device along with other similar devices that are available through DIY or commercial options.

Capturing Ideation of each individual components and how they will work together to accomplish the objective of the device

This document will require prototyping design and taking notes along the way of successes and failures

Creating a rationale for design based off of that prior prototyping

## Device Photo(s)

**Primary Audience:**

Device User, Device Maker

**Purpose:**

To give individuals interested in making or using this device an idea of what the final product looks like. A variety of photos, videos, or GIFs of the device in use and on its own allows an individual to get a good idea of the device.

**Requirements:**

* + At least one, clear, focused image that illustrates the device.
  + At least 500 x 350 pixels and up to 1000 x 800 pixels

**Instructions:**

These pictures should be attached in the zip file when submitting all completed templates. Or if you are creating a GitHub repository, please include a folder for photos. These pictures should be taken in good lighting environment that shows off the device in a positive way. There should not be any identifiable faces or features included in these photos, even if they have filled out MMC media consent form.

## Maker Guide

**Primary Audience:** Maker

**Purpose**: This document is intended to provide a framework for future makers to build this device. The maker should be able to follow this document from the beginning to end of the build and to use as a final check at the end of the project to make sure they covered everything.

**Requirements**:

* List of items to ask user about before building
* List of items to be 3D printed
* Link or mention of where to find BOM
* Instructions for cleaning the device before shipping or drop off
* List of items to deliver to user

**Instructions**:

Fill out the maker checklist template. Include all above requirements and any other information that a maker should know during their building process.

Putting yourself in the position of a maker who took on or is interested in tackling this project and creating a document that will act as a “To-Do” list for the maker.

### Assembly Guide

**Primary Audience:**

Device Maker

**Purpose:**

The Assembly Guide provides clear, step-by-step instructions on how to build the device. Enough detail should be included so that makers with a range of different skill level can successfully build the device independently.

**Requirements:**

* Step by step instructions
* List of tools required to build the device
* List of Personal Protective Equipment (PPE) an individual should wear when building

**Recommended:**

* Photos or graphics that illustrate each step
* A labeled photo or diagram with parts in a knolled fashion (laid out)

**Instructions:**

Write out the different steps required to assembly the device.

Make a list of all tools and equipment that are required during assembly. Don’t forget to include any personal protective equipment like safety glasses.

If possible, take photos or create graphics to illustrate the different steps during an actual build. Ideally, visual guides that don’t rely on text are preferred (e.g. IKEA).

Fill out the assembly guide template. This will require a start to finish build with photos and notes being taken at each step of the build. This information can be used to fill out the template. The photos are intended to be placed within the locations indicated on the document. This can be done by deleting the text and inserting a picture into the cell indicated and resizing as you see fit. This file should result in a document that can be followed by any maker that is interested in building this device.

There often are places in a design that are particularly tricky or to make it work a certain technique is used. Please make sure that these steps are noted in case the future maker is unfamiliar with that method.

### 3D Printing Guide

**Primary Audience:**

Device Maker

**Purpose:**

Used if the design includes 3D printed components. Allowing future makers to have all the information needed to have the best chance to have a successful first print. Each printer may require fine tuning to get a viable device but providing the settings and materials used gives future makers a starting point for the print.

**Requirements:**

* Summary of important total print specifications (total time, mass, etc.)
* Print file names
* Individual print specifications and any important notes per file
* Post processing notes (removing supports, cleaning, etc.)
* Customization options (color, custom markings, etc.)
* Ensure that the STL is exported in BINARY format rather than ASCII. ASCII format will not allow for an easy download on GitHub or other platforms.

**Instructions:**

If your device requires 3D printing, please fill out the 3D printing guide template including the above requirements. All of the information should be available by most common 3D slicer software such as Cura or Prusaslicer. Make sure to add these 3D print .STL files in a ZIP file when submitting your project on the website.

This will require multiple test prints to test the reliability of the design/what settings work best.

*Special Note: In the summary section there is a place for multiple configurations. This is only for if there are multiple orientations the print parts could be configured in that would significantly change the metrics. For example, if it is a 3D printed switch that has multiple tops and one top version takes significantly more time and material to print.*

## Bill of Materials (BOM)

**Primary Audience:** Maker

**Purpose:** The Bill of Materials provides a comprehensive list of all of the materials required to build the device and information on where to obtain them. Allowing the viewer be able to source or evaluate the materials needed to build the device. Also provides the explanation and break down of the cost per each device component. Can be a great source for future updaters to see if there could be improvements on materials sourced.

**Requirements:**

* Detailed name of component (e.g., 3.5 mm Female Stereo Cable – 6ft)
* Quantity of the component needed
* Price of component
* Link to purchase of the device

**Instructions:**

Every component in the design should be listed in the Bill of Materials.

