

D-Lab: Design
Spring 2010 - Class Notes

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Introduction

2010.02.03

Amy Smith and Victor Serrat

D-Lab divided into:

DEVELOPMENT, the theory and practice

DESIGN, making prototypes and technological solutions

DISSEMINATION, bringing technologies to those who need them

Class overview

Introduction, Mini-Project, Design Challenges, Build-It Modules, Case Studies, Design Review Sessions, Final Presentations

Course Goals

Teaching the Design Process

Goal of instructors is to guide students through the design of these technologies. Will have mentors to come during the class and assist in this.

Amy and Victor

Enjoy co-teaching because of good cop/bad cop dynamic.

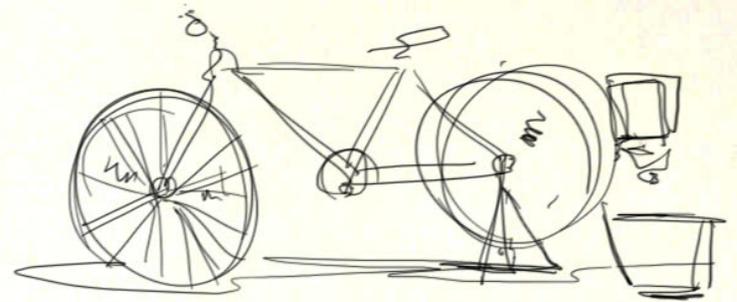
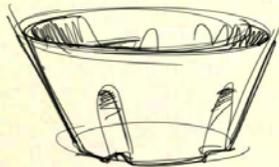
Example of past projects:

Soy Milk Maker for orphanage in Peru

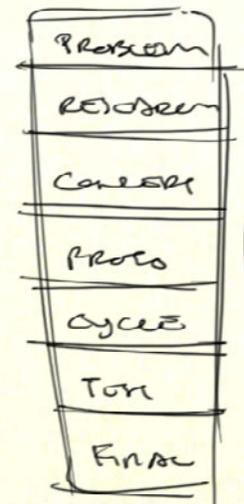
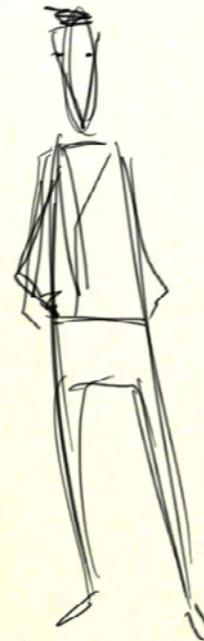
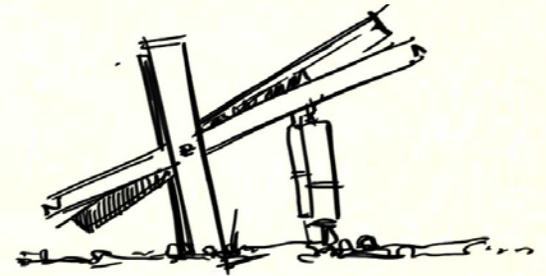
Vac-Cast in India with Jaipur Foot

Has since moved forward to the Vac-Soc using polyurethane beads instead of sand as form medium

To work on a project that allows an organization to do what it does (faster and better to boot) is a wonderful thing.



• GRINDING SOY BEANS •



D-Lab Philosophy

Traditional development in 1950s and 1960s have an urban industrial focus, with cheap labor. And then with the Green Revolution in the 60s having an urban focus with high inputs and high outputs. 1970s has appropriate technology approach (Schumaker's Small is Beautiful).

Participatory Development to involve people in the appropriate technology use.

Creative Capacity Building is making the community creators of technology, and this will enable co-creation.

The story of Bernard Kiwia.

"I used to fix bicycles, and now I make things."

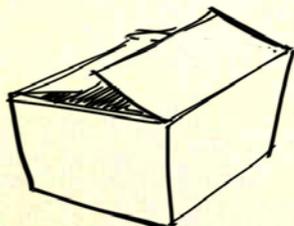
Chlorine Dosing in Honduras and the spread of ideas through Don Hermon. Has slowly been taken up by communities and is now designed into new system installations.

Guiding Principles

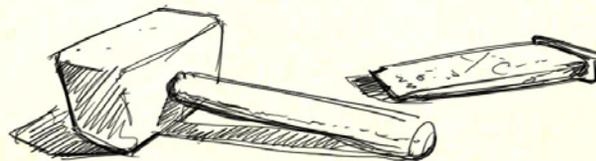
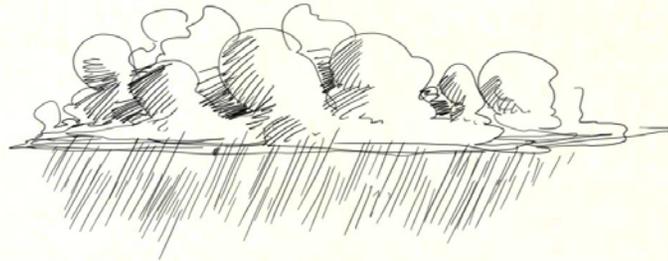
We will always strive for simplicity in this class. Through understanding the functional requirements. Simplicity is often looked over far too often.

Value indigenous Knowledge and promote local innovation.

Strive for sustainability because of our responsibility to do so, and the state of the world.



Box 'o' THINGS



Design, Innovation & Technology

2010.02.08

Invention - to be the first to make or use something
The vanguard

Design - working out the details form and structure

This is D-Lab Design, not I-Lab Invent
You don't have to have an invention in order
for it to be a design

Innovation - looking at something, and using it in a new way. Not necessarily the first to use it, but in a certain way.

Design examples:

Humdinger Windbelt

Inspired by design constraints in Haiti

Shawn Frayne - harder problems lead to better inventions

Challenges in Design

Tradeoffs - there is no right answer

Dynamic Life - there is no one time solution, consider design for failure

Details

Time - deadlines for market, competitors

Economics - one of the biggest driving forces in design possibilities in developing world

Use and Misuse - how is device likely to be used and misused

The litigious nature of design in the United States

Consideration of more than functional requirements

Ethics - what are the potential uses for things

Ben Linder says stay away from product porn - use up materials, take up design time, and add little value to society

Creativity Caveat of Design Process

The process is to help you go through steps, but don't let the process detract you from the product. The process is there because we are not always struck by massively creative ideas. It is a check and balance to go through the process. But don't worry if you are wonderfully creative and just come up with an idea.

*where did Amy get the Changing Approach diagram?

Design Process

Information Gathering

Getting an idea for the context

obtaining breadth on the problem you are viewing

Problem Definition

Stating clearly and concisely the problem you are addressing

Functional needs without implying solutions

Who? User What? Device and Function Where?

Context implementation

Design Specifications

Measurable design requirements to test final product

Translating customer needs (into real tangible goals)

Idea Generation

Brainstorming - try to generate useful information

Defer judgment

Build on ideas of others

One conversation at a time

Stay focused on topic

Encourage wild ideas - helps you jump design spaces

Analysis & Experimentation

Concept Evaluation

Pugh Chart

To analyze ideas against a standard (s,t,-)
Characteristics can be weighted

Detail Design

Start thinking about, how will I build this

Detail drawing with dimensions and tolerances

Fabrication

Building it

Can be easier if Detail design is done well

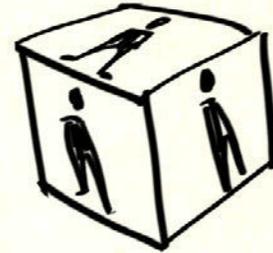
Testing & Evaluation

Design Requirements for Developing Countries:

Cost	Transparency	Profitability
Materials	Sourcing	Lifetime
Portability	Reusability	Efficiency
Simplicity	User Needs	Durability
Maintenance & Repair	User Familiarity	Social Impact
Cultural Acceptance	Scalable	Environmental Impact
Efficiency	Desirability	Manufacture/Assembly
Ergonomics		

If this were the US, which of these design principles should we cross off?

GOOD DESIGN IS GOOD DESIGN



D-Lab: Health Title

2010.02.10

Agenda & Logistics

Project Selections (Mar 1)

Design challenge descriptions due Feb 17 (Wednesday)

Sample design challenges will be emailed out

Slides due noon, Feb 24 (Wednesday)

Kurt Kornbluth Quote

"Brute force engineering options often meet the criteria but somewhere there is a profound solution, which is simple, cheap, and beautiful. Hold out for this as long as possible."

D-Lab hold true this.

