

TOT Challenge -2

Tools, Small Technologies

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Tools are an important component in the practice of Bamboo Craft .

What is that a Craft trainer needs to 'Learn' about Tools?

5 Topics come to significance

1. Tool Traditions of Bamboo and adjacent materials in different Cultures.
2. Properties and making methods of Materials used for Tools.
3. General and Product Specific tools for bamboo.
- 4 .Production Tools for a small scale Production
5. Power Tools.

I shall elaborate each of these.

- 1.Tool Traditions of Bamboo and adjacent materials in different Cultures.

We had a UNDP project which opened up a large knowledge base on 'Tools for Bamboo' ! We did an extensive survey of tools used in Indian and other Cultures for bamboo, cane(rattan) and wood. From the pictures we got in the literature, we made drawings, mock ups in plastic and got prototypes made in spring steel by local black smiths. We found 97 tools which can be used for bamboo. Prototypes of all of them were made to try out and evaluate their use for Indian bamboo varieties! For example an inter node removing tool from Chinese literature was redrawn. A mock up in poly styrene was made as seen in the picture in the next page, which lead to making the actual prototype in spring steel for trials.



↑ Internode removing tool

Exposure to such research efforts opens up the minds of trainers to the possibilities of how one can study, evaluate and adopt tools of a different Culture.

Prototypes of all the 97 tools identified and made at Bambu Studio were also made accessible to Craft trainers for hands on trials during the training at IDC.

India being a large Country with diverse cultural traditions has variety of practices in bamboo Craft.

I found craftsmen in Nagaland have a great proficiency in making tools for bamboo! They use the 'suspension springs of old vehicles' for making tools. A typical Naga traditional 'Dhau' has all the qualities to keep it as **a life time treasure!** Carefully wound wire around the handle gives fine grip in addition to its powerful look! Long Bamboo handles give them a flexibility to use it in multiple ways!



Naga Dhaus in Tool maker's shop.



Dhau being forged from vehicle spring



Naga Dhau getting shaped



Handle in bamboo getting smoked

before assembly.

North East has 4 different types of Dhaus.

Naga Dhau is used to cut bamboo culms. It is also used for splitting bamboo by gripping in the middle nearer to the blade!

Manipuri dhau is longest among the 4. Blade is smaller. More conducive to splitting by holding near the blade!

Assam dhau is much heavier. Not very conducive for fine splits, as the blade is heavy. Long periods of fine splitting is strenuous.

Tripura dhau similar to a grass cutting dhau used in many places in the Country. Dhau is kept on a stand and bamboo is pushed through for

splitting. Since dhau is resting on stand it becomes easy to make fine splits in bamboo for long periods.



It is important for the craft trainers to know local tool traditions as well as Traditions of other Cultures which have long, rich bamboo heritage.

At Adilabad (Andhra Pradesh) I came to know that 'Local Black Smiths' play a significant role in spreading tool technology! Once I had asked Guruji (Late Dr.Ravindra Sharmaji) how technology transfer took place traditionally in good old times! He revealed an interesting process. Local black smiths used to move from place to place to keep themselves occupied throughout the year in their business. Once in a while an ingenious craft person gets an idea for a 'new tool'. He or she talks to the local blacksmith and gets the new tool 'forged'. With few iterations of 'use and corrections' the new tool takes optimized shape. Seeing its advantage other craft persons start using the new design as well!

Thus an 'Innovation' is born.

But it spreads later to other areas through the moving (nomadic) black smith. He is the one to spread the new design to new areas. Current bamboo craft person might be handicapped with a break in such long prevailing traditions! But the spirit seems to continue. To my amazement I found number of variations in local tools when we were conducting a workshop at Bishnupur, Jarkhand. Shri Sunil Deshpande who brought us(idc team) into picture for conducting the workshop, was also our guiding partner. With his initiative we documented all the knives used by craft persons who participated in the workshop. Craft-persons belonged to different craft communities from nearby villages .