Any cell that is colored grey in like the picture below is **automatically** calculated based on inputs. These will calculate things such as final price, total print time, etc. Make sure to include a source to the component so future makers can purchase it. Having alternative links is also preferred as more information will help future makers if the product is discontinued, link is broken, or they are located in a different country.

Table

Description automatically generated

The template auto calculates 3D print price base off of $25 average 1 kg roll of PLA. If your design includes 3D printed components but you used a material that has a higher or lower average price, this can be changed by changing the estimated cost of 1 kg roll cell seen below:



User Guide

**Primary Audience:** Device User, Health Professional, Design Tester

**Purpose:** This document will be used to provide clear instructions and details of how to use the device to the user. Describing how all components of the design work is important as for many devices the use cases can be very different. This document should allow the user to get using the device and understand all its capabilities.

**Requirements:**

* Intro to device explaining its purpose
* Labeled Component photo(s) or diagram(s)
* Explanation on how to use the device
* Devices Compatibility if it works in conjunction with other devices
* Specifications such as size, weight, or any others that are pertinent to the device
* Cleaning instructions
* Support information in case device breaks (has been included in template and should not be changed)
* Standard Liability information (has been included in template and should not be changed)

**Instructions:**

Fill out the User Guide template. This will include taking pictures of the device and collecting specifications on the device such as mass, size, etc.

This will include:

Taking a picture of the complete device and labeling the important components the user will be interacting with.

Measuring the specifications of the device such as mass, size, etc.

Testing out compatibility if the device requires interacting with other devices.

Making sure that there has been input from users who would use this device on language used and to understand more of usage cases.

Changes

**Primary Audience:**

Device makers, Design updaters

**Purpose:**

This document allows individuals to track the development of the device. Intended to communicate the changes between versions and what versions have been created.

**Requirements:**

* V1.0 key features
* If there are future versions: version number and key features of that version
* Date finalized for each version

**Instructions:**

Fill out the Change Log template. If you are just starting the design, please use this template to make notes while prototyping to catch any important decisions/features that were made for each version. For original version state any key components of the device.

Make point form notes of key changes that have been made for new versions.

Device Summary

**Primary Audience:**

Anyone who views device website post

**Purpose**:

This information will form the basis of the device listing in the Makers Making Change Library. It should include a description of what the device is, how it works, and for whom it is intended. It should also include a basic summary of what is required to build the device.

**Requirements**:

* Overview of device
* Device material cost
* Skills required
* Approximate Time required
* Tools required
* Usage explanation (i.e., target users, what the device supports)
* Name of components needed for 3D printing with estimated times and mass
* Attribution

**Instructions:**

Fill out the information under the headings in the template. Include any other important information you think an individual (maker, user, someone interested) who is looking at the device page on the website should have.

Most requirements will be able to be pulled from the other main templates as this is a summary of all of the information found in the templates.

# Design Files

This document is focused on the documentation aspect of submitting a project. However, this section relates to the best practices of creating the design files that will be included in a submission of a project to the Makers Making Change library.

## Accessible

Documentation should be accessible to all individuals. This can be done by the use of:

* Alternative text for pictures and videos.
* Descriptive video for a demonstration of how devices work.
* Majority of documents being text with headings.

## 3D Printed Components

The design of 3D printed components should be done with widely available filament that most printers can use. Some unique designs may not allow for this, but it must be noted that this will decrease the ability for designs to be accessible by most makers. There are a few key techniques that make 3D printed designs successful:

* Adding a document to the design including recommended print settings.
* Ensuring that the orientation of the STL file is the orientation that the device is intended to be printed in and will result in the most successful print when added to the slicer.
* ABS print material should be avoided as many people’s printers cannot print it. PLA is a good alternative standard that is easily accessible and affordable.
* When creating the STL file in the CAD software ensure that it is exported in BINARY format rather than ASCII. ASCII format will not allow for an easy download on GitHub or other platforms.

## Printed Circuit Boards

Mounting holes should be for M3 or #4-40 screws. Smaller screw sizes such as #2 can be hard to source and should be avoided.

## Easily Improvable

* As a device is used and tested, it should be easy to incorporate feedback to improve the design. Improving the design is much easier if the original design files are available and the reason for initial design choices is documented, as the original designer may not be able to make the changes themselves.

## Maker Manufacturable

Open AT devices in the MMC library are intended to be built in small quantities all around the world. Some recommendations to make the build more accessible for a broad audience can be seen below:

* Utilize common, readily available components; Avoid components that are only available from a single source.
* Add alternative links to components that may be difficult to be sourced.
* Avoid or minimize use of specialized tools.

## Modularity

An initial design might be designed for a particular person or purpose, but future sizing should be kept in mind.

* Making files parametric and able to be resized is beneficial for future use.
* Creating sizing documentation that can be easily understood by the users of the device.
* Provide options and/or instructions for how to personalize a device – user selectable colors, markings, etc.