Case study of Charcoal Project

2.4 Billion people rely on wood charcoal for fuel

D-Lab originally in Haiti, recognized the need

for an alternative fuel

Turning bagasse into charcoal briquettes

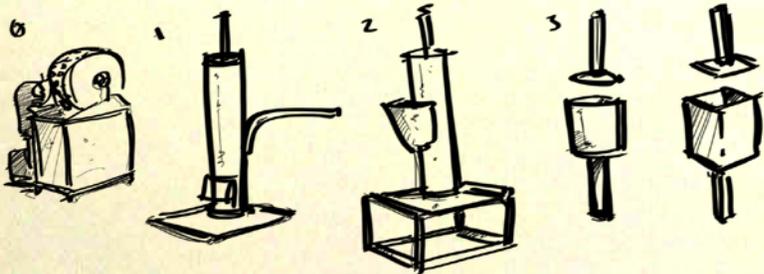
Burning bagasse in oil drum, combining with binder, hand making into briquettes. The problem of fragile briquettes.

Found mechanized briquette maker... for \$8k

Wanted to make a more individual level machine

Needed a machine with higher force than forming by hand

Found that impact force was enough to create briquettes



In Class demonstration of First Prototype (\$25)

4-5 Briquettes per minute, this is slow

Videoed different people using device

Documented the time people spent doing different tasks

Eject 42%, Hammer 24%, Load 34%, Cleaning 17%

Used this as a talking point for "What do we do next?"

In Class demonstration of Second Prototype (\$30)

6-8 Briquettes per minute

More expensive because there is more material

Thought that price could be reduced by reducing material

Showcased Features of Second Prototype B (\$20)

Substituting angle iron and other less costly

elements for more expensive components

People in Haiti liked this new design, but it was

still too expensive

In Class demonstration of Third Prototype (\$2)

10-12 Briquettes per minute

A dramatic decrease in cost that

increased performance

Ended up being that perfectly beautiful solution

"If you want to make something 10x cheaper, remove 90% of the material" -Amy

Showcase of Third Prototype B (by Kenny in Zambia)

A manufacturing improvement over previous design

Square tubing is more readily available

Showcase of Third Prototype C (in Haiti)

Sheet metal that was available to blacksmith in Haiti

Sheet metal is cheaper than square tubing

(cost not listed)

You can't make things too cheap

Third Prototype is the best design of original designs. Have to keep thinking of how to go about it.

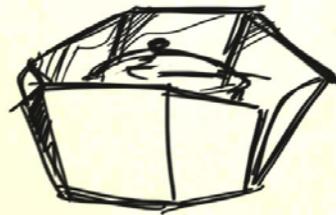
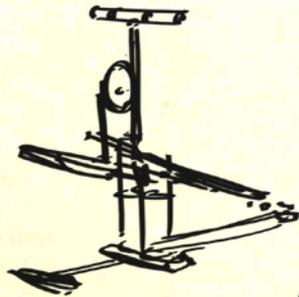
When designing for a place, stick with designing for that place, and leave dissemination in other areas for future design iterations. Don't try to do a universal solution at first.

Student Presentations on Technologies

Students say their Name, Major, and what they bring to the class

Treadle Pump

Originally developed by IDE. There are x million of treadle pumps out in the field. Result in an 6 fold increase in crop production. Implementation in Africa different than India and Asia, because Africa has deeper ground water, and pump is made for shallow water. Takes getting used to, IDE did have many implementation programs. Thumbs up for IDE's implementation program, briefly mention IDE's bollywood movie dissemination program.



Solar Cooker

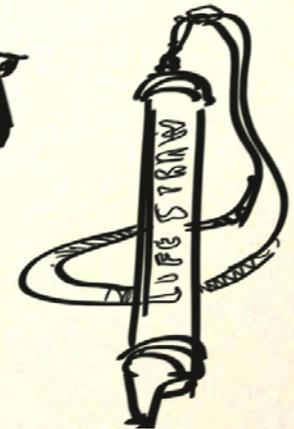
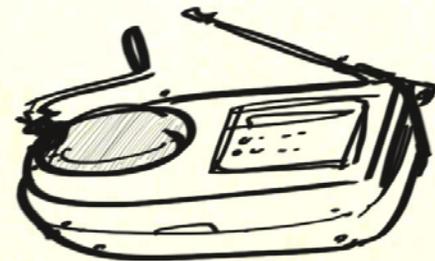
The cardboard is fragile, and might be subject to breaking. The glass pot is also an item that is fragile, and might be hard to replace. Really prevalent in refugee camps and some businesses formed around it. Individuals, once they know the general principles can make their own. Problem with adoption is that it doesn't fit in with people's traditional cooking or taste preferences. It is also very slow.

Freeplay Radio

Interesting implementation model, to give to an individual in a group to make sure that it is taken care of. It is \$50, which is expensive enough in the US. It has elements that might not be transparent in design, and impede maintenance. The idea of hand cranked radio, to overcome the information barrier of people in rural areas, is nice, but the implementation is questionable. The technology could be improved upon in the future.

Lifestraw

A man wanting to work in Africa as an adventurer, with assistance from his father who was a hotel entrepreneur, but discovered the humanitarian element later on. Had evolving design parameters, that are interesting to make note of. It is not their responsibility to make these sort of things, but because it can have an impact, it is their obligation to do so. Address issues of unsafe water and its results, such as diarrhea. The product doesn't prevent viruses or metal, which are also issues for people in developing areas. Other critiques on design is that it doesn't prevent the need of people to travel to water among with previous mentioned notes. The straw works through series of mesh layers and iodine, with carbon to absorb iodine. Costs \$3.50. One element that is good is its intuitive use, no worrying about how much chlorine to add.

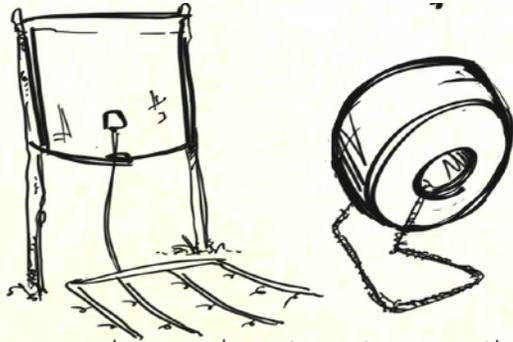


Drip Irrigation

Low cost system that reduces water waste by direct root irrigation. Increases crop yields. Marketed towards increasing nutrition value in families through crops that would add to that end. Only costs \$2.50, which makes it much cheaper than other irrigation methods. A concern that the material is only tough garbage bag material, it is easy to fix.

Bag is meant to collect rainwater. Holes can be poked in piping at users discretion to deliver water to plants. There is a concern that how easy it is to poke holes works two ways.

There was an intentional design trade-off for a low cost system. The manual is very technocratic engineering manual over a more easy to understand pictorial based instruction manual.



Q Drum

Very transparent design, grab rope, drag to water, pop the cap, fill it up. It is very heavy, at half full, it was a lot to use. The manufacturing process is expensive, using HDPE and rotational molding. Those who need it, can't afford it, those who don't can. It is not being marketed in a sustainable way.

The Q Drum has won a number of design awards, and raised awareness about difficult it is to gather water. But its expense (\$50) is far out of reach of those who need it. Distribution of Give & Gain system, only 10 drums have been donated in the past 6 months.

Marketed as taking the burden off women... and onto children. In contact with ground, may roll over waste and contaminate water and those who touch it. At full weight, 110lbs, could overwhelm a weaker person. It is extremely difficult to unload. Can be used to hold fuel and dried goods.

Design Mini Project

Background and Inspiration

Village of Pestel in Haiti

People can't afford rainwater from sisterns, and have to go elsewhere.

Plastic polytanks (as alternatives) are also expensive.

People end up going to the ocean for water sometimes as well.

