

1 – first meeting with the artist

In the first meeting Giacomo Lepri asked me to help him designing a new version of the instrument named “Chowndolo”, Giacomo’s plan is to produce a series of about 50 pieces of the instrument, bringing it from a state of prototype to a product that is possible to sell as an assemblable kit that the user should be able to put together and use.

The meeting happened via videoconference

2 – second meeting

In the second meeting Giacomo went in person to me and I had a chance to inspect in depth the instrument that I will redesign.

The meeting consisted in a session where the instrument was set up and played by the client, and at the end of this first session Giacomo exposed all the flaws that, in his opinion, need to be fixed in order to turn his prototype into a product that is possible to sell, and I also provided a feedback regarding a few aspects that, in my opinion offered room for improvement.

The to-do list :

- 1 – improve the visual aspect of the instrument maintaining the essence of the current state. (giacomo’s request)
- 2 – improve the stability and the steadiness of the instrument (giacomo’s request)
- 3 – Improve the integration of the amplification circuit with the instrument (giacomo’s request)
- 4 – Improve the strength of the pendant that is currently sustained by the same electric wires that make the instrument work (nicolò remark)
- 5 – smooth the corners in order to avoid fragile spots of the instrument (nicolò’s remark)
- 6 – design of an external casing to store the Bela that powers the system (giacomo’s request)
- 7 – improvements in the coil sensor (nicolò’s remark)
- 8 – improvement of the UX design, by changing the actual connectors with more commonly used hardware such as audio jack/minijack. (nicolò’s remark)
- 9 – implementation of IoT devices that might expand the instrument’s capabilities (nicolò’s remark)
- 10 – improve the instrument from a sustainability point of view (nicolò’s remark)
- 11 – optimization of the design for series production (Giacomo’s request)

Giacomo also told to Nicolò that the design of the new circuits will be made by Andrew McPherson, that will follow the advice of

The session ended with the share of the documentation that describes the instrument with photos and with implementing CAD files that have been used to laser-cut the instrument

3 – Analysis of the documentation

The next work session was carried on by Nicolò, and it consisted in analysing the documentation sent by Giacomo.

Nicolò observed that all the implementing files were in PDF format, which is a vector file that is compatible with laser cutters.

Although the documentation provided was good to start working. The documentation provided it's not very clear about the assembly process.

Nicolò decided to turn improve the current documentation by importing the PDF files into a parametric 3d modeling software (FreeCAD) and make a 3D model of the Chowndolo.

The act of modelling the Chowndolo with FreeCAD had two main objectives: to facilitate the design process and prevent the obsolescence of the documentation.

4 – sketching session

The next session consisted in a design sketching session where Nicolò started to hypothesize a series of solutions that might fulfill the requests that emerged during the meeting with Giacomo.

In parallel with this drawing session, Nicolò set out the constraint of making the object in such a way that it could be built in a Fablab/Makersspace, so that the production of the instruments could happen virtually anywhere and that the outcomes of the design process could be easy to share among the future instrument's buyers and allow them to easily fix and/or hack the instrument if in need.

The first hypotheses for the instrument's development was therefore to design the main structure as a laser cut friendly objects, and to implement some 3d printed casing to contain the circuits.

5 – CAD session

In Line with the considerations made in the previous session, Nicolò used open source software (FreeCAD) to make a first 3D model of the main structure, that remained almost alike the original, and the shells that shall contain the amplifier circuit.

6 – meeting with Giacomo

The outcome of the first sessions were discussed with the client during a remote call session.

The client provided as a feedback the appreciation for doing a new design that it's easy to replicate in makerspaces, and the desire of not having multiple manufacturing methods to produce the instrument, and invited Nicolò to design something doable exclusively with a laser cutter machine.

The session continued with some aesthetic consideration regarding the shape and the dimension of the circuit's casing. Nicolò's consideration was that those aspects were at the moment very speculative since the shape and the dimension of the circuit to be contained it's still undefined.

The team therefore decided to organize a short session with Andrew McPherson to talk about the circuit design.

7 – meeting with Andrew McPherson

The team had a meeting with Andrew McPherson, who is in charge of designing the circuit. During the meeting we discussed what component to use to power the circuit and how to connect the device to a sound system. After a brief discussion we opted for using a USB C connector for power and a mini jack for audio out.