Craft Communities In Jarkhand and their Tools

- Brijya Community
- Murmu Community
- Turee community





Holong
(Kanti)
Birjya community



Pakur
(Kaida)
Murmu community



Mandar
Hesmee village
(Chhuree)
Turee Community



Bundu
(Kattu)

2.Tool steel properties and making methods .

Traditionally Village craft-persons have been using spring steel from old vehicles by forging them into required shape. Carbon content in these steels gives the required hardness, though it is necessary to quench the steel after forging to regain the hardness . Chromium content in these steels gives the 'spring quality' making them virtually unbreakable, as forging aligns the molecules in the steel.

As compared to this, old hacksaw blades (small and big) have high carbon content giving them higher hardness. But they remain brittle and become vulnerable for breakage when bending moments are applied.

3. General and Product Specific tools for bamboo

Dr.Avinash Shinde who worked as a design Associate on the UNDP project has been a co-designer of tool kit and product specific tools.

In the UNDP project after initial research prototypes of 97 tools were made! A list of all the tools with sketches along with photographs (pages 7 to 17) can be seen in my website www.agrao.in under Bamboo Craft, UNDP report 1.



Early phase of Bambu studio with prototyped tools

A toolkit for bamboo craft emerged after a feed back workshop 'Get Up' conducted at Guwahati, Assam in collaboration with C B T C(Cane and Bamboo Technology Centre).



IITBombay.

Participants who tried out tools from a set of 97 tools given to CBTC by IDC,



Mr.Pariat, head of Meghalaya craft Unit taking tool feed back from his craft group.

30 craft-persons, entrepreneurs, govt. officials took part and gave valuable feed back. 18 tools became 33, with new additions as per the requirements

in North East. Foldable Pruning Saw, useful to cut green bamboo got included. A master craftsman from Tripura asked whether a fine weaving tool similar to 'shoe maker's tool can be added which he can use for 'Pineapple Weave'. We came out with a laser cut weaving tool for that.

This 'imaginative tool requirement' coming from a craft trainer is crucial to the process of 'Tool Innovation'!

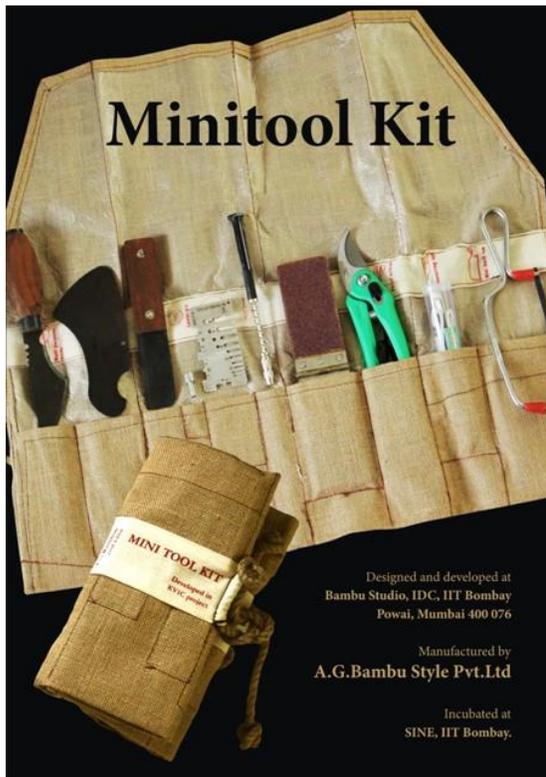
Inter Design workshops with designers, design students and Craft Trainers with **Tool Innovation** as theme, ought to be new mode for Tool Innovations in Craft!

The 'Tool kit' which we brought out along with the tools can be seen below. A Video, in the website, elucidates how the tools can be used.

Toolkit Videos



mini tool kit in use

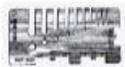


Tools in the mini tool kit.

