

Azali Bah

Bamboo furniture for
Rural schools and
Primary Health Centres
in Assam

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Introduction

This project attempts to reflect the many possibilities in new design and developments of a whole range of products that can address the local needs of our rural community. It is self-sustainable as it utilises locally available raw material which is extensively available. It utilises the talents of our highly gifted craftspersons. It can become an initiative which can aptly be called 'for the people, of the people and by the people'. It encourages local entrepreneurship and self-employment opportunities. It directs the potentials of locally available skills for meeting basic community needs.

There are many an initiatives and incentives offered by the state towards meeting these requirements. But unfortunately not all of them result in accountable transformations and benefits. There is an urgent need for exposure and appreciations of the possibilities this project offers. The logical next step is for the authorities and decision making agencies directly concerned with these areas of engagements to undertake steps towards implementation of the outcome of this project.



The Team

Project team

Department of Design

Project Head:

Prof. S.Nadkarni
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Graphic Design
Industrial Design

Design Associate:

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Furniture Design

Craftspersons

Associated with

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Shri Bhisnu tamuli
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Shri Kamaleswar Das
Shri Raghunath Das
Shri Mahesh Pathak
Shri Rajek Ali

Model & Prototype
Computer Graphics
Multimedia
Craftsman
Master Craftsman
Master Craftsman
Assistant Craftsman
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Project Objectives

The Northeastern states of India are blessed with an abundance of a variety of cane and bamboo. These find wide application in the everyday lives of the local people.

In the context of its relevance to the immediate community of the region, this project has focused on the use of cane and bamboo in the design and development of a new range of utilitarian furniture. The vision of this project is to explore the possibilities of utilizing the local materials, Cane & Bamboo, as a sustainable, eco-friendly timber/ metal substitute through the design development of functional products for rural schools and hospitals and in doing so making available basic functional products which find little or no access to the rural population. This project undertaken by the Indian Institute of Technology,

Guwahati, is a path breaking initiative in developing a new range of furniture that meet the basic infrastructure needs of furniture in rural schools and Primary Health Centers.

Its objective is to generate new directions in which craftsmen working in cane and bamboo could reorient themselves in producing functional and utilitarian items of furniture that are easy to produce using simple hand tools, economically viable and ecologically sustainable. In the process improving the overall quality of facilities in our rural institutions.

This project therefore aims to:

1. Develop innovative functional objects
2. Develop process rationalization
3. Train craft persons in new techniques
4. Create new business opportunities



The Importance & Significance of the Project

The project seeks to empower what we commonly perceive as the 'emporium handicrafts' community to begin to engage itself in a larger circle of productivity that involves the development of functional utility products. The design approach is neither intrusive nor exclusive. It instead empathizes with the local indigenous skills, tools and technology available and does not require extra infrastructure or the import of new technology and materials. It instead involves craftsmen to think, question and contribute to the wholeness of the product, be it structurally or a touch of local aesthetic identity.

Such an activity has tremendous employment opportunity since the larger population in rural India has little or no access to these basic necessary products.

The development of products based on local materials also ensure that basic repair and maintenance is easily affordable and ensured, especially in such scenarios where little maintenance allowance has been extended by the government to schools and hospitals during the last two decades.

This initiative is significant in the context of its timing considering the renewed impetus given by the government in the last few years to improving the infrastructure facilities in the fields of primary education and primary health services particularly in the rural sectors of Indian society.

Bamboo

Some Facts about Bamboo



India has the second largest resources of bamboo in the world, next only to China. About 10.03 million hectares of bamboo forests producing 3.2 million tones of bamboo annually.

Of this 5% goes to the crafts sector, 40% goes to paper industry, housing and construction takes up 40% and 15% is put to other uses.

Although bamboo offers a high employment potential in the craft sector, much of the bamboo is presently supplied to paper industry at a subsidized rate.

Unconcerned exploitation of bamboo forests has led to ecological damage.

There are approximately 13 lakh persons involved in bamboo work all over the country.

Of this approximately 5-6 lakh workers are involved in bamboo craft. Bamboo craft has reached maximum levels of sophistication and applicability only in the northeastern parts of the country.



Some features of Bamboo



Essentially a grass, there are hundreds of kinds of bamboo that grow abundantly in different regions of our country. Unlike timber, they are a fast growing species, and reach their mature height and full growth in about 5 years. Their life span is approximately of 40 years duration. Their size varies in length and width: upto 60 meters length and 25 cm diameter. Bamboo is fully fibrous and possesses formidable

strength, lightness, workability and easy availability especially because of its capacity for rapid regeneration.

It is an ideal choice for several applications, particularly for poorer segments of society.

The range of applications includes housing, grain storage barrels, agricultural implements, animal carts, furniture items, hand tools, household containers, ladders and temporary structures.

Bamboo species available in Assam

Vernacular Name	Internode-length	Circumference	Serviceable Length
Jati	18" to 24"	8" to 10"	25' to 30'
Bhaluka	6" to 15"	12" to 18"	30' to 40'
Bijli	12"to 20"	2" to 4"	16' to 24'
Muli	12" to 24"	6" to 12"	16' to 20'
Jili	6" to 16"	" to " dia	6" to 16"
Kata	9" to 18"	4" to 12"	15' to 25'
Kako	10" to 16"	10" to 12"	30' to 40'

Vernacular Name Cane species available locally

Raitang

Jati

Gulla



Why Bamboo?

Bamboo can be a potential source of employment generation in rural areas through manufacturing activity and utilization of local material in value added products. It offers considerable opportunities for local people to increase their economic independence and their self-reliance. Bamboo grows abundantly and specific species required can also be grown on a small scale, preservation can be done in a factory which does not require high investment, and construction executed with relatively simple tools. In Assam, North East of India, a single knife commonly known as the 'dao' is the time tested single traditional tool for working on bamboo.



Some properties, which determine the best use of available bamboo, are:

1. The dimensions
2. The total height of the culm before harvest
3. The useful length of the culm
4. The outer diameter at the bottom and the top of the length selected.
5. The wall thickness at the same places
6. The length of the internodes
7. The straightness of the culm is an important factor
8. The mechanical properties of the species available for us.
9. The natural durability and preservations required
10. The useful length

Advantages of Bamboo:

1. Because of its hollow form bamboo is relatively strong and stiff and can be cut and split with simple tools
2. The surface of bamboo is hard and clean Bamboo can be grown on village scale and family scale

Disadvantages:

1. Low natural durability; bamboo needs preservation treatment, which in many cases is more difficult than for wood.
2. Bamboo can hardly withstand contact with the soil; however, in dry soil it can last a long time provided there are no termites
3. Fire is a very big risk
4. A bamboo is not completely straight; it is tapered. The nodes occur at different distances; the prominence of the nodes can be nuisance when the material is being worked.

5. Standardization is virtually impossible; because of the variation in sizes, only in the joints can standardization be attempted.

Harvesting and preservation:

Only adult culms should be cut. Young culms should mainly be left in place, not only to grow and mature but also to provide food for the plant. It is important not to cut too much bamboo from a single clump. A bamboo culm is ripe or mature in 3 years. It can be easily be recognized by the change in colour and other time tested methods followed in different bamboo-using regions. Harvesting should be done in the late dry season because then the bamboo culms have low moisture content, making transport easier and reducing the chance of attack by fungi and rot. During the rainy season no harvesting should ever be done.

Why Schools and Hospitals

As a national priority, there are a number of programs that the government has initiated, both at the Center and the State level, with the aim of providing education and health for all.

However a study of the local/regional environment indicates that the infrastructure of furniture presently available in institutions such as Schools and Primary Health Centers in the rural sector is still pathetically inadequate. Most of these public institutions are unable to provide basic facilities due to paucity of funds. In many instances the facilities available are either inappropriate, very poorly designed or sometimes non-existent.

There is an urgent need to strengthen the basic infrastructure of furniture for public institutions like rural schools and Primary Health Centers. This process could utilize materials and skills available in the local community.

Both cane and bamboo offer tremendous scope for introducing a new range of furniture that can be locally produced with locally available skills of the regional crafts community. There is enormous scope to design and develop economical and sturdy furniture in cane and bamboo to meet these needs. The demand for such furniture seems vast and could develop itself as an organized enterprise creating new avenues for employment generation and enterprise in the rural and semi-urban sectors of the region.

Work Method

Designing a product / product system involves an understanding of the primary needs that the product should meet. It is influenced by a comprehensive perspective of the socio-economic conditions within which it exists. Design proposals therefore always attempt to reflect features that meet user centric considerations. Comfortable to use; functionally appropriate; novel; economical and aesthetically pleasing to the eye are the objectives it encompasses.

There is a systematic work method to achieve these objectives. In this project the method of enquiry involved:

Field studies undertaken in different Schools and Primary Health Centers in specified locations to understand the different environments of use

Interaction with crafts persons to study, document and understand their crafts practices

Study of properties of cane and bamboo as a raw material for making furniture

Study of Ergonomic factors in furniture design.

Design conceptualization and prototyping

Design refinement after trial with end users

Design finalization, making technical drawings etc.

Documentation

Exhibition of products to decision-making authorities

Field Survey: Rural Primary Schools

Scenario I



Field survey was undertaken in the rural settings in Assam to gather a first hand impressions of the ground realities in the area s of study

Scenario III



Scenario II



Field Survey: Rural Primary Schools



Scenario of basic amenities available in schools



Encouragement for utilizing local materials for/as educational tools



Bamboo Ruler



Model making: Clay from the river side

Field Survey: Rural Primary Schools

The project team visited local primary schools in and around North Guwahati, Tezpur, Goalpara, Meghalaya and Mizoram on many occasions during the entire product development period.