At this point Nicolò proposed to design a hypothetical shape for the circuit that would be later on completed by Andrew by placing the components on it.

8 – CAD session

Nicolò had a CAD session where he use FreeCAD and KiCAD together (through a FreeCAD addon calle “KiCAD stepup”) to design and export a circuit outline that could fit perfectly in the casing designed so far. The outcome of this phase was exported and shared with Andrew, that approved the dimension of the outline as capable of containing all the components needed.

9 – CAD session

After a brief confrontation with Giacomo, Nicolò had a new CAD session where he replaced the shells modelled so far with new elements that could be done with a laser cutter, and bended thanks to a folding pattern.

To carry on this process, Nicolò experimented a new FreeCAD Addon called “sheet metal” and that allows the designer to easily design folding patterns.

The outcome were shared via mail with giacomo and posted on social media (Instagram, Twitter, Facebook, Mastodon)

9 – Feedback from Giacomo and FreeCAD community

Giacomo provided (via whatsapp) a feedback where he claims that the shell designed by Nicolò it's too “heavy” aesthetically, and suggests a new solution where the pcb it's not hidden by the shell but only supported by it, this piece it's been named “the V piece” as it goes between the pillars that forms the structure of the Chowndolo. Giacomo also provides as a reference a sketch made by himself and some pictures of the Bare Conductive Touch board.

Also the FreeCAD community provided feedback about the project, and a small debate started around the use and the name of the “sheet metal” workbench

10 – Cad session

Nicolò models in FreeCAD the parts as Giacomo suggests, using again the FreeCAD Sheet Metal addon. Then he also edited the PCB previously designed in order to fit into the new design.

Since Giacomo provided as a reference a product (the bare conductive touch board) that is a stand alone PCB, Nicolò also hypothesise the possibility of just attaching the PCB directly to the structure, and take an extra effort to design a PCB that is a sort of piece of PCB art, for this technique would also save some materials and machining time in the production phase.

In fact the PCB could also be attached to the base as that would be probably the best spot to show a piece of PCB Art.

11 – meeting with Giacomo

The CAD files produced in the last session were examined together by Giacomo and Nicolò as Nicolò exposed his ideas to Giacomo.

Giacomo claims that he is not really interested in doing a piece of PCB art, and that the idea of putting the PCB on the base of the instrument it's quite far from what he envisions.

The team then approves the adoption of the "V piece" as the one to be developed.

During the meeting Giacomo express the desire of having the PCB perpendicular Respect to the base of the instrument. This statement sets the basis for a new research focused on designing some lasercut supports that could keep the PCB in the right position by allowing the user(s) to easily use some screws to remove it, changing it and attach it. The conversation then moved towards a more conceptual debate around the topic of how the PCB should be visible, here Nicolò tried to make a sort of "open access scale" where he explained that we could go for a maximum accessibility (PCB attached on the base and fully visible) to minimum accessibility (where the PCB is completely hidden), and a step in between where the PCB is visible, but not so easily accessible. To explain this Nicolò provided some references, an instrument called "wonky drum sequencer" as intermediate step and another called "nano aetherphone" as example of non accessible/hardly accessible PCB.

After the conclusion of the meeting, Nicolò thinks that it's not written anywhere that the pcb must be attached through the use of screws, and hypothesise the possibility of designing a "snapfit-pcb" that could be attached to the structure without the use of screws. This possibility it's actually given by the use of the addons used in the past, and it's a methodology that is hardly used in the development of electronic devices.

12 – CAD sessions + meeting with Giacomo

The designer went back to the CAD software, where he designed the parts (PCB and structure) and also came up with 2 different versions of the structure, one extremely organic, one that basically resemble the previous version of the Chowndolo with very slight changes (mostly chamfers to smooth the corners of the structure).

During a meeting with the musician, the team agreed in having a structure where the inner part of it it's more sinuous to strengthen and prevent fragile spots

13 - final CAD session

The designer carries on a CAD session where the remarks made in the last meetings are embedded in the design.

The outcome of this phase are CAD files and PDFs that can allow the artist to build the first piece of the new version of the Chowndolo.

A secondary outcome of this process is a repository containing the files mentioned above, with the aim of releasing them as a public repository that future users can consult to relatively easily make or hack the DMI produced.