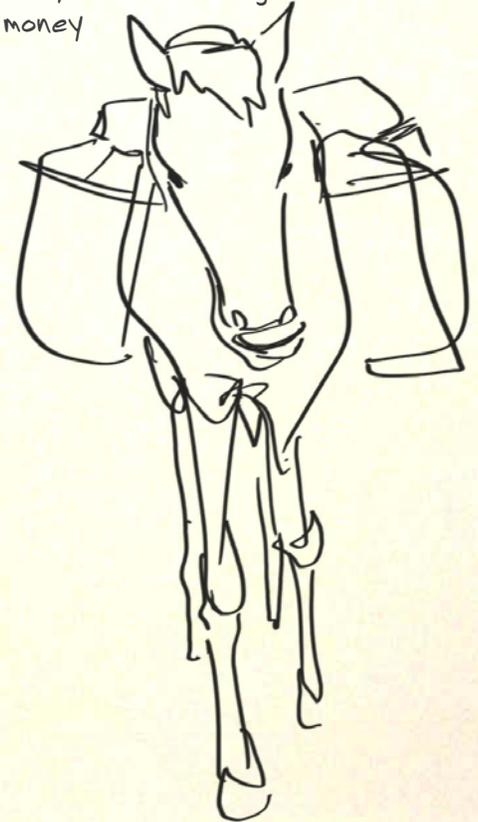
Possible inspirations

Sodis, and plastic films for storages
(as well as disinfection)

Tippy Tap

Paul Polak's divisible horse

Buying only part of a device when you can afford it, then more as get additional money



Brainstorming

2010.02.16

Goal of mini-project: to go through the entire process so you've tried it before. And when we start doing the big project, people can move a pace that fits their project then, rather than be forced through all the steps.

Background of Rain Water Harvesting

Pestel, Haiti

Rainwater harvesting in the area, done with cisterns, that are cost prohibitive to some people. Contamination during storage is a problem for some cisterns. Polytanks as an alternative to cisterns, are also cost prohibitive for all to have. Cost of storage for a family for time in between rainy seasons.

Alternatives to storage

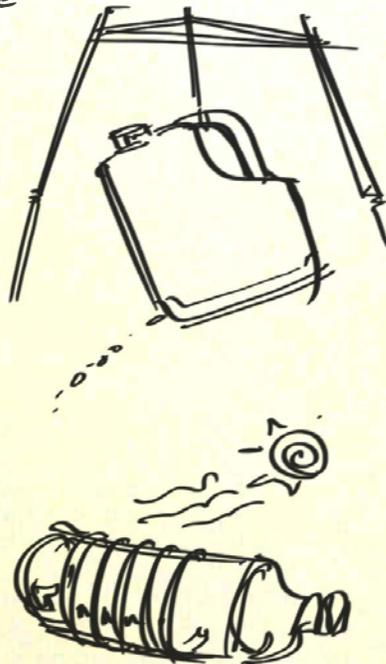
Sodis - UV disinfecting process
Tippy Tap - hand washing
Can't buy part of a horse

Mini-Project (in 3 main parts)

Information

Ideas

Implementation



Brainstorming

A particular way of thinking of ideas

Brainstorming Rules:

Defer Judgment (don't say no, don't think no)

Encourage Wild Ideas

Be Visual (write it down, draw it out)

Build on the ideas of others (?)

Go for quantity (60 in an hour)

Stay focused

one conversation at a time (listen)

Be optimistic (think that everything is possible)

Bisociation

- Respirators & Food, running oxygen through soup bubbles
- Charcoal and Shoes > and eventually come up with something that is a reasonable idea

Context shifting

Change your point of view

Look at things, play!

Back to basics, naivete

Start with a broad design space that is loosely defined. And then after on you can narrow it down. It is easier to start broad and narrow, than start narrow and broad.



Design Process...

2010.02.17

A brief conversation on things what will guide the overall design:



We would like it to be:

Very low cost

You can reduce materials

Reduce lifetime of product

Works well for refugee situations

If it saves money vs lifespan (cost \$1/saves \$20/year)

Modular/Buy in parts

System that uses rooftop harvesting system

System to be set up anywhere

"universal" fitting system between designs

Design individual bags for each use OR

Use one bag (egg bag), with different attachments.

Fitment attachments for hand washing, showering, etc

Bag use considerations

Drinking Water, Washing water, irrigation water, etc

Having identification between bags (no mixing)

Clean water?

Assuming that rain water is kept clean

Consider the surfaces that water comes in contact with

Amount of water used?

Different uses require different amounts of water

Does this mean different sized bags, stacking bags, etc?

PUGH Chart

	BAC	MON	POT
SPEED	D	+	=
COST	A	-	-
CLEAN	T	+	-
SAFE	M	=	+

PUGH CHART

This is part of the concept evaluation phase.

Selecting different criteria to measure across different designs

Choosing one of the designs as a Datum (standard) to measure the others against. Then marking other designs as =, +, -

It is a good thing to keep a limited number of criteria (50 would definitely be too many).

PLASTIC FILM PROTOTYPING

Scissors are excellent cutters, and very flexible. If you need straight lines, a box cutter and a ruler work well.

Plastic Sealers

Impulse sealer - easy to use, applies current for user set amount of time

Clip Sealer - super heavy duty sealer

Iron Sealer - for curved and compound lines

Showed the technique of using paper to prevent sections of plastic from sealing. A one-wave valve was demonstrated as well.

Mini Project Presentations

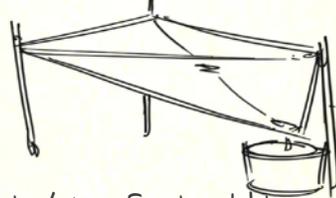
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Rain Water Solutions

Harvesting

Final Design Parameters: Large Surface Area / Easy to Assemble /

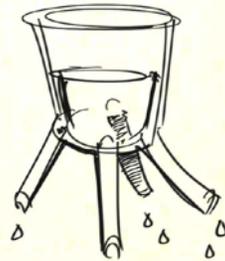
Final design was made out of a single piece of plastic with a number of cuts and folds, for easy of construction



Bag Filling System

Design Criteria: Capacity / Cost / Flow Rate / Manufacturability / Durability

Design Manifold was the main idea

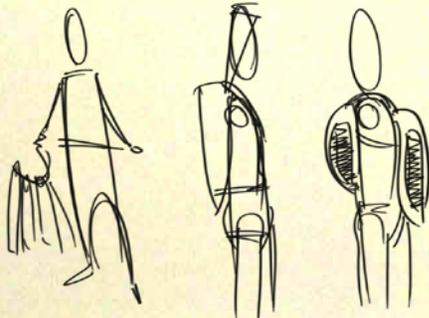


Transportation

6 Categories of Ideas

backpack / hook / modified Q-drum / cargo bike / life vest / zip line

Both prototypes were made of the same basic materials



Irrigation

How to get water out of the bag? GRAVITY / pump / weight
How to get water into the field? VINYL / pipes / chains / trenches
How to get water to the plant? Drip / Sprinkler / Animal / HOLES (pipes)
IDE spent 8 years developing their design, and it still holds up. This student team has made a few small modifications to improve the design.

Hand Washing

Hand washing is an important way to prevent disease transmission in developing countries.

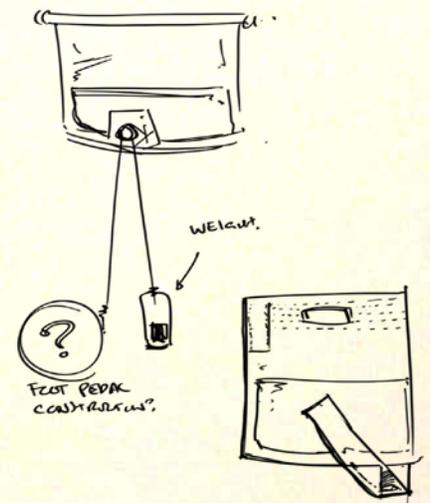
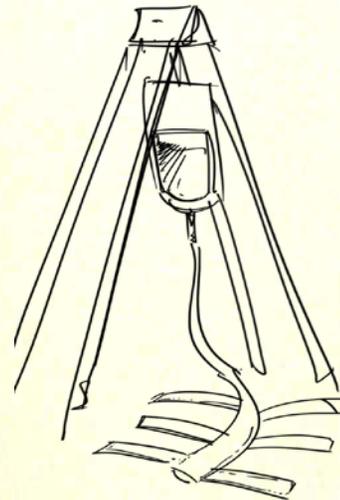
Design Considerations: Clamp design / Clinging Design / Flow Control / Counterweight
Wanted to have a "Foot pedal" design, that is naturally closed, and opens with foot pedal depression. Their design has the advantage of being able to be filled naturally by connecting to another rainwater harvesting system.

Domestic Use

Drinking / Cooking

Cheap / Easy to make / Easy to handle / control of flow / minimize water waste

Opted that gravity is one of the best ways to control the flow
Sodis style valve on one end, so it doesn't leak when turned over



Discussion on going through the Design Process:

Idea generation in multiple sessions was beneficial to coming up with quality ideas. (A subtext to that is letting ideas simmer in downtime).