The entire existing scenario can be summed up into the following chart:

Scenario I	Staff	1 Teacher cum Principal
	Classes	'Kaw' to IV
	Age Group	3 - 12
	Av No. of Students	50-80
	School Building	1 Open Hall
	Salary	An average of Rs 5000/- pm for all
	Fee Structure	no fees charged
	Furniture	1 Table & Chair for Teacher All students sit on the floor
	Fixtures	No Lights, Fans & Storage Systems
	Sanitation & Hygiene	Availability of drinking water well, funded by the UNICEF for some schools No Clean Drinking Water Facilities Inadequate Toileting facilities
	Maintenance	No Funds provided for maintenance.
Scenario II	Staff	2 Teachers = Principal + Vice Principal
	Classes	'Kaw' to IV
	Age Group	3 - 12
	Av No. of Students	100
	School Building	1 Open Hall + 1/2 smaller rooms
	Salary	An average of Rs 5000/- pm for all
	Fee Structure	no fees charged
	Furniture	Long wooden desks & benches Excess students sit on the floor
	Fixtures	No Lights, Fans & Storage Systems
	Sanitation & Hygiene	No Clean Drinking Water Facilities Inadequate Toileting facilities
	Maintenance	The local School Committes and the Panchayat provide for basic utilities like chalks.

Scenario III	Staff	3 or more
	Classes	'Kaw' to IV
	Age Group	3 - 12
	Av No. of Students	100 plus
	School Building	Hall with room partitions
	Salary	An average of Rs 5000/- pm for all
	Fee Structure	Token amount
	Furniture	Long wooden desks & benches Excess students sit on the floor
	Fixtures	No Fans & Storage Systems
	Sanitation & Hygiene	Inadequate Toileting facilities
	Maintenance	The local School Committes and the Panchayat provide for basic utilities like chalks.

Analysis and Design Needs

Products required by Rural Primary Schools are:

Table & Chair for Teachers
A furniture system with storage facility

Tables & Chairs for Students

- 1) Single Seater
- 2) Double seater or more
- 3) Tables & Chairs with variations in height for different age groups
- 4) Tables that can stack, easy to store, gives the possibilities of different configurations
- 5) Tables with storage facilities for bags, water bottles, etc

Blackboard

- 1) Single or double sided to be accomodated into different spaces
- 2) Permanent fixture or folding

Storage Systems

- 1) Storage for student's bags, water bottles etc.
- 2) Storage for excersice books, library books
- 3) Open Storage
- 4) Closed storage for safe keeping
- 5) Partition Systems

Others:

Toileting and drinking water facilities
New & improved Teaching kits and manuals

Field Survey: Rural Hospitals & Dispensaries

Hospitals and Dispensaries in the rural areas are poorly equipped. Most of them do not have basic accommodation facilities for patients; e.g., waiting rooms, hospital beds and stretchers.

Equipments wherever provided, are basic and lack even the simple comforts of a thin cushioning between the patient and the cold metal surface. There is lack of maintenance which is necessary especially for over used facilities.

The effect of metal corrosion and rusting is a safety concern in humid tropical regions like Assam.



Analysis and Design Needs

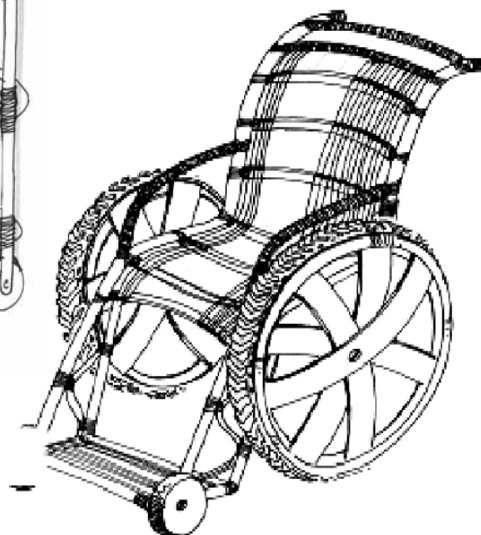
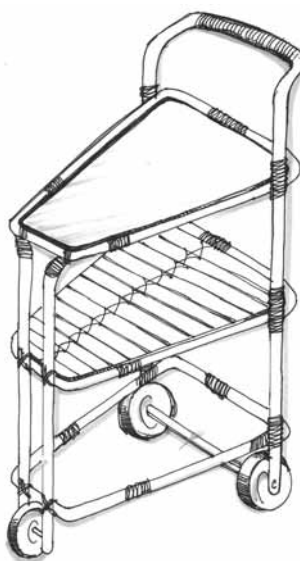
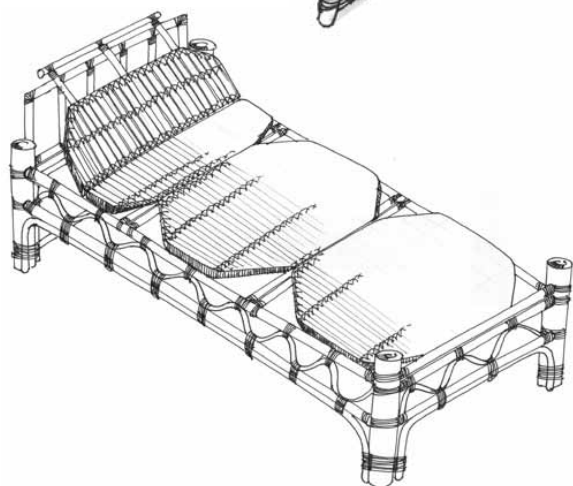
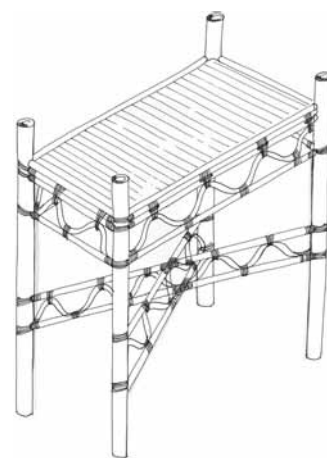
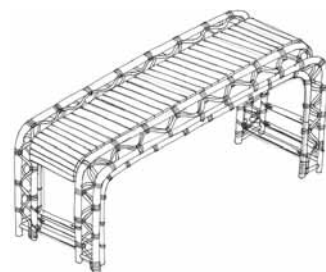
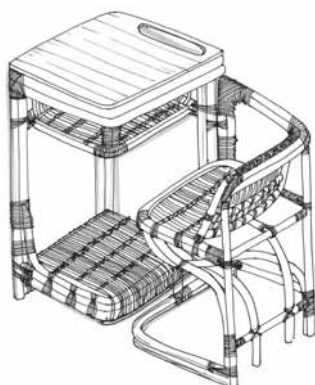
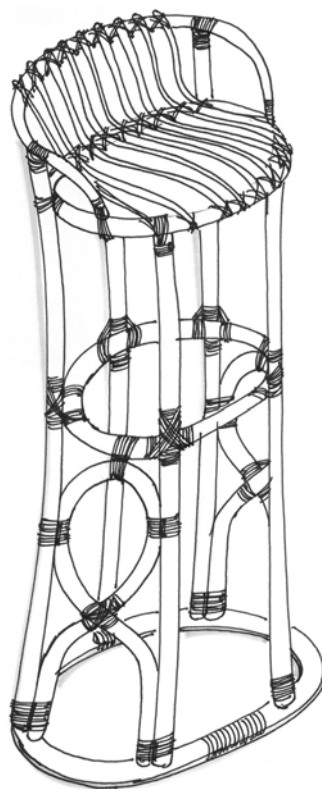
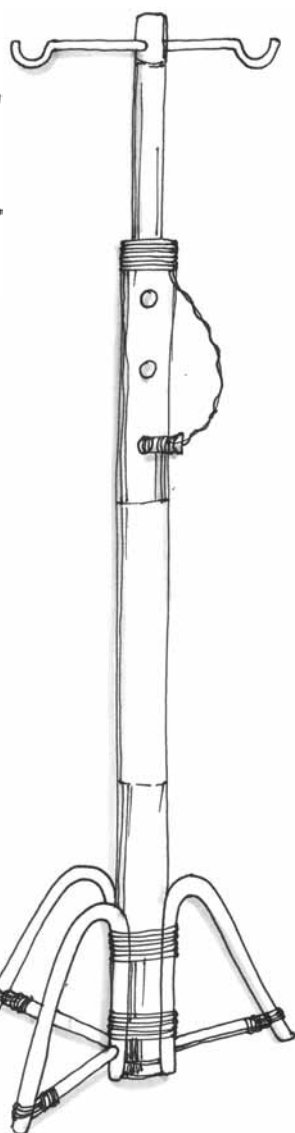
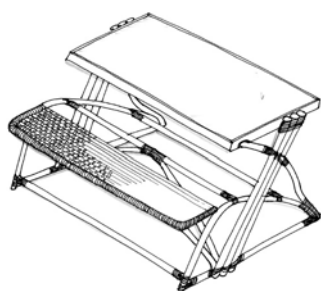
Products required by Rural Hospitals & Dispensaries are:

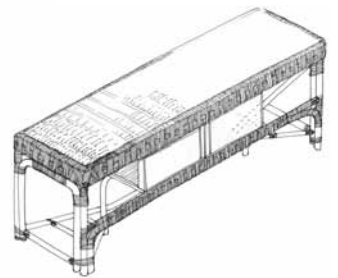
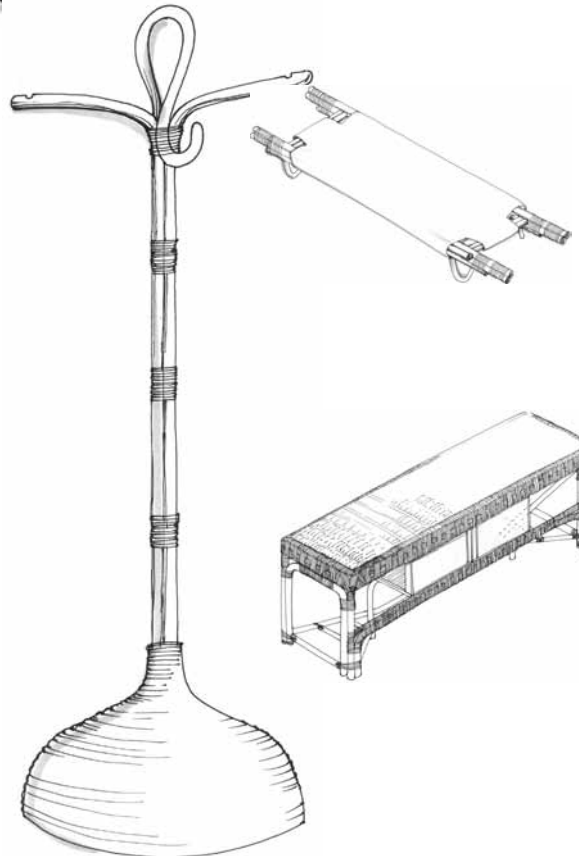
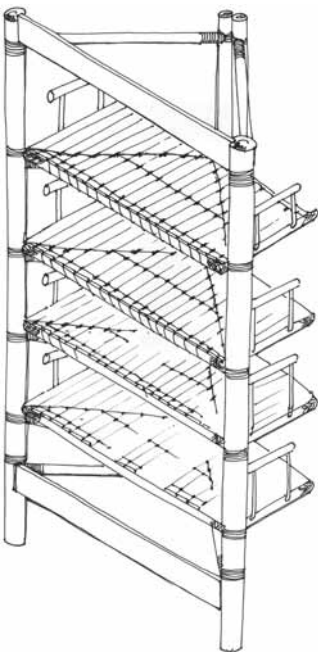
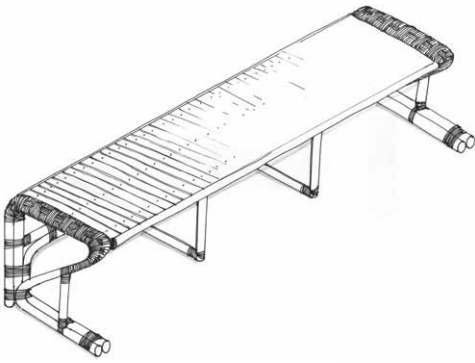
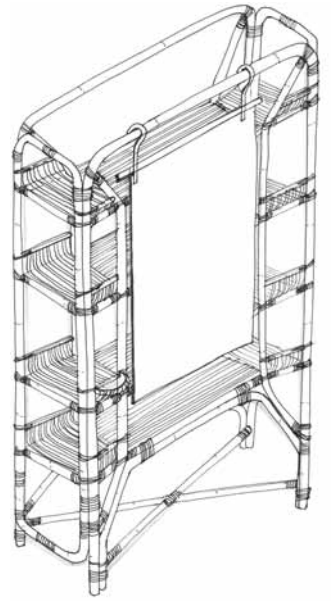
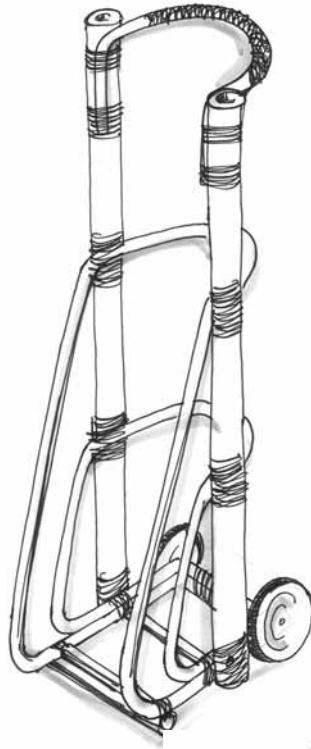
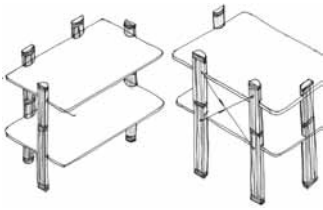
- Hospital Bed
- Stretcher
- Storage System
- Partition Units
- Saline Stand
- Laboratory Table
- Doctor's Examination Table
- Doctor's Examination Stool
- Oxygen Carrier
- Medicine Trolley
- Visitor's waiting Bench

Others:
Waste Disposal Systems
Toileting and drinking water facilities
Laundry sterilization facilities



Product Manual



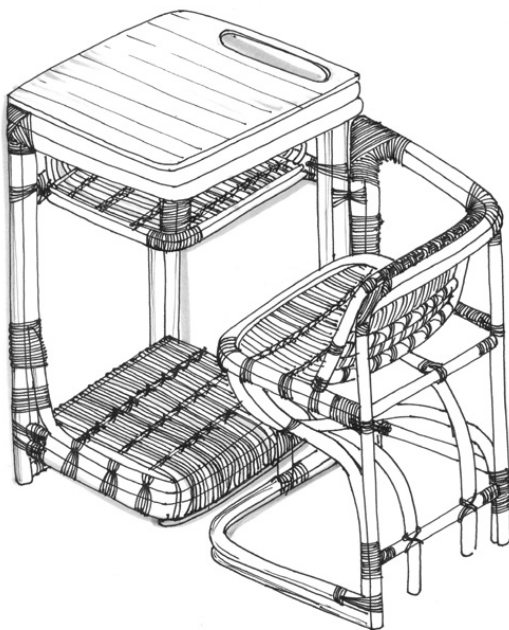




Products in detail



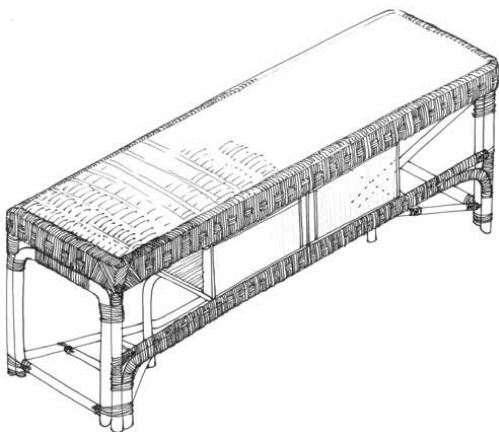
Folding Table & Seat



Product Specifications
 Dimension: 900 x 470 x 665

Material	Quantity	Cost	Amount
Raidang Cane	10 x 12ft	Rs 42 x 10	420.00
Jati Cane	60 x 14ft	Rs 6 x 60	360.00
Jati Cane	60 x 14ft	Rs 6 x 60	360.00
Nails & Finishing			50.00
Total			920.00

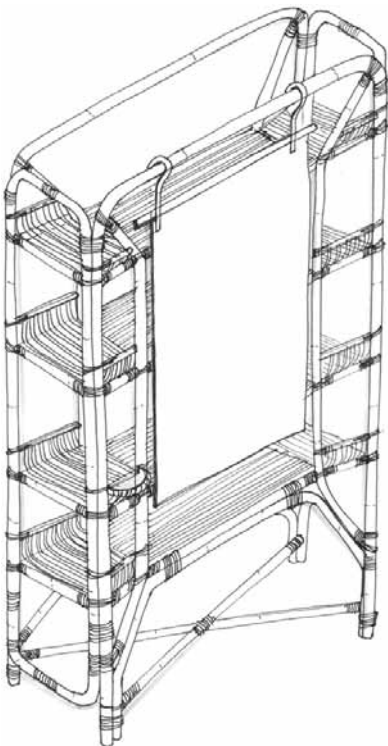
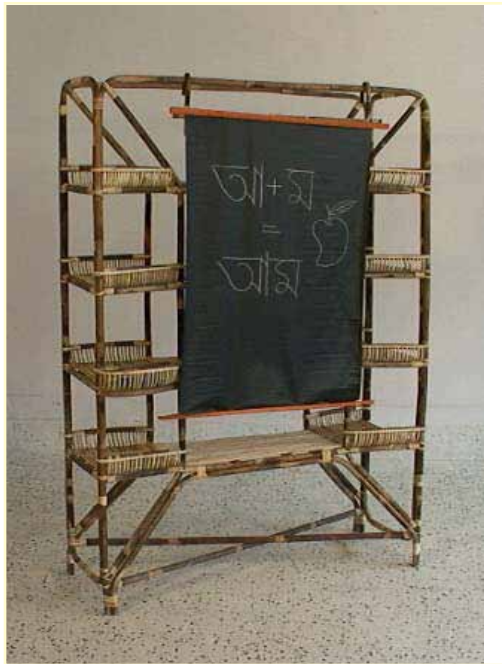
Table with Storage Shelf