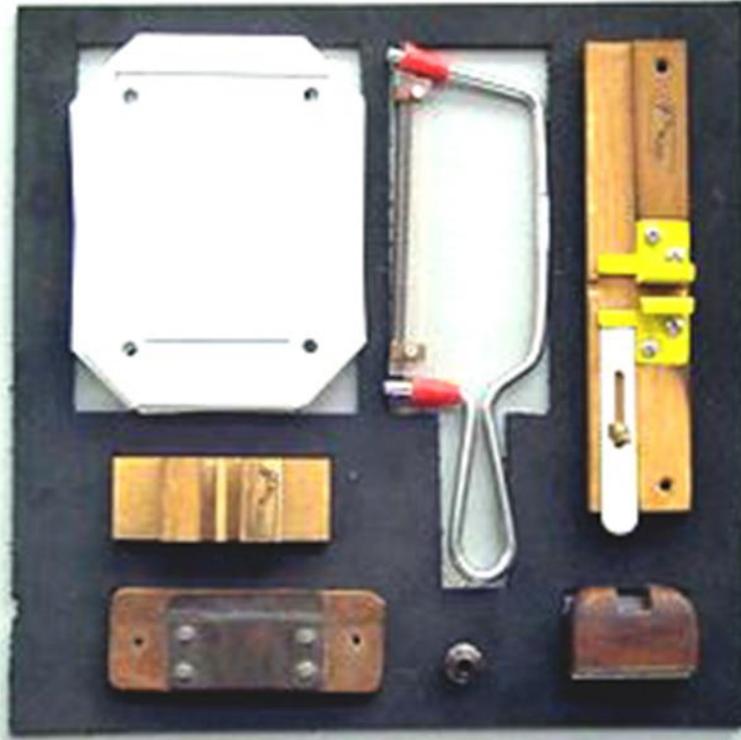
1. Multi Purpose Knife
2. Cane Scraper/ Pruning Scissors
3. Fine Splitting Knife
4. Mini Hack Saw
5. Measuring Tape
6. IDC Gauge
7. Pen Drill
8. Sand paper folding pad
9. Centre Pin
10. Scraper

11. Tweezers

Tool pictures in the same order:



Product specific Tools



When we were developing new products like a note pad we started innovating new tools 'specific' to this product.



←Note pad

With these new tools making the product became easy and faster. Thus evolved a new concept 'Product specific Tools'.

For making note pad 9 general tools were used. In addition to this 9 tools specific to the 'note pad' were innovated.

Each operation of making each part of the note pad was looked at from a point of view of a 'new Tool' which could make the operation easy and faster. Each operation which was unconventional in bamboo was looked at to arrive at 'specific tool'. With the new specific tools, 'Production time came down' and 'Precision of making' increased resulting in higher quality!

List of the general tools and the specific tools which include moulds, jigs and 'fixtures attached to tools'.

General tools

1. Machete or Dhau
2. Chisel edged rasp file
3. Mini Hack saw
4. Width sizer
5. Thickness sizer

6. IDC gauge
7. Hand drill
8. IDC piercing tool
9. Sand paper Pad

Product Specific tools

10. Sheet trimmer
11. Half cut saw
12. Step cutting Jig
13. Step making tool
14. Frame Mould
15. Frame ejector
16. Round stick making die
17. Slot cutting jig
18. Slot making tool

Description of Product specific tools

10. Sheet trimmer: Photo sheet trimmers are available in the market. The trimmer is adopted with a 'jig attachment' to give '2' exact lengths of strips.

Thus the pieces for 'length' and 'breadth' can be cut in numbers **without marking each time**, using the sheet trimmer effectively, as seen in the picture.



↑ Jig setting for longer length



↑ setting for shorter length

11. Half Cut Saw: To make the frame joint each strip has to be cut to a depth of 1mm out of 2mm thick strip to remove the end portion. A special tool is designed to facilitate this. An attachment is fixed on mini hacksaw which stops the cutting once it reaches 1mm depth. With this cutting 1mm depth out of 2mm thick strip becomes easy.