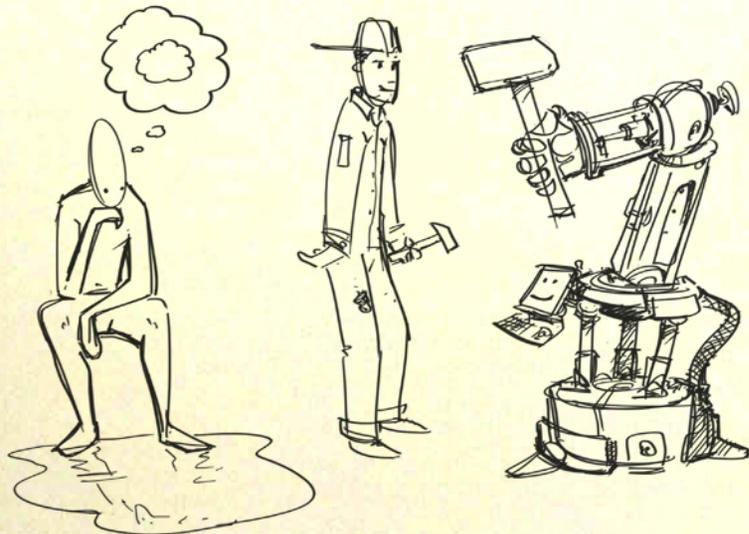
Using the Pugh Chart to help combine features; it is an evaluation tool as well as an idea generation tool.

Experimentation leads to better Evaluation. Hands on prototyping aided in understanding what issue were important, and contribute to evaluation.

Stretching imagination to think of new and non obvious solutions. Lateral thinking so as to not be fixated on constraints. Constraints allowed to more innovation in specific directions. Design specs as references/evaluation tool

Information / Ideation / Implementation / Iteration
Finish early so you can make more iterations

A big part of design is design for manufacturing. It is not a glamorous part of design, but it is extremely important, and is the difference between a product and a prototype.



Discussion around "Caution" in Design For Developing Countries :

Lifestraw example; get feedback before its too late to do anything about it

Curious about D-Lab failures... D-Lab doesn't have many technologies out there in the world. Combining Academia and Development is possibly one of the slowest project tunnels one could imagine.

Making anything and disseminating is difficult, it took Paul Polak X years to sell a million treadle pumps. People think its easy, when its not. These things don't happen overnight (very few things do).

People should consider what they can bring to the field. What skillsets can they add and use to aid a community they intend to visit.

How do we refer to "developing countries" alternative to that phrase?

Design Challenge Selection

2010.03.01

Agenda of upcoming classes
Build-It Module (Mon + Wed)/
Team Presentations (Wed)
Design for Manufacture (Mon)
/ Team Presentations (Wed)

Project Presentations
Proposals have been
reviewed by students
before class

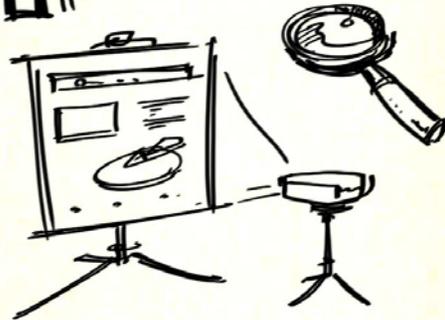
Goal of session is question and answer
These are only design challenges, how each team goes
about designing the solution is up to them, and doesn't
have to be in the same way the project is presented.
Handouts for students to choose top 6 projects

Bamboo Pencil Maker

Will utilize mechanical engineering skill set/interest
Final solution will be "gadgety"
Community partner has good email contact

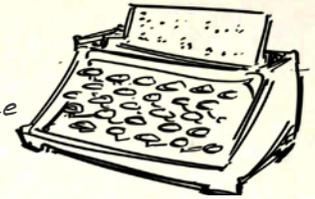


INFORMATION



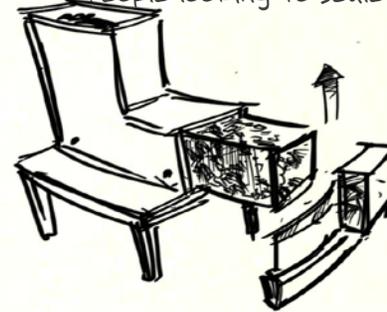
Braille Typewriter

Complex and challenging device



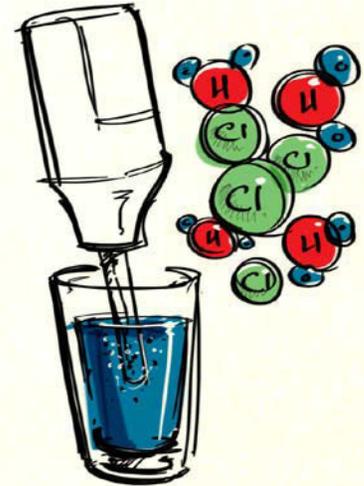
Charcoal Briquette Maker

People looking to scale up briquette making business



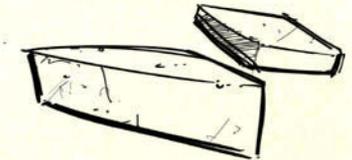
Chlorinator Generator

Interested in making lower cost
versions for the developing world
One of the biggest aspects to
address is batteries
Amy sells "supercaps"



Clay Molder

- This is the shape that sells
- Altering the shape not an option
- People eat clay for its high calcium -
content (especially when pregnant)



Forestry Growth Management

- Rebuilding forest after tragedy of
Vietnam War
- Align incentives for farmers to manage
- No direct reward for management
- Develop system to monitor growth, with
some kind of device



Low CO Stove

There has been a lot of work done in last 5 years
There are very few with ACTUAL improvements
Looking for a low cost fuel efficient charcoal stove
Many other designs are based on wood
Indoor/outdoor? Many people cook indoors

Maize Sheller Attachment

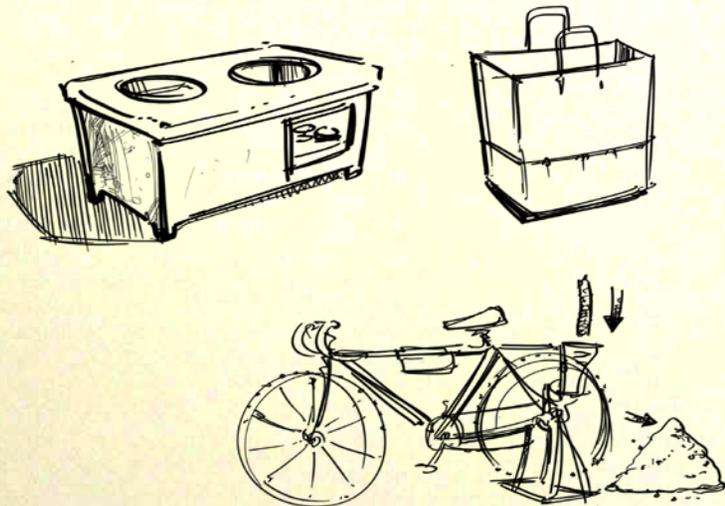
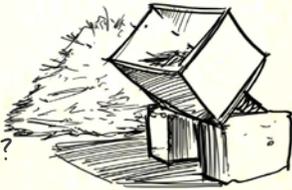
Working with Global Cycle Solutions
Redesigning a sheller that can be made locally in Tanzania

Paper Bag Making

Group of women in India
For domestic and export use
Everything is done by hand
Looking for machinery to speed up the process
Trade-off of cost::output ratio

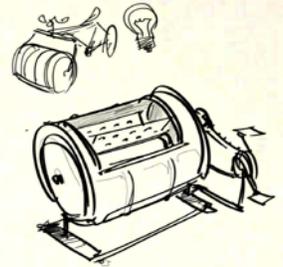
Pine-Needle Stove

Finding a way to burn pine needles
What would people be cooking on it?
Hot fast? Slow? Open Flame?



Portable Pedal-Powered Washing Machine

Trying to make a portable machine for women who go from house to house washing clothes. Previous designs work, but have aspects that don't fit this niche



Soda Bottle Chipper

Waste pickers could get a higher price for chipped bottles
PET soda bottles
Possible applications in local Cambridge environment!!!



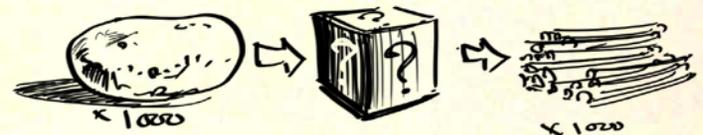
Straw Chopper

First Mushroom based D-Lab project
There is a big interest in mushroom and vermicomposting as income generation in developing world

Vegetable Cutter

Back to the orphanage in Lima, Peru, and trying to improve their nutrition

Water Siting Instrument



Design Review Presentations

2010.03.10

Groups will present on what they have done so far.
Information Gathering, Problem Framing and Problem Statement.