Product Specifications
Dimension: 1524 x 335 x 450

Material	Quantity	Cost	Amount
Raidang Cane	25 x 12ft	Rs 42 x 25	1050.00
Jati Cane	50 x 14ft	Rs 6 x 50	300.00
Nails & Finishing			30.00
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Total			1380.00

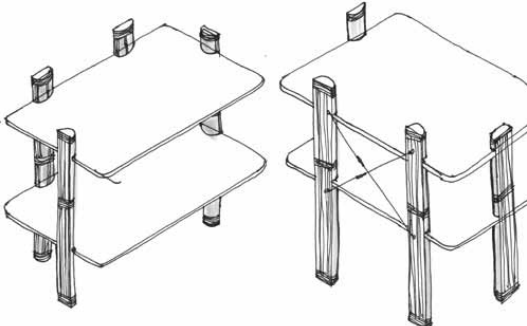
Shelf with Black Board



Product Specifications
Dimensions: 1200 x 440 x 1580

Material	Quantity	Cost	Amount
Raidang Cane	10 x 12ft	Rs 42 x 10	420.00
Jati Cane	60 x 14ft	Rs 6 x 60	360.00
Black Board	1	Rs 50/-	50.00
Nails & Finishing			50.00
Total			850.00

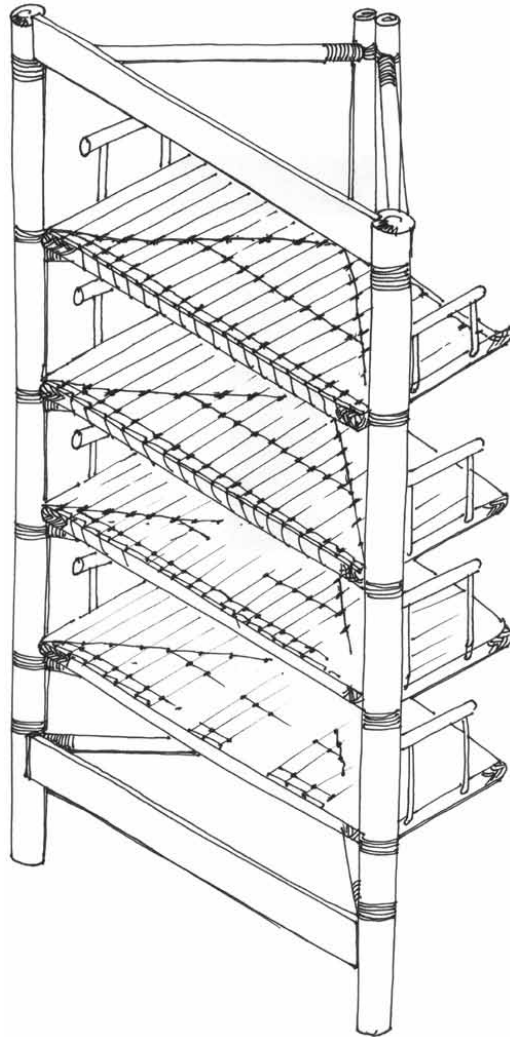
Free Standing Shelf



Product Specifications
 Dimensions: 900 x 400 x 800

Material	Quantity	Cost	Amount
Jati Bamboo	1 x 12f	Rs 45 x 1	45.00
Jati Cane	5 x 14ft	Rs 6 x 5	30.00
Cycle Brake Wire	2	Re 1	1.00
Plywood	5ft x 4ft	Rs 120	120.00
Nails & Finishing			20.00
Total			216.00

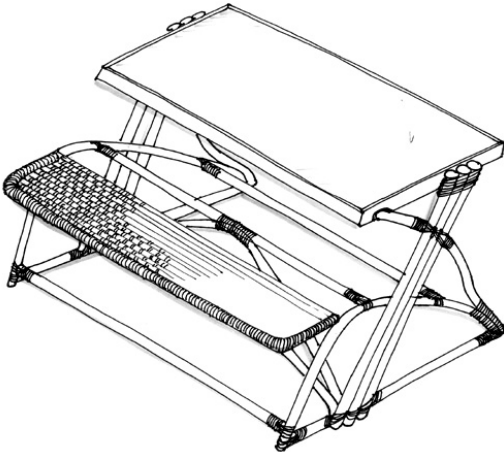
Library Rack



Product Specifications
Dimension: 914 x 304 x 1370

Material	Quantity	Cost	Amount
Jati Cane	10 x 14ft	Rs 6 x 10	60.00
Bijli Bamboo	12 x 14ft	Rs 12 x 12	144.00
Plywood	6" x 3ft	Rs 30	30.00
Nails & Finishing			30.00
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Total			444.00

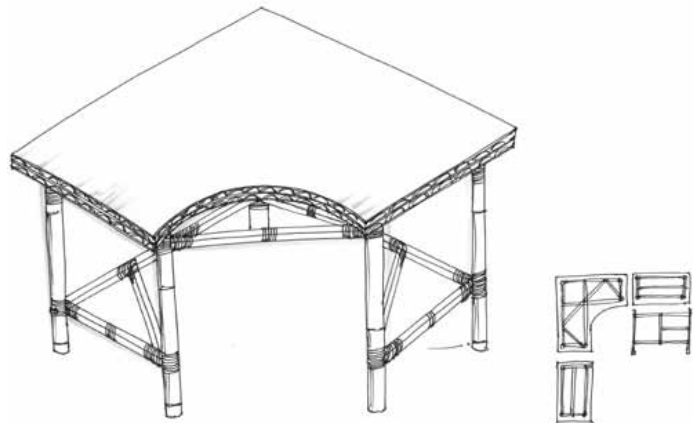
Table with Seat



Product Specifications
 Dimension: 1020 x 790 x 840

Material	Quantity	Cost	Amount
Raidang Can	10 x 12ft	Rs 42 x 10	420.00
Jati Cane	10 x 12ft	Rs 6 x 10	60.00
Plywood	2ft x 4ft	Rs 80	80.00
Wood	4ft x 6ft	Rs 40	40.00
Nails & Finishing			30.00
Total			630.00

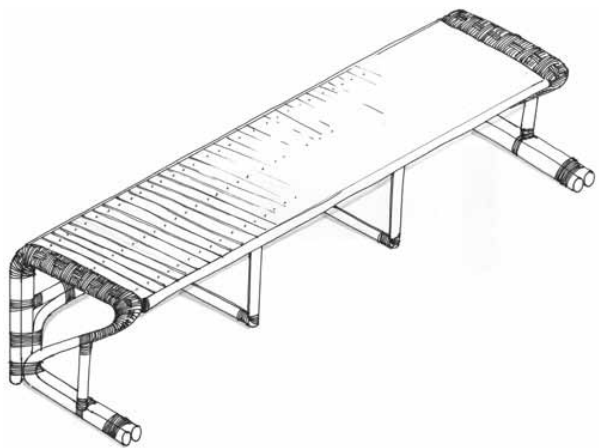
Computer Table



Product Specifications
Dimension: 915 x 450 x 660

Material	Quantity	Cost	Amount
Jati Cane	10 x 14ft	Rs 6 x 10	60.00
Jati Bamboo	2 x 14ft	Rs 30 x 2	60.00
Bijli Bamboo	10 x 14ft	Rs 12 x 10	120.00
Plywood	4ft x 5ft	Rs 70 x 3	210.00
Nails & Finishing			50.00
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Total			500.00

Low Working Desk



Product Specifications
Dimension: 1524 x 355 x 308

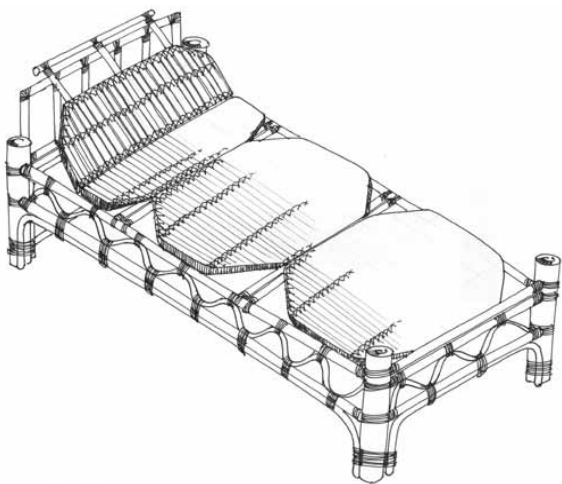
Material	Quantity	Cost	Amount
Raidang Cane	6 x 12ft	Rs 42 x 6	252.00
Jati Cane	10 x 14ft	Rs 6 x 10	60.00
Jati Bamboo	5 x 14ft	Rs 30 x 5	150.00
Nails & Finishing			30.00
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Total			492.00

Outdoor Bench

Product Specifications
Dimension: 1219 x 609 x 456

Material	Quantity	Cost	Amount
Jati Bamboo	4 x 14ft	Rs 30 x 4	120.00
Jati Cane	2 x 14ft	Rs 6 x 2	12.00
Finishing			10.00
<hr/>			
Total			142.00