Acrylic fixture on mini hack saw to give 1mm blind cut

12. Strip cutting Jig: Strip cutting jig is needed to get the half cuts exactly without marking . This jig guides the

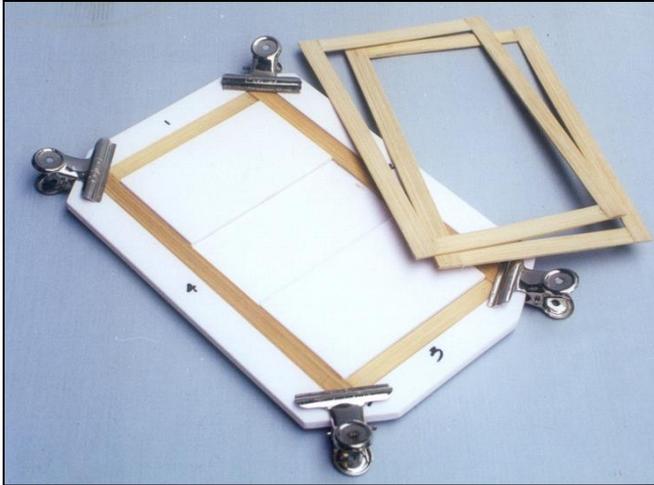


half cut saw to make perpendicular cut at required distance from the end.

13. Step making tool: After making half cut in the strip at one end of the end piece has to be split to get a step with half the thickness i.e. 1mm. A special tool is designed for this in which one end of the strip can be inserted. It splits the strip in half till the saw cut line. Thus by inserting and pushing the strip into the tool 1mm step can be made easily.

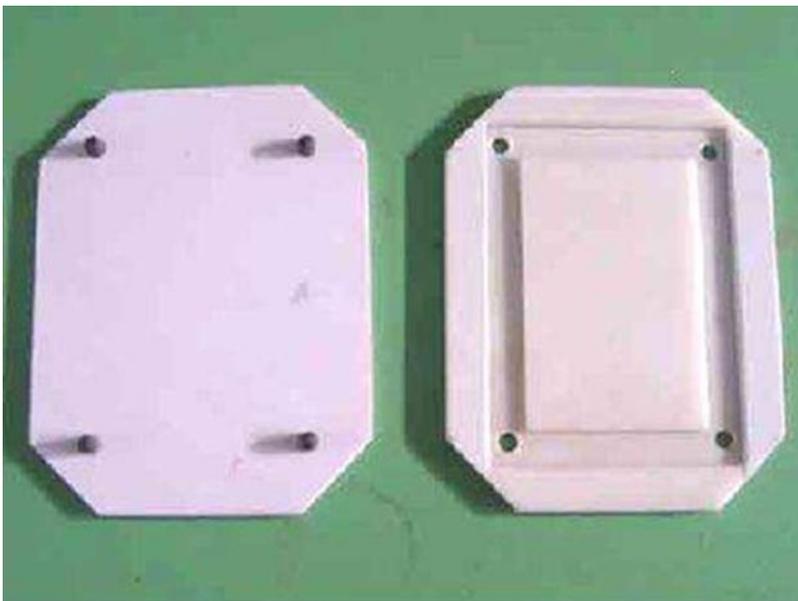


14. Frame Mould: Frame Mould(right side in the picture below) is made in polystyrene, which prevents the frame getting stuck to the mould. It has 2 mm groove conforming to the frame size. Strips with half splits at either end are placed in the frame with fevicol(glue) applied in between. This gives even thickness and exact 90° for the frame



. Clips can be used to give light pressure while the fevicol dries.

15. Frame ejector: Frame ejector(left side in the picture.) has four pins to push out the bamboo frames from the mould once the glue has dried. The frame ejector pins



go through the 4 holes provided in the frame mould and push the frame up evenly at all corners when the 'mould