Mentors present with various specialties to aid students with their expertise. They will be present for all the design reviews. It is a bit of an experiment.

Benjamin Linder - Faculty at olin, focusing on Sustainability and Design
Chick Davis - I don't look good on paper, but can do all kinds of stuff, an intuitive seat of the pants guy.

Dennis Nagle - you can call me Nagle, runs the D-Lab shop and how to use tools.
Mike K - serving as a mentor and knows the design process well.
Amy - I've been to a lot of places where these projects work.

Bamboo Pencil Manufacturing

Project motivation, current manufacturing is very industrialized, trying to bring the scale or production down. There is a large market around the world.

overview of the industrial pencil making process.
Looked at the example of homemade pencil construction (science for kids style)
Research on bamboo.

Different problem framing ideas:

Grow skinny bamboo.

Process bamboo into slats

Final choice, change the process for the unique shape of bamboo

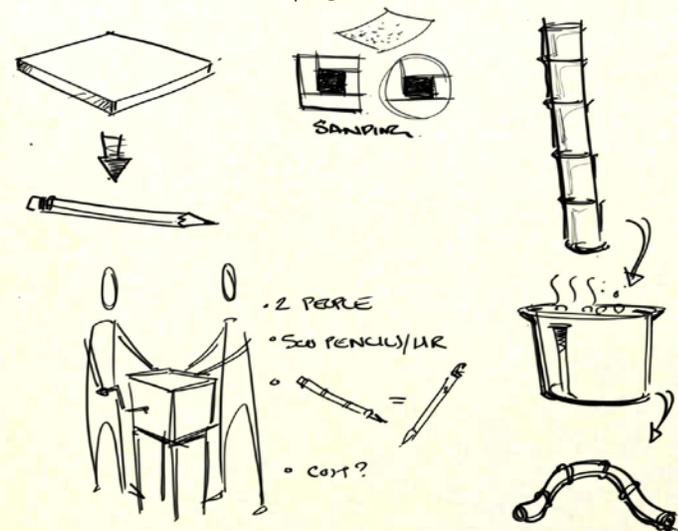
Design specifications, where are they coming from?

These were given to them by the design challenge

There is an opportunity to challenge this

Need to come up with a more precise problem statement

Recommend playing with bamboo



Vegetable Cutter

Requested by long time partner of D-Lab. An orphanage in Lima, Peru, that has about 600 children and only 30 staff. They have a desire to improve the nutrition and diet of children by having a vegetable cutter to process them faster.

Problem Framing

Nutrition

Considering alternative nutrition sources to vegetables

Efficiency

Just not enough people, making the process more efficient through the tools. Increase the number of people some how (children help out)

Vegetable Size

Can they get smaller vegetables, breeding smaller varieties

Focused on efficiency and looked at related tools

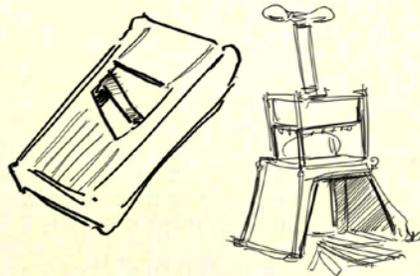
Affordable / Non-electric / Safe / Working together / Efficient / Repairable

Consider the cleaning of the device

(time to clean as a specification)

Resource poor environment of Cambridge soup Kitchens for feedback on project

Making calls on the VOIP 9 001 then country code and number



Pine Needle Stove

Pine Needles are very acidic

Being developed for Uttarakhand

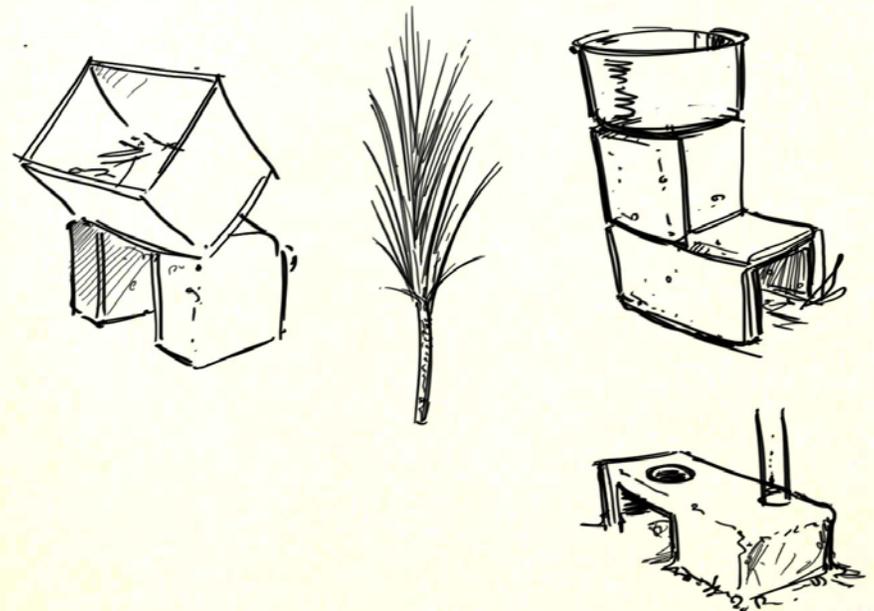
Did lots of research on stoves

Stove design parameters

Cooking vs Heating and Inside vs. Outside

Durability / Materials / Cost / Health / Safety / Heat Control /

Ease of Use / Quantity of pine needles / Pine needle processing



Design for Manufacture

2010.03.15

Victor goes over rescheduling the deliverable due dates

Spring Break Reading

Small is Beautiful - argument against scale as a source

Gaviotas - a village in ... made to address the problems of urbanism

Cradle to Cradle - manifesto on sustainability

Fortune at the Bottom of the Pyramid - 12 Innovations for BOP Markets



Manufacture - the use of machines tools and labor to make any kind of thing, usually at a large scale for sale and distribution.

Design for Manufacture - adapting a design to make it easy to manufacture and to reduce manufacture costs.

It is easier to incorporate DfM in the design phase, so you don't have to redesign in later stages of the design process. DfM gains more and more importance with each step of the design process.

Considerations:

Job Creation / Resource Availability / Replicability / Scale

Manufacturing Costs:

Components - get worn down over time and cost different parts

Custom vs Off-the-Shelf Part

Raw Materials / Labor / Tooling & Equipment

Assembly -

4 Paradigms

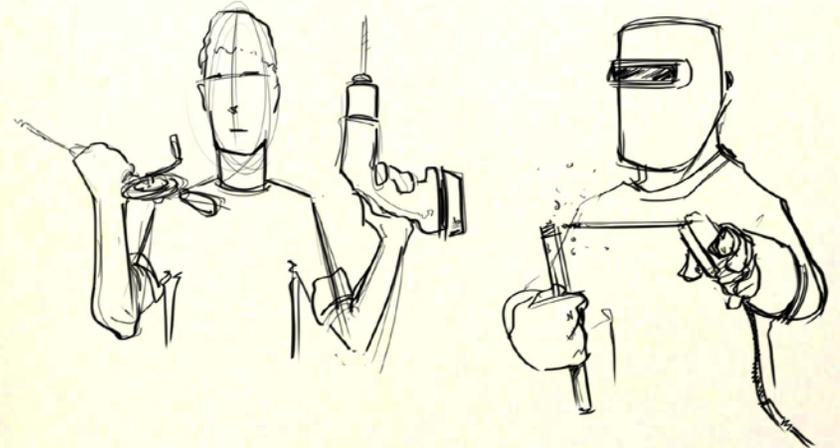
1. manufactured locally + Assembled Locally + Maintained Locally
2. Manufactured in Urban + Assembled Locally + Maintained Locally
3. Manufacture in Urban + Assembled Urban + Maintained Locally
4. Urban + Urban

Photo of man manufacturing hinges by hand

Welding is widely prevalent in the world, because it is of such a great need

Jigs and Fixtures for manufacturing multiple parts quickly

Consider how the products you design can be manufactured, and how you can come up with efficient (time saving, resource efficient, etc) processes.