Folding Hospital Bed



Product Specifications
Dimension: 1802 x 950 x 460

Material	Quantity	Cost	Amount
Raidang Cane	10 x 12ft	Rs 42 x10	420.00
Jati Cane	40 x 14ft	Rs 6 x 40	240.00
Jati Bamboo	1 x 14ft	Rs 30 x1	30.00
Bijli Bamboo	12 x 14ft	Rs 6 x 12	72.00
Nails & Finishing			40.00
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Total			802.00



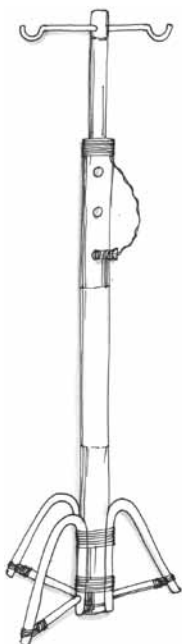
Drip Stand



Product Specifications
Dimension: 1650

Material	Quantity	Cost	Amount
Raidang Cane	2 x 12ft	Rs 42 x 2	82.00
Nails & Finishing			20.00
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Total			222.00

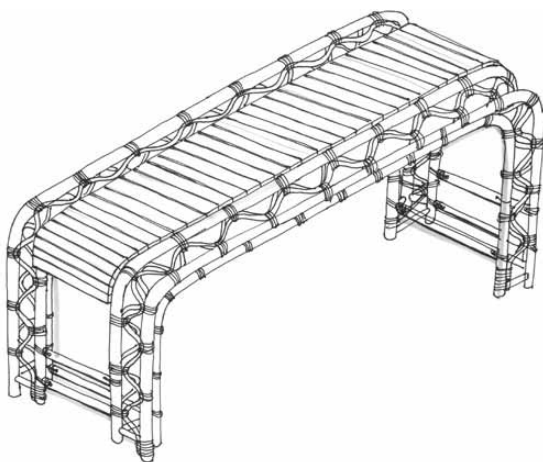
Height Adjustable Drip Stand



Product Specifications Dimension: 1650

Material	Quantity	Cost	Amount
Raidang Cane	6ft	Rs 20	20.00
Jati Bamboo	4ft	Rs 20	20.00
Jati Cane	2 x 14ft	Rs 6 x 2	12.00
Bijli Bamboo	2ft	Rs 6	6.00
Nails & Finishing			10.00
Total			68.00

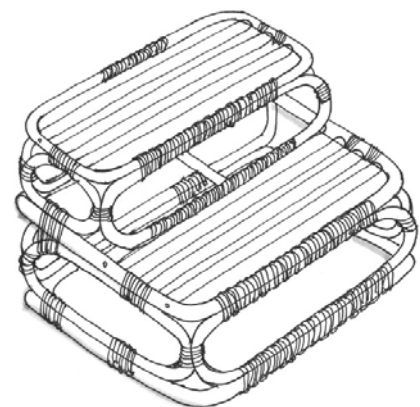
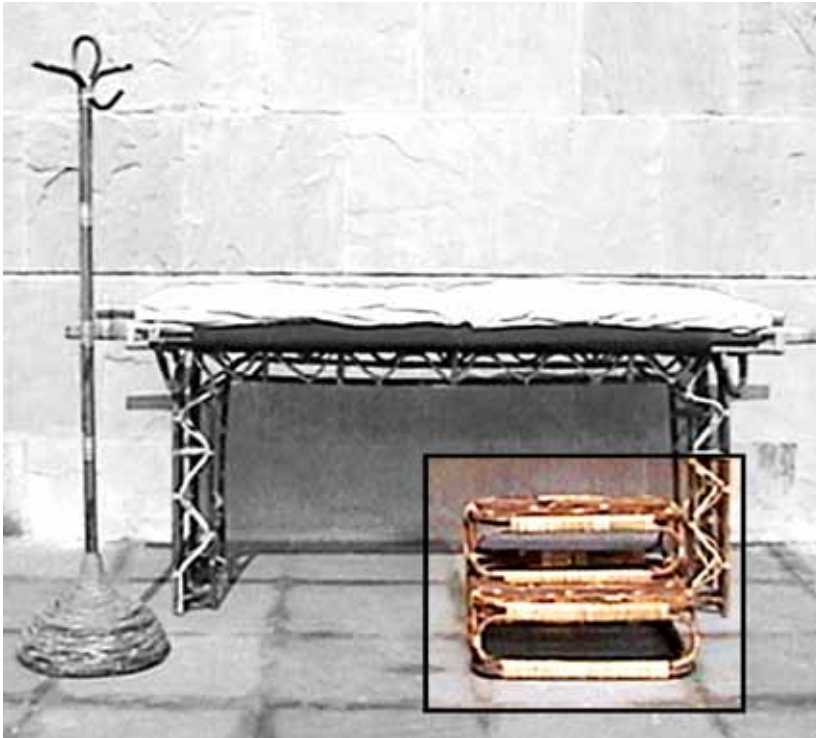
Doctor's Examination Table



Product Specifications
 Dimension: 1620 x 500 x 800

Material	Quantity	Cost	Amount
Raidang Cane	12 x 12ft	Rs 42 x 12	584.00
Jati Cane	30 x 14ft	Rs 6 x 30	180.00
Nails & Finishing			40.00
Total			804.00

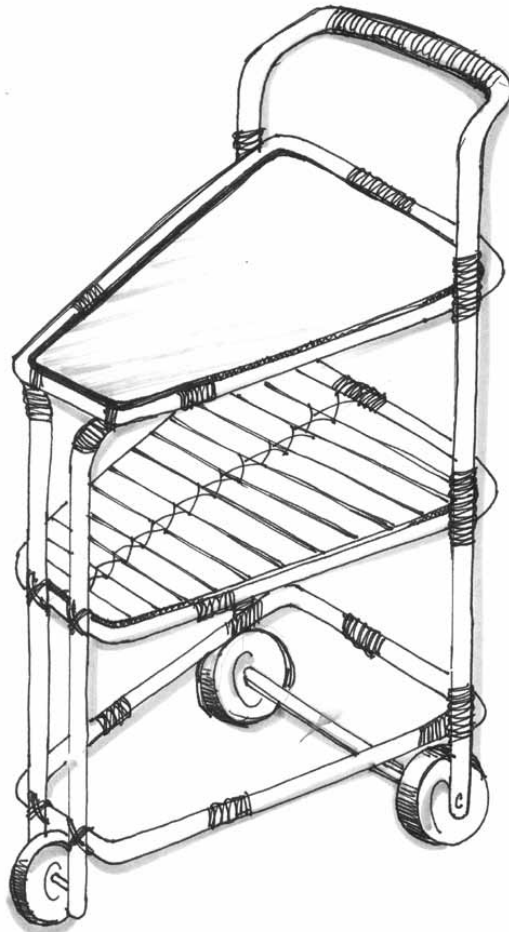
Steps



Product Specifications
 Dimension: 600 x 580 x 375

Material	Quantity	Cost	Amount
Raidang Cane	3 x 12ft	Rs 42 x 3	126.00
Jati Cane	5 x 14ft	Rs 6 x 5	30.00
Nails & Finishing			20.00
Total			176.00

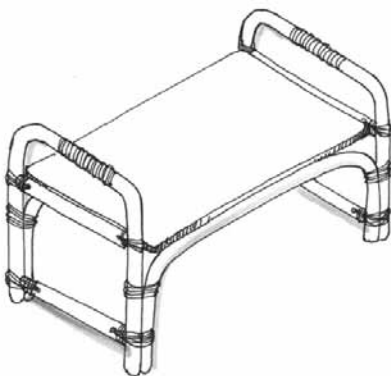
Medicine Trolley



Product Specifications
Dimension: 761 x 304 x 914

Material	Quantity	Cost	Amount
Raidang Cane	5 x 12ft	Rs 42 x 5	210.00
Jati Cane	5 x 14ft	Rs 6 x 10	60.00
Jati Bamboo	1 x 14ft	Rs 30 x 1	30.00
Rubber Wheels	3 of 5" dia	Rs 45 x 3	135.00
Nails & Finishing			30.00
<hr/>			
Total			465.00

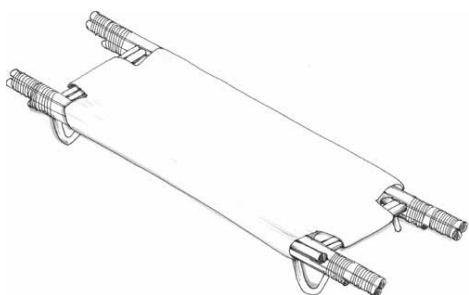
Serving Table



Product Specifications
Dimension: 512 x 300 x 300

Material	Quantity	Cost	Amount
Raidang Cane	1x 12ft	Rs 42 x 1	42.00
Jati Cane	3 x 14ft	Rs 6 x 3	18.00
Mat Board	15" x 18"	Rs 30	30.00
Nails & Finishing			10.00
<hr/>			
Total			100.00

Collapsible Stretcher 01



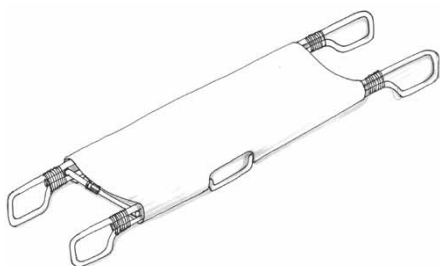
Product Specifications
 Dimension: 2550 x 580 x 210