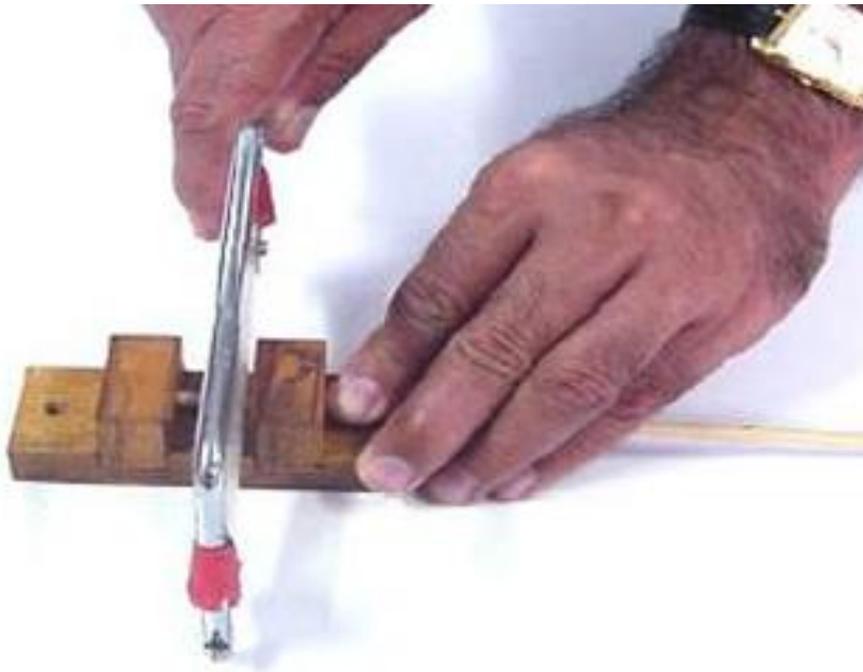
'with' frame' is placed over the frame ejector and pressed down.



16.Round Stick making die: A die of exact dimension made in hardened steel is used to make round sticks for the hinge. To start with square-sticks are made with general tools. The dye is placed in a vice and the square stick hammered through the dye with a mallet to give round sticks.



17. Slot Cutting jig: Two 20mm wide slots are to be made on the hinge rod for winding a thread to act as a hinge. For this two 1 mm deep cuts are to be made at 20mm distance for each slot. *Cutting such a slot is extremely difficult due to the linear fibers in bamboo!* A specially made jig makes it easy to make these cuts at exact position with half cut saw. The stick can be turned to get the cut all along the periphery.

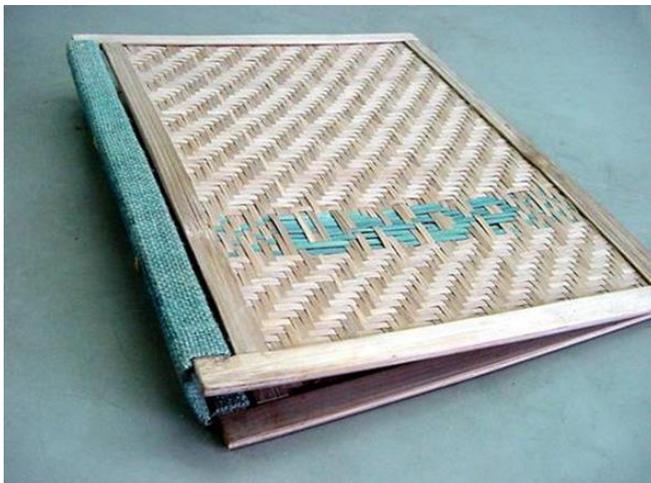


18. Slot making tool: Slot making tool is similar to a 'pencil sharpener' with its blade equal to the width of

the slot. The hinge rod, after making the 1mm deep cuts for the slot, is to be kept in the tool. The tool is closed and the rod rotated like in a pencil sharpener. A uniform step-cut of 1mm depth around the stick can be achieved by this.



Many of the 'Product specific tools' developed for note-pad can be extended to a range of 'frame based products' like 'file folder', 'menu card holder, etc,.' .



File folder



Menu card holder

The Concept of 'Product specific tools for bamboo craft products' is new. It can open up a way of 'design thinking' to bring in new contemporary forms in bamboo craft . Bamboo with its special properties different from wood poses a challenge in joining and detailing where product specific tools can bring new aesthetics with ease of making into bamboo craft.