Keys to DFM in Developing Countries

Understand manufacturing capabilities
Incorporate the most accessible and
affordable manufacturing techniques

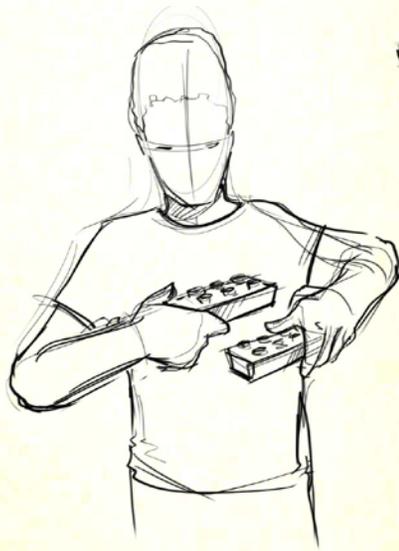
This is not easy to get the first time
May be required to build a prototype,
then redesign with manufacture in mind

Design for Assembly

Reduce the cost
Improve quality
Reduce part inventory
Reduce equipment necessary

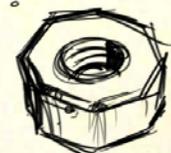
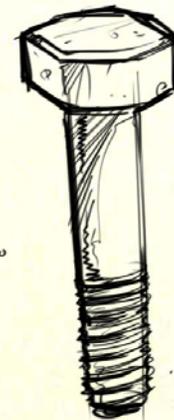
Guidelines

Minimize different parts,
use standardized parts
Minimize the number of parts
Try to use symmetrical parts
(reduce orientation specifics)



No Spare Parts

Video on manufacturing in Ghana
Suame Magazine one of the largest informal manufacturing
areas in the world



Idea Generation Design Review

2010.03.17

How are things going with contact and community partners?
How is experimentation and idea generation coming along?

Bamboo Pencil Manufacturing

Idea Generation

Role bamboo paper around the led

Concept Evaluation

Decided that pulp and mold was the best idea

or

Cutting thin pieces and making a homemade pencil

Experimental Results

Made some shapes that could be used for pencils

Heating up bamboo

Boiling bamboo wasn't too successful

Grow thinner bamboo

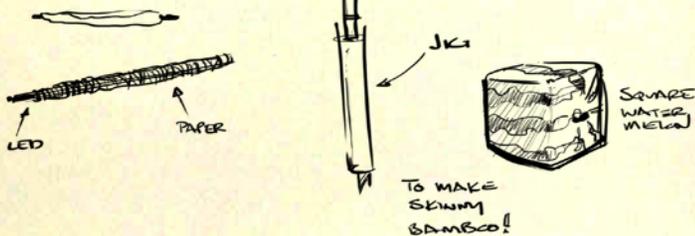
What if you soaked the bamboo for a long time in water? Would this soften it? Even without heat, this would be a low energy, high impact solution, if it worked. What about adding salt or some other additive. That could then be removed through drying.

General Notes

What is the reasoning for individual design specifications?

Portability, something people think is valuable, but isn't required or desired. Things like this need to be confirmed by the community partner.

Pencil specs vs Machine specs



Vegetable Cutter

Idea Generation

Looked for ways to power device

Crazy ideas! Piano wires as cutting device, while learning music!

Considered the resulting shapes of what you wanted to cut

Concept Evaluation

Experimental Results

Tested different devices and videoed it

As a result, reconsidered the force necessary

What was the sharpness of the blades?

Slap chop

You get weird shapes and things get stuck

General Notes

Revised problem statement

Focusing on corer/slicer devices

How does this relate to community partner needs?

Vegetable sizes/shapes, types/ budget

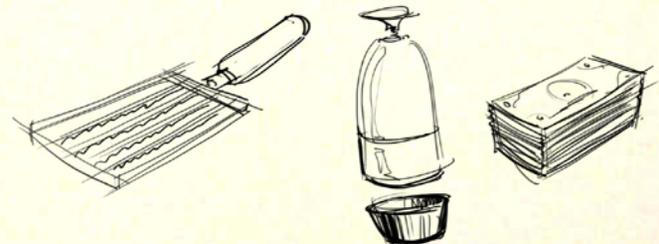
Scale of the device you are working on

What is the lifecycle the partner is working in?

He wants to package and sell this stuff, what does this mean?

Packaging? Preservation? Sanitation? Tabletop cutting? Etc

I have some links on some German hand powered kitchen devices.



Pine Needle Stove

Idea Generation

Feeding Methods... something about this makes me feel like it's on the wrong path

My concern for the ideas here is that they are not considering the user interaction enough. Some of the ideas are very specific, which is good but very specific very early. And it will be harder to expand your ideas later on in the process.

Concept Evaluation

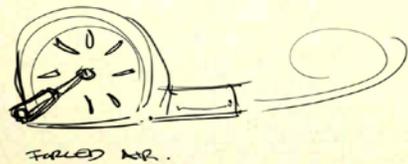
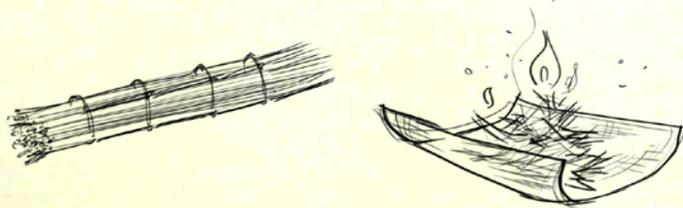
Experimental Results

Packing pine needles into logs

General Notes

Optimal Burning - Fuel/Temp/Air (balance)

What groups did was initial experimentation and idea generation. This was good, and gives students a direction to think about going, and focus on new ideas based around this.



Human Factors

2010.03.29

Suprio Das - Designer in Residence

Engineer, then started working with an NGO on water remediation when he gave up his job. And has been using his engineering skills on various projects since. Currently working on automatic chlorine dosing, and will be around D-Lab until early May.



Community Involvement in Technology Development
Consider involving as much as possible in the design process.

Taking photos and sending them to them
Talking on the phone about what you are up to
Come up with another way to do so!

Human Factors

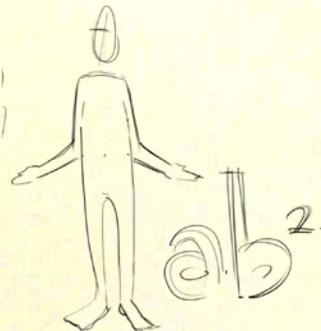
Useful - something that serves a purpose

Usable - something that is understandable

Desirable - something that people want

Banana Slicer - Useable + Desirable - Useful

Useful + Usable are the things on the shelves that don't get sold



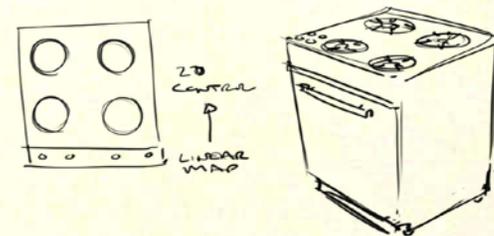
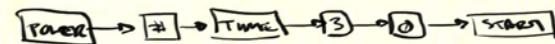
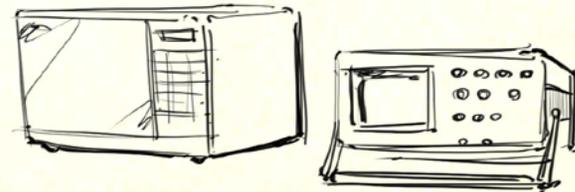
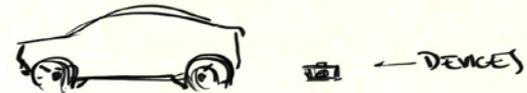
Principles of Good Design

(From Human Factors Standpoint)

Taken From Donald Norman

1. Visibility (experiment to turn on oscilloscope)
2. Good Conceptual Model (30seconds Microwave Experiment)
3. Clear Mapping
4. Feedback

Labels are a quick fix, and are language dependent. A good design would be intuitive in form to hint at function.



Design for [X]

2010.03.31

"There are no solutions, there are only trade-offs"

USABILITY

Solar Water Disinfection

Clear water in sunlight can be disinfected with UV
(within a day)

By destroying pathogens

Transportation Issue of getting bottles from A to B

Making a plastic bag as a solution, non-usability of
original bag

Sodis design by Shawn Frayne

Characteristics of the original bag:

Hard to fill / painful handle / stressed corners

Is there some sense to the device, how do people understand it

Make sure that people get feedback when using the device

Trade-offs of cost and performance

AFFORDABILITY

Charcoal Press was done by reducing the material

IDE Drip Irrigation Kit

Looked to cut costs everywhere

Used a plastic bag + rice bag to make an inexpensive
container

Used cheap thin wall tubing for piping

Don't want to go so far in one direction that you make a
trade-off of quality into the realm of unusability

Methods

Remove material

Material Selection

Reduce part count

Increase scale of production

When producing in the scale of millions,
you're paying for material and labor is negligible

Trade-offs

The appearance of "quality" (lead in parts)

Our perceptions of quality

Lowering cost and reducing "quality" can increase accessibility,
as in the case of the drip irrigation kit.