Material	Quantity	Cost	Amount
Raidang Cane	4 x 12ft	Rs 42 x 4	168.00
Jati Cane	15 x 14ft	Rs 6 x 15	90.00
Bijli Bamboo	1 x 14ft	Rs 12 x 1	12.00
Canvas	2.5 m	Rs 125/-m	310.00
Nails & Finishing			100.00
Total			680.00

Collapsible Stretcher 02

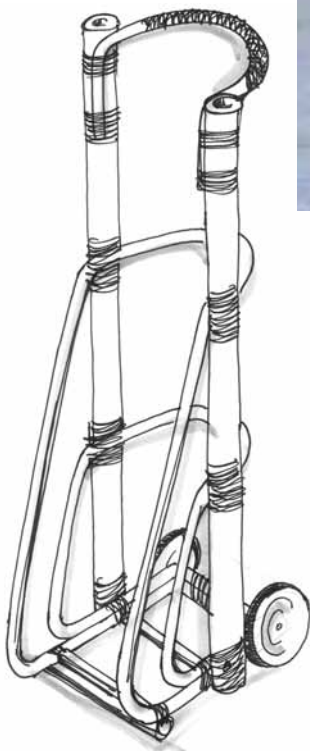


Product Specifications
 Dimension: 2300 x 575 x 220



Material	Quantity	Cost	Amount
Raidang Cane	2 x 12ft	Rs 42 x 2	84.00
Jati Cane	5 x 14ft	Rs 6 x 5	30.00
Bijli Bamboo	6 x 10ft	Rs 12 x 6	72.00
Canvas	2.5 m	Rs 125/-m	310.00
Nails & Finishing			100.00
Total			496.00

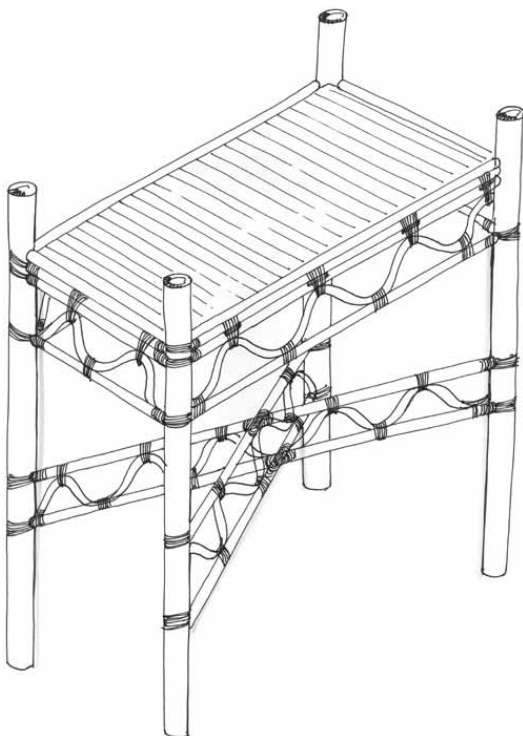
Oxygen Cylinder Carrier



Product Specifications
 Dimension: 177 x 202 x 556

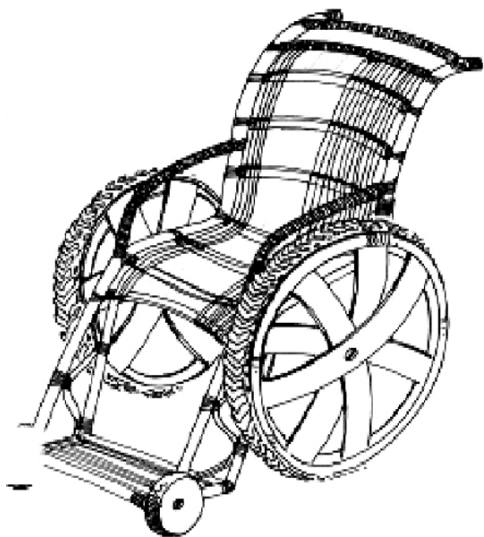
Material	Quantity	Cost	Amount
Raidang Cane	1 x 12ft	Rs 42 x 1	42.00
Jati Cane	3 x 14ft	Rs 6 x 3	18.00
Jati Bamboo	1 x 14ft	Rs 30 x 1	30.00
Rubber Wheels	2 of 5 "dia	Rs 45 x 2	90.00
Nails & Finishing			20.00
Total			200.00

Laboratory Lab



Jati Cane	40 x 14ft	Rs 6 x 40	240.00
Jati Bamboo	4 x 14ft	Rs 30 x 4	120.00
Bijli Bamboo	6 x 14ft	Rs 12 x 6	72.00
Nails & Finishing			20.00
Total			452.00

Wheelchair



Product Specifications
Dimension: 1050 x 620 x 930

Material	Quantity	Cost	Amount
Raidang Cane	5 x 12ft	Rs 42 x 5	210.00
Jati Cane	40 x 14ft	Rs 6 x 40	240.00
Jati Bamboo	1 x 14ft	Rs 30 x 1	30.00
Cycle Tyres	2	Rs 300	300.00
Rubber Wheels	2 of 5" dia	Rs 45 x 2	90.00
Nails & Finishing			20.00
Total			890.00

Sample of Slat Explorations



Product Specifications
Dimension: 456 x 456 x 456

Material	Quantity	Cost	Amount
Jati Bamboo	1 x 12ft	Rs 30 x 1	30.00
Finishing			10.00
<hr/>			
Total			40.00

Miscellaneous Bamboo Products

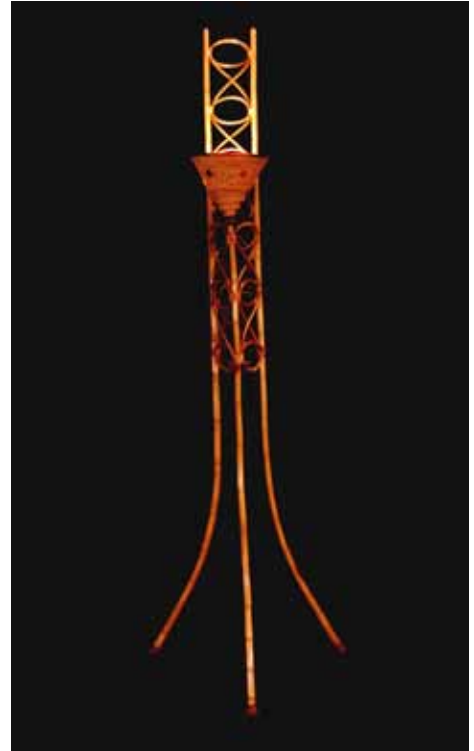
Screens



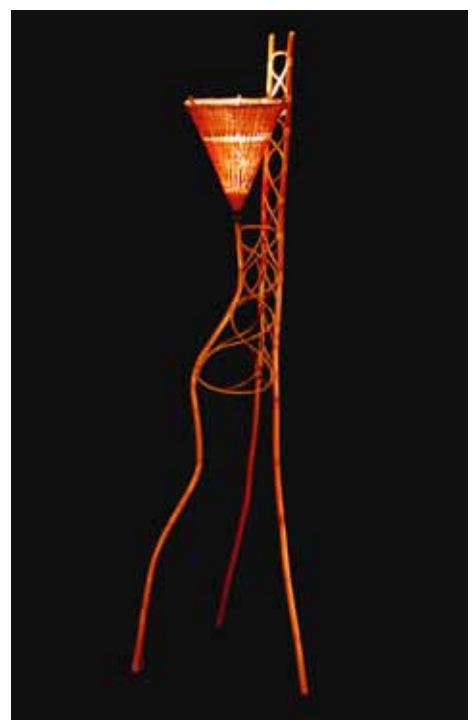
Black board stand



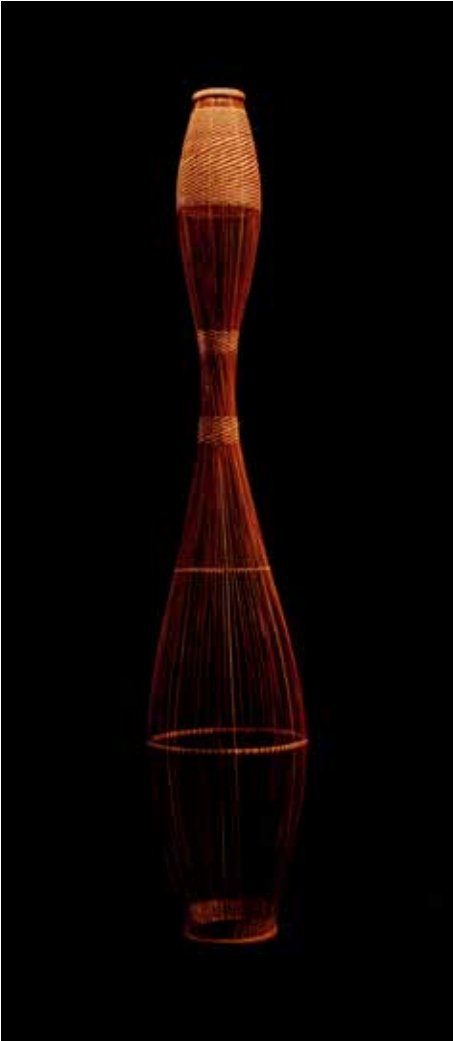
Lamp



Lamp 2



Lamp 3



Teachers' chair



Single Seat



High Seat for Laboratory



Vending Cart



Desk Bench Unit



Desk



Lamp 4



Teachers' chair



Projected market price

Projected Market Selling Price

Projected Market Selling Price of Products Developed as indicated by the local mastercraftsmen working on the project. Cost of materials remaining constant as per the current market value:

Articles	Cost
Hospital Products:	
Folding Hospital bed	Rs 2500- Rs 3000
Saline Stand	Rs 350 - Rs 400
Adjustable Saline Stand	Rs 150 - Rs 200
Non- Collapsible Wheelchair	Rs 1200
Foldable Stretcher 01	Rs 900
Foldable Stretcher 02	Rs 750
Doctor's Examination Table	Rs 2000 - Rs 2500
Doctor's Examination Stool/ Laboratory Stool	Rs 400 - Rs 450
Oxygen Tank Carrier	Rs 250
Steps	Rs 600
Primary School Products:	
Library rack	Rs 1000
Folding Seat & Table	Rs 2500
Table with Seat	Rs 1000
Computer Table	Rs 1500
Low Working Desk	Rs 600
Table with Storage Shelf	Rs 2500
Free Standing Shelf	Rs 350
Shelf with Blackborad	Rs 2000
Laboratory Table	Rs 800
Outdoor Bench	Rs 300
Slat Exploration	Rs 130

Comparative Cost Analysis

Cost of Existing products in the Market:

Articles	Cost
Folding Hospital Bed	Rs 7150 - Rs 9500
Height Adjustable Saline Stand in ms	Rs 650
Height Adjustable Saline Stand in ss	Rs 950 - Rs 1200
Collapsible Wheelchair	Rs 3700
Non- Collapsible Wheelchair	Rs 4100
Foldable Stretcher	Rs 850
Adjustable Examination Table (w/o cushion)	Rs 5200
Examination Table (with cushion)	Rs 6200
Height Adjustable Examination stool is ss	Rs 600
Oxygen Tank Carrier	Rs 850

Cost of Product design Developed in Cane & Bamboo:

Articles	Cost
Folding Hospital bed	Rs 2500- Rs 3000
Saline Stand	Rs 350 - Rs 400
Adjustable Saline Stand	Rs 150
Non- Collapsible Wheelchair	Rs 1,200
Foldable Stretcher 01	Rs 900
Foldable Stretcher 02	Rs 750
Doctor's Examination Table	Rs 2000 - Rs 2500
Doctor's Examination Stool/ Laboratory Stool	Rs 400 - Rs 450
Oxygen Tank Carrier	Rs 250

Cost of Product design Developed in Cane & Bamboo:

Library rack	Rs 1,000
Folding Seat & Table	Rs 2,500
Table with Seat	Rs 1,000
Computer Table	Rs 1,500
Low Working Table	Rs 600
Table with Storage Shelf	Rs 2,500
Free Standing Shelf	Rs 350
Shelf with Blackborad	Rs 2,000
Laboratory Table	Rs 800
Outdoor Bench	Rs 300
Slat Exploration	Rs 130

Cost of Existing products in the Market:

Advantage of the Existing Furniture System:

The cost of existing furniture system in Rural Primary Schools is only Rs 450- Rs 500 for a set of long table and bench having a capacity for seating 5 students.

However, it may be noted that this does not necessarily have an added advantage over the concept of developing the same furniture system using the local, easily available material, cane & bamboo.

Some of the problems with existing Furniture System are:

Poor maintenance:

As there is no seperate fund provided for maintenance, most of the furniture system is depleted and not in use. Once it is broken there is very little repair work that can be done on them.

There is constant shortage of desks and benches. Besides the lack of funds there is no concept initiated to help themselves produce the required furniture with local materials, skills and tools.

Some of the many advantages of using of cane & bamboo are:

Possibility of designing and developing furniture for specific requirements; e.g, height variations in tables & seats

Possibility of developing new products as and when the need arises

Ease of maintenance and repair as and when required

Ease of developing new furniture due to the availability of material, local skills, tools and techniques

Employment generation to the local community

Reduction of mis-use of funds by middle men and suppliers

Raw materials . pre

Details of Raw material Used

The following species of cane and bamboo have been used to develop the different range of furniture.

Bambusa Affinis

This variety is very extensively available in Tripura. It is slender, tall and strong and therefore used as a fishing pole by the locals.

It is extensively cultivated in Katlamara by the local farmers. It is easy to heat bend this variety of bamboo and can be used in making of a variety of other household utilitarian products including furniture.

Bijuli

Bhaluka

Preservation and treatment of bamboo

To preserve the bamboo from attacks from fungi, Borer beetle and termites, the bamboo was chemically treated using the Dipping process.

The bamboos were immersed in a tank filled with solution containing the following proportions: Boric Acid (H_2BO_3) - 300 gms, Borax ($NA_2B_2O_7 \cdot 10H_2O$) - 300 gms dissolved in 10 litres of water.

The bamboos were kept immersed for the duration of 5 days. After that the bamboo was removed and kept to dry in shade.

servation and tools

Hand tools used for fabrication of furniture

Keeping in mind the high skills that the craftsperson were used to in traditional hand tools, it was decided to induct them into the design and development of the new range of furniture by using tools the same set as far as possible. Additionally they were also introduced to the complete range of new hand tools developed by Prof. A.G Rao of Industrial Design Centre, IIT Bombay. This helped them to realize first level of mechanization that enhanced their abilities at replicability and precision work ship. Craftsperson in the process also experienced a degree of increased productivity in comparison to their traditional practice that they follow.



The set of hand tools / motorized machines they were introduced to included the following:

- Hack Saw
- Cane Frame Saw
- Common Hand saw
- Tripura Dau
- Assam Dau
- Round Bottom Plane
- Scraping Knife
- Hand Drill
- Portable Power Drill
- Portable Power Sander
- Hammer
- Piercing Knife
- Cane Bending Tool
- Tailor Tape
- Steel Tape
- Needle files

The Product Development Process in the Department of Design Workshop



Anthropometric data

S.No	Dimensions considered for 50th percentile of measurements and rounded off	Group1 Age range 7-10 years	Group 2 Age range 11-14 years	Group 3 Age range 15-19 years
1	Seat Height	30	35	42
2	Seat Length	32	35	39
3	Seat Width	27	34	39
4	Back Rest Height	42	48	53
5	Back Rest Length	32	35	39
6	Back Rest Width	22	25	28
7	Seat to Table Top Height 14	16	19	
8	Elbow Rest Height	20	23	25
9	Foot rest Height 7	10	10	
10	Seat to foot rest distance	27	30	34
11	Seat to table top distance	15	17	17
12	Black board width	75	90	106
13	Black board length	As per requirement	As per requirement	As per requirement
14	Table Length	70	80	85
15	Table depth	60	65	75
16	Table height	52	65	75

All dimensions in cms

Recommended Dimensions for School Furniture as per anthropometric data

S.No	Dimensions considered for 50th percentile of measurements and rounded off	Group1 Age range 6-8 years	Group 2 Age range 9-10 years	Group 3 Age range 11-12 years	Group 4 Age range 13-14 years	Group 5 Age range 15-19 years
1	Max Arm Reach 24	58.4	62.8	66.9	74.1	77.8
2	Functional reach 25	57	61.8	66.4	71.7	82.4
3	Seating Height 27	62.9	66.7	71.1	76.6	80.9
4	Sitting Upper Lumber Height 29	22.6	24.5	25.5	27.1	28.7
5	Sitting Waist Height 30	17.4	18.6	19.8	21.9	23.8
6	Sitting Lower Lumber Height 31	14.0	14.7	15.9	16.5	19.1
7	Sitting Eye Height 34	51.8	55.6	59.6	64.9	69.8
8	Sitting Popliteal Height 35	30.1	32.6	35.3	39.3	40.4
9	Squatting Height 36	62.3	66.2	70.5	75.7	80.6
10	Squatting Knee Height Maximum 37	16.6	17.9	19.1	21.1	21.1
11	Squatting Knee to Knee Length 38	44.0	48.2	51.3	57.7	59.5
12	Squatting Buttock Knee Length 39	37.2	39.9	44.8	49.6	53.5
13	Sitting Buttock Knee Length 40	38.4	42.2	46.0	52.2	54.2
14	Sitting Buttock Popliteal Length 41	31.4	34.2	37.9	43.4	44.6
15	Sitting Thigh to Thigh Length 42	19.9	20.9	23.9	26.1	30.2
16	Sitting Knee to Knee Length 43	14.4	15.2	16.3	17.6	18.9
17	Stature 2	118.8	128.2	136.6	151.3	158.6
18	Acromion Height 11	93.2	101.5	110.1	123.2	128.9
19	Total Span 44	117.4	127.2	136.2	154.4	159.9
20	Elbow to Elbow Breadth	28.1	29.9	32.9	35.7	39.1
21	Waist Breadth 49	16.0	16.8	18.6	21.1	21.3
22	Chest Breadth 48	18.2	19.2	20.7	22.9	24.9
23	Buttock Leg length 59	70.9	77.9	83.7	96.4	101.2

Source: Ray, G.G and Sadhu, N., Anthropometry of School Children, Unpublished, IDC, IIT Bombay, 1986

All Dimensions in cms

Anthropometric Data for School and Hospital Furniture: 50th Percentile values of different measurements for different age groups



Product Dissemination

Entrepreneurship development and Training Programs

Craftsperson in New Design and Development of Bamboo Furniture

Entrepreneurship development & Training Programs to Craftsperson / NGO's / Government Officials / Other Beneficiary Groups was an integral part of the project objective right from commencement of the project. Once the designs for the range of furniture for rural school and Primary Health Centre were developed, these were fabricated into full scale prototypes. The first set of craftsperson engaged in the development of these furniture were also trained in the use of simple hand tools, modes of surface treatment for termite production, surface finishing and use of simple mechanized machine tools for fabrication of the prototypes.