It is important that 'Trainers' get exposed to this concept. They can bring a new dimension to bamboo craft, by making market viable 'new products' in numbers using product specific Tools.

4. Production Tools for a small scale Production

Traditional craft-persons have been using limited tools. Indian craft-person has a knack of adopting the same tool for multiple operations.

To reposition the craft into a contemporary frame work of Design and Manufacture a new bent of mind is needed. Production planning and organizing production space become crucial. In a group production unit 'Chaitanya' which was hand held by IDC for couple of years, an organized effort for production activities took place. Tools, small machines and work benches were designed to suit the local space.

A full case study of Chaitanya is available at Bambu Studio.

Here we will look at the specific tools developed and used.

4.1 Work desk, storage tray and work space



Master craftsman Rudra Paul fixing the width sizer on work desk



Chaitanya group

A work table for each person to operate in a sitting posture was designed. A width sizer and a sand paper pad were fitted on each work desk. It also acted as a lockable individual storage unit.

4.2 Template for visual alignment and marking



Specially designed template helped them to mark and cut keeping the 'visual orientation' vertical in spite of small

variations in the weave lines, which are characteristic of a craft process.

4.3 Production tools for basket making at Basel, Switzerland.

I had a chance to see 'Early basket makers' tools' made for production at Basel (Switzerland). These were being used in a Cane weaving Unit specially created for 'visually impaired' persons! The tools were sturdy and well made with good quality steel for Production. They were not meant for training . The Instructor with normal vision was using these tools.





see the video for more information.

[Swiss basket making tools video](#)

The Instructor was kind enough to demonstrate the use of tool bench as seen in the video above.

5. Power Tools

During the UNDP project in 2000+ we were asked not to use 'power hand tools', as most of the villages didn't have Electricity!

But today(2019) the scene has changed. Most of the rural production centres in India have Electric supply. 5Amp. Domestic Power supply is available(some times in limited hours of the day) in most of the places. Using electric portable tools is an option bamboo craft production centres can think of.

Power Tools specific to Product Areas.

5.1 Furniture and House Construction:

Bamboo Units in furniture making (especially with full bamboo) and House Construction will need

5.1.1 A Cross Cutting Machine(portable circular saw)
for length sizing of bamboo poles,

5.1.2 Power Stapling Gun,

5.1.3 Portable jig saw cutting machine,

in addition to

5.1.4 Drill,

5.1.5 Spray-gun with compressor,

5.1.6 Hot air blower.

5.2 Weave and Carving related:

Traditional bamboo weavers can work without power tools fairly efficiently!

But Power Tools can enhance Quantity and Quality!

Useful Tools

5.2.1 Hand drill with a stand for fixing attachments

5.2.2 Small sander for finishing

5.2.3 Spray gun with a small compressor,

5.2.4 Hot air blower with a sealer for shrink packing can

become very handy for final get-up of the product.

5.3 Special Power Tools

Crafts can also make use of special tools available to create new craft specializations

5.3.1 **Electric Pyrographic Tool** : Pyrographic Tools can be imported. Nicrome wire tools of various shapes give number of possibilities to produce graphic pictures on bamboo!

5.3.2 **Hot Stamping Machine** : Hand operated stamping machines can be used for production purposes.

5.3.3 Laser Etching and cutting machines:

Small laser Cutting and Etching Machines are available in the Indian Market. Samples experimented at Institute of Hyperwerk, Basel, Switzerland can be seen in the picture and video.



laser cut sample

[Laser cut bamboo video](#)

It will be possible to develop 'laser based bamboo craft' as a new enterprise

5.3.4 Power Fret saw

Fret saw or jig saw Machine can be used to cut shapes out of bamboo. Hollow bamboo with 3mm thickness is ideal for working with a Fret saw. Range of Animal shapes for toys, variety of key chains can be produced giving the skill a new craft mode in bamboo.

Small Clusters for bamboo craft under Govt/KVIC will be ideal to nurture new bamboo craft entrepreneurs. Providing common work space, market and raw material support helps to build a conducive ecosystem!