MANUFACTURABILITY

Phase Change Incubator

Going from making 100s (plastic canisters) to making 1000s (phase change balls) decreased the price. Going to plastic bags reduced the cost even further, costing only pennies.

Methods

- Ease of manufacture
- Scale of Production
- Processes and material selection
- Tooling, jigs and fixtures

Trade-offs

Economic Benefits - who is making the money from your making the product. Hand crafted has distributed economic benefit of local manufactures. While making it en masse can make it cheaper and more accessible.

Environmental Impact - often cheaper to make it at a cost to the environment

Capital Investment - an injection molding machine costs a lot of money (1000s), while a forge doesn't cost a lot (100s)

SUSTAINABILITY

Will be covered in detail by Benjamin Linder in a few weeks

Methods:

Material Choice, what are the impacts of it
Manufacturing Process

System Design - what is the system in which this item works

Life Cycle Analysis - not the just the materials in the device, but the energy and material used to make those materials. Defining boundaries is very difficult to do.

Trade-offs:

- Cost
- Performance

If done right, you don't have to have these trade-offs. Often these things are in conflict, but it is not a given.

RE-USE

Thinking about the product at its end of life. Either re-using or easy disassembling for re-use.

FAILURE

Plow made to fail in specific point so that farmers can fix in the field when they hit the rock. Design a device that fails in such a way that it is easy to fix.

How will it fail? (it will fail)

How will it fail first?

What is the best failure mode?

What is the worst failure mode?

Modeling something very well, you can predict how it will fail, and isolate the uncertainty in specific areas. You can be more efficient in areas, using less material. Take advantage of your failure modes.

Paul Polak & Shawn Frayne

2010.04.05

Paul Polak Background

Author of the book students have been reading in class. Founder and former President of IDE. One of the most successful disseminators of technology in the realm of development.

Shawn Frayne Background

Generation one D-Lab student and inventor of Humdinger. Uses an interesting market based approach to technology dissemination through licensing.

Will be interesting to here how these two people have found interesting niches to make a living in this field. It doesn't happen that students go to the career fair and pick up 15 brochures on how to continue development work.

Shawn Frayne Talks

Always appreciated simplicity in technology, and always thought he would go into clean tech. Was in the original D-Lab class when it was called the Haiti class. How to take something and design something to fit the constraints of Haiti. A long process of marching towards simplicity (7+ years).

In designing for the developing world, the constraints come up with interesting technologies that in their simplicity have applications towards the developed world.



Currently, Humdinger is based in Hong Kong. The goal moving forward, is how to make this into a global invention factory. For now, you have to create your own business to work in this field. Maybe ten years from now there will be a packed career fair, with GEs in this field.

The nice thing about development type technologies is that their pretty cheap to make.

Paul Polak:

"It is it true what I heard that you can get a lot of dough from bakeries?"

Sources of inspiration? D-Lab was just getting started back then. But the phase change incubator was amazing, and I think it has applications in the developed world, and licensing could make a lot of money.

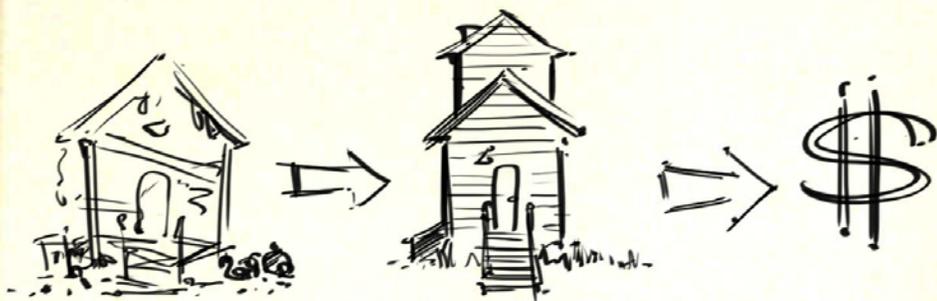
I'm an inventor, so I'm inspired by technologies, rather than business models, which might be a problem, and something he's working on.

Why Hong Kong? There is infrastructure to make multiple prototypes quickly. A chasm to overcome.

Paul Polak Talks

Was working as a shrink. The most important thing that happened, his love of Scuba Diving, where he met some people. He met a man, Willard, who augmented his work as a lighthouse operator, with fishing. Got interested in helping Willard with his fishing business. Paul originally used his own money, from real estate investments as a shrink.





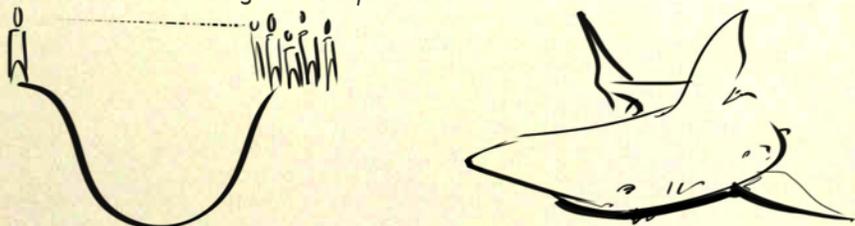
How did you find your way? I believe in erratic, the Harvard business plan sucks. People often try to plan things, but if you just let it go and are honest, you'll find your way. Learned to give up control, and take advantage of opportunities. When you give up control and let things you happen, you gain a lot of power.

Do you need one great idea? Before you have a business? I don't believe in ideas, so much as having a vision. What I do now, has changed so much since when I started. You have to be willing to commit to a vision and let it evolve, and understand that it will evolve in a way you can't control. And sometimes, there will open big opportunities.

Things don't work by having a big idea and making it happen. [It's a myth].

Amy: Serendipity plays a huge part in things, having a vision allows you to choose opportunities based upon the vision you want to achieve.

Sean: It's nice to have something you're working on, while you're in the "sea." But there is a lot of interesting stuff that comes along the way.



Don't bother... are you undercutting a population with this? The idea is not to say, things that reach two thousand people aren't good enough. However, if you built a good bridge design, how many could you make? I'm not saying its useless to help a small number of people. But one of the scarce things, is your time and money. If you go to a village, you can come up with twenty problems. My point is, in the interest of helping people, why not pick up the two problems that are applicable to 1000 villages.

Donations? You can't donate people out of poverty. Doesn't mean there isn't room for investment or some donation plans. Development as a whole, was focused on donation based system [when I wrote the book]. For wheelchairs, consider the cost of mobility vs immobility.

What do you do when people don't want help? I've encountered people who were so accustomed to getting free things, they didn't want to pay. People always do things for a good reason. What are the reasons that people might not want help?

I was thinking that people didn't want to interfere with their traditions/culture. That depends who you are. If you wander around with an idea, versus sitting down to learn and learning from them.

People aren't going to turn away from opportunities to improve their livelihoods. So it depends what you are offering and how it is perceived.



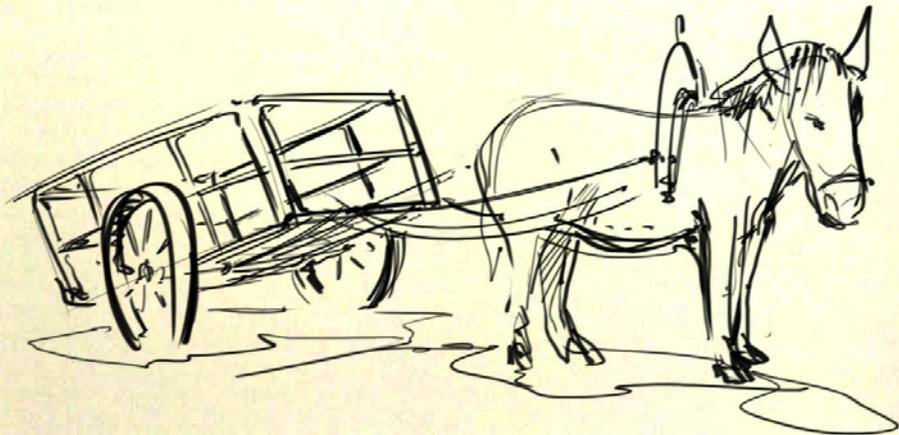
What are some organizations that are doing it right (similar to IDE)? It is all matter of degree. When IDE started, it was a shot in the dark, now there are many more. Hefer International, not perfect, but it works. CARE as an organization is doing some things that are very market based. There are many more organizations doing things more market based, if not the whole organization, then part.