As part of the project initiative training programs titled 'KVIC-IITG TBU Training programs in Cane and Bamboo' were offered by the Design team. These were both on campus at the Department of Design in IIT-Guwahati and others which were exposure programs of shorter duration in craft clusters. The ten day bamboo-crafts training cum production programmes were organized for craftsperson from the North Eastern region & included craftsperson hailing

from Guwahati, Darrang, Goalpara, Barpeta, Tezpur and Nalbari.

The theme of the training program was design and development of Cane and Bamboo furniture for Primary Schools and Primary Health Centres.

Short duration exposure programs ranging between one-two days were organized periodically and included activist / entrepreneurs and craftsperson working for NGO's in Shillong /Cherrapunjee, Guwahati, Barpeta, Tezpur and Nalbari proved very beneficial to these groups.

Subsequently an interactive Exposure program introducing new design and development of furniture was also organized for the craftsperson of a community of Cane and bamboo workers working in Garo hills of Meghalaya.

In most of the activities undertaken, training of grass root field workers, craftsmen was in built. There was conscious effort to not only train them in the technology being transferred, but in the entrepreneurship development so that it would help in employment generation and self sustenance of rural economy.



The Craftsmen

Training cum production Programme Conducted for Craftsmen

Training Program 1

List of Craftsmen who attended the workshop in November, 2003 for product development.

S.No	Name	Address
1	Madhab Biswas	Fatashil Ambari Tiniali, Guwahati -25
2	Bageshwar Boro	Fatashil Ambari Tiniali, Guwahati -25
3	Kamaleshwar	Fatashil Ambari Tiniali, Guwahati -25
4	Rezzak Ahmed	Village; Bakua, Dist: Barpeta
5	Manas Fatashil	Ambari Tiniali, Guwahati-25
6	Krishna	Fatashil Ambari Tiniali, Guwahati-25
7	Pabitra Medhi	Village: Solmari, Dist: Nalbari
8	Dhaneshwar Das	Village; Dokowa, Dist: Nalbari
9	Mahesh Pathak	Fatashil Ambari Tiniali, Guwahati-25
10	Dilip Roy	Fatashil Ambari Tiniali, Guwahati-25

Training Program 2

List of Participating Craftsmen who attended the workshop, 3rd to 13th March,2004

S.No	Name	Address
1	Nipen Barua	Fatashil Ambari Tiniali, Guwahati -25
2	Bapan Sarmah	Village: Darmori, Dist. Darrang
3	Bishnu Ram Pathak	Village: Simlitala, Dist. Goalpara
4	Dhananjay Das	Village; Bakua, Dist: Barpeta
5	Rakesh Das	Fatashil Ambari Tiniali, Guwahati-25
6	Surajeet Sarmah	Village: Bhogpur Dist: Barpeta
7	Dinesh Rajbanshi	Village: Solmari, Dist: Nalbari
8	Naresh Das	Village; Dokowa, Dist: Nalbari
9	Ajay Deka	Village: Bangabari, Dist: Darrang
10	Dilip Roy	Fatashil Ambari Tiniali, Guwahati-25





Training Program 3

List of Participating Craftsmen who attended the workshop, 16th to 26th March, 2004

S.No	Name	Address
1	Panteshwar Roy	Fatashil Ambari Tiniali, Guwahati -25
2	Umesh Boro	Ulubary, Tezpur
3	Deganta Das	Village: Shilbary, Barpeta
4	Bhupen Das	Village; Dongary, Dist: Barpeta
5	Nirmal Sharma	Village: North Bali, Dist: Nalbari
6	Santaosh Haloy	Village: Nalicha, Nalbari
7	Pradip Boro	Village: Baglamari, Dist: Nalbari
8	Jinku Madhi	Village; Simli Tola, Dist: Golpara
9	Gorgo Ram Nath	Fatashil Ambari Tiniali, Guwahati-25

Training Program 4

List of Participating Craftsmen who attended the workshop, 30th March to 10th April, 2004

S.No	Name	Address
1	Kankan Das	Village: Silbari, Dist: Barpeta
2	Hemanta Kalita	Village: Bartejpur, Dist: Kamrup
3	Nabajit Talukdar	Village: Khetinipara, Dist: Kamrup
4	Mahesh Sarmah	Village: Khetinipara, Dist: Kamrup
5	Kailash Deka	Village: Bhomotahati, Dist: Kamrup
6	Jitushekhar Barua	Village: Rajadowar, North Guwahati
7	Dhananjay Rabha	Village: Kachcigaon, Dist: Bongaigaon
8	Jitu Patar	Village; Bamonbori, Morigaon
9	Ashim Patar	Village; Bamonbori, Morigaon
10	Kankan Das	Village: Hajo, Dist: Kamrup

Project Documentation

Documentation in the form of product photography of furniture items was an important initiative undertaken under this project. The objective was to utilize this for preparation of training material and project documentation in English and regional languages to facilitate dissemination of the project outcome to craftsperson and beneficiary groups in the near future. A product catalogue was planned as the medium for communication.

Design Dissemination to public

A three pronged approach was planned to announce the complete range of new furniture developed under the project. This included:

1. A product exhibition of the complete range of furniture for view of the general public in Guwahati.
2. Invitation to beneficiary groups including decision making authorities and officials from Government departments including Primary Education, Rural Development and Primary Education.
3. Invitation to the media and press to write an article about the outcome of this project and about the design work undertaken at the Department of Design, IIT Guwahati.

Increasing awareness amongst technology students from IIT Guwahati

The faculty of the department has made a conscious effort to float projects, summer training programmes with a focus on rural industrialisation so that ethos towards development of rural sector is manifested amongst students.

The Department of Design, IIT Guwahati has included as a part of its curriculum a project on the theme of 'Craft and Technology' as a part of its undergraduate curriculum in Design.

The outcome of these efforts has resulted in development of very interesting and innovative range of products by the students of the Department of Design.

These have been under the able guidance of members of the faculty of the department who take a keen interest in guiding students in this area of design work.

The Exhibition

Product Display

A permanent display of the furniture range developed under this project is put up permanently in the department of Design to facilitate dissemination of the same to different craft communities. Craftspersons from different location are informed to visit the department of design for getting an exposure to the new range of cane and bamboo furniture / product developed in this project. It continues to receive a good response from various bodies who visit the institute from time to time. Visitors including government officials, craftsperson, social scientists, school teachers and students and visitors, both national and inter-national, from various fields, have visited the institute from time to time and have been introduced to the design development initiative undertaken in this project.











The Product Development Process in the Department of Design Workshop



Department of Design

Indian Institute of Technology - Guwahati

Name of Organization

Indian Institute of Technology Guwahati
Department of Design
North Guwahati - 781 031
Phone: (0361) 690 321-28
Fax: (0361) 690 762

Department of Design

Department of Design (DoD) was established in 1997 at the Indian Institute of Technology-Guwahati, and offers for the first time amongst the IIT's, an undergraduate program in Design with specialization in the areas of Product Design and Communication Design leading to the degree of Bachelor of Design (B.Des)

Located in the northeastern region of the country, the Department of Design has a special emphasis on the design and development of the various product and communication systems relevant to the development of the eastern sector. It combines a broad-spectrum of design and development activities ranging from high technology products on the one hand to design of Products and Communications systems that meet basic needs. Use of Appropriate technology for sustainable development is one of the areas of attention. Ecological considerations in the development of products and the use of locally available materials find special attention in evolving design solutions.

The education model follows an approach of 'learning by doing' through the different projects that a student undertakes during his program at the institute. Compulsory industrial training at the end of every year helps the candidate in getting continuous exposure to the real life practices of design in industry.

Along with design education, members of its faculty offer consultancy to various industries, government departments and the social sector organizations. Their areas of expertise include:

- New product design and development
- Package design
- Craft design
- Graphic design
- Exhibition design
- Video filmmaking

The department has full-fledged workshop/studio facilities including wood working, metal, Plastics and ceramic processing. A special section is devoted to cane and bamboo processing.

Its studio facilities include:

- Photography including product photography
- Video studio for shooting and editing
- Multimedia Labs and Computer studios.

Human Factors / Ergonomics laboratory is well equipped to undertake various design evaluation assignments in the above two fields.



Acknowledgement

This project commenced with a conviction that there is need to redefine and reorient new directions in the use of the talent of a large community of craftsmen to address issues of basic needs. Functional furniture for basic needs of Schools and Primary health care center-that was locally sustainable and economically viable – was the chosen theme for the project.

The members of the sub group take this opportunity to thank Khadi and Village Industries Commission for their foresight and unstinting support towards this project.

Sharing experiences with Prof. M.P.Ranjan and Mr.Sushant of NID, Ahmedabad and Prof. A.G.Rao of IDC, IIT-Bombay was very enriching and their books invaluable as resource material.

The experience of working with a talented team of local craftsmen whose involvement and engagement was fruitful in translating ideas from mind into matter.

We thank them all.