Amy: the infuriating aspect for me is people introducing products that aren't appropriate to the context in which they are working. Imposing rather than introducing, and not utilizing local resources, expertise, creativity or supply chains. In the long run, these may not be successful.

Paul: donated tools are ??? (I missed this!!!). If you have to design a hand pump that people are going to pay for, as a designer you will design to that. (Rather than donated government wells made of steel that are x inches wide).

To find out how much... Ask people how much they pay for treating bad water? But before that, ask people how many of them know the effects of bad water. When I talk about talking to twenty five farmers, its much more than just going with your product, and asking people what they think about. "I don't give a shit what the facts are, what matters is people's perception."

It's not just talking to the people, its understanding the system and context around the "problem".



Millenium Development Goals? I think they've done more harm than good. Overall, people have the idea that more money will solve the problems. JUST throwing money at the problem, will attract the crooks, and when money is gone, the problems remain.

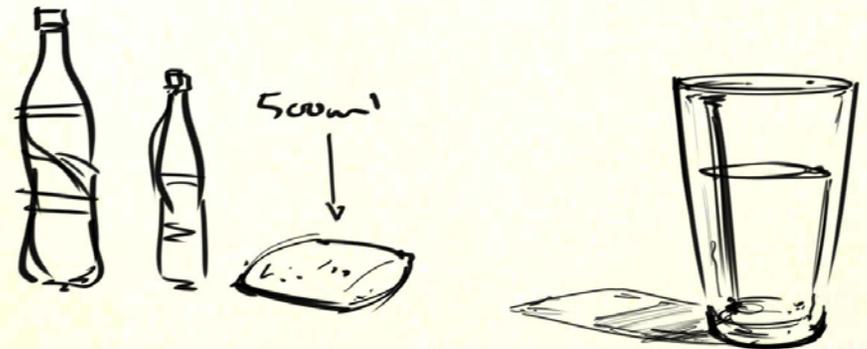
Foreign Aid can be useful. It has to be disciplined and market driven.

Can big business do good?

Coca-cola selling smaller bottles isn't helping anyone. It's a rotten product to begin with. Changing the packaging isn't always good. Water sachets in Ghana litter the ground.

Multinationals can make a contribution, but they have to go through a radical change to do so.

Products for the GE of Emerging Markets? Starting with drinking water.



Design Review

2010.04.07

Pine Needle Stove

Worked on a feeder for pushing pine needles into the stove.
Looked at gasification, took a 70 minutes before it even started gasifying

Spiral Prototype

Will know to put more fuel in by seeing the fire, as it dies down, add more needles.

Pot doesn't have to cover the stove completely, but without a pot on, the stove design doesn't work effectively.

Bamboo Pencils

Experimented with slats

Community partner is working on a big industrial scale

Pulping Bamboo

The process so far:

Grate bamboo

Mix w/ Adhesive

Need to decide what adhesive to use.

Ideally want to use long fibers

Vegetable Cutter

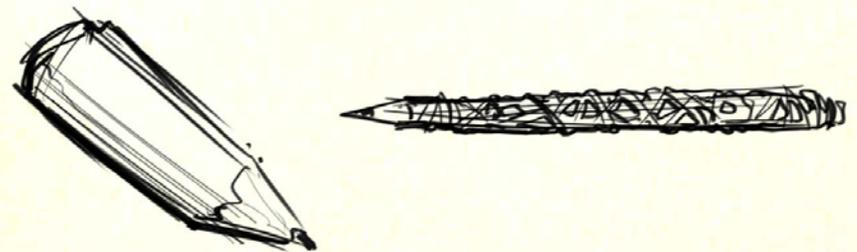
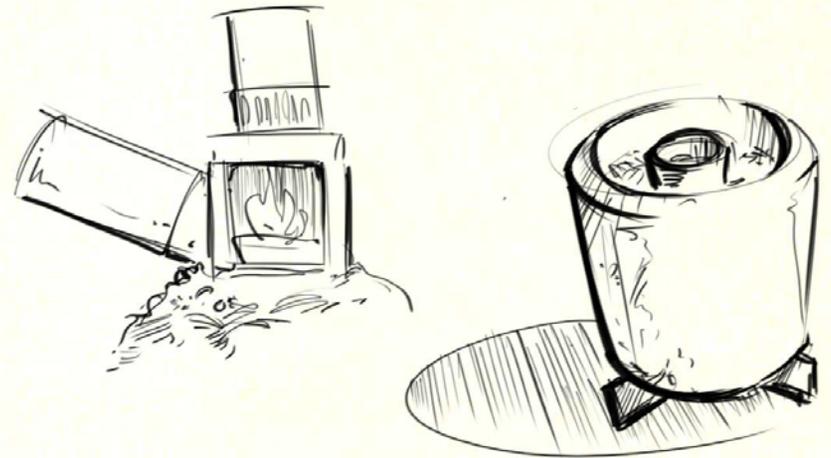
Brainstormed and then looked for devices that embodied what they were looking for.

What do the potatoes in Peru look like?

Are currently basing it off the russet

A potato grater...

Can you start to consider the process? Grating potatoes and automatically dropping them in a bucket of water.



Green Engineering

2010.04.12



Benjamin Linder

Sustainability is rarely talked about around product design in developing world. More typically it is talked about in the context of the US (the West).

Two common definitions, from our Common Future, Brundtland Report, and from John Elkington, People Profit Planet.



A typical flaw of representing the triple bottom line as a ven diagram says that sustainability lies in the intersection of the 3. (society/economy/environment or people/profit/planet)
Actually, the economy is a subset of society, which is a subset of the environment.

WWF Living Planet Report 2006

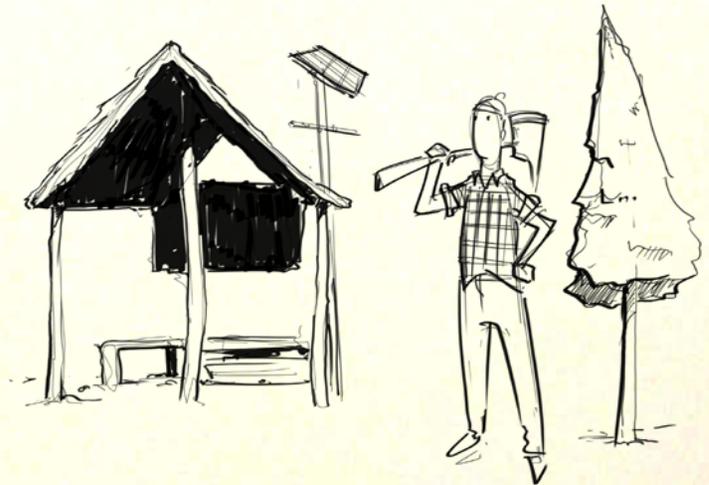
2.5 Acres per Hectare

Cuba's position on the map is interesting

An island society and economy, that was completely isolated in the Cold War. They had a great deal of resources that were subsidized, and suddenly stopped at the collapse of the Soviet Union. A society supported by outside resources, that had to rapidly change and adapt.



Sustainability can be seen as moving people across the graph in two ways, less impact, or more human development.



Carrying Capacity

We are using more Earth's than are available

Sustainability is a lot about rates, how things balance out

Depleting resources faster than they can replenish themselves

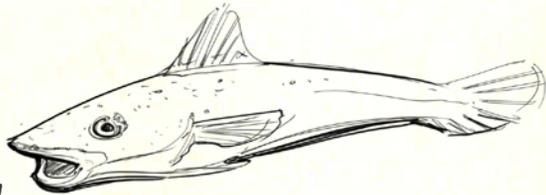
Cutting off tree branches vs chopping down the tree

Source vs Sink

Resources consuming in vs Resources putting out

Will the planet run of oil first, or will the world warm up too much before we run out of oil. A simultaneous problem.

Cod in and waste out.

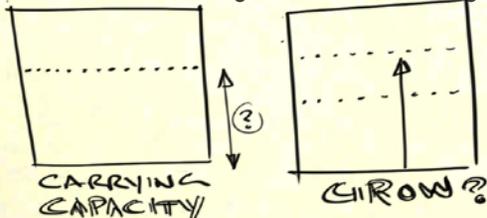


Carrying Capacity

Copper only has so much, there is no renewable rate for it, it is a STOCK

The problem with carrying capacity is that we don't know where it is, there is no line in reality showing when to stop consuming Cod.

The only way to get below carrying capacity rapidly is to stop consumption completely. And drop below the line. Human behavior isn't so straight forward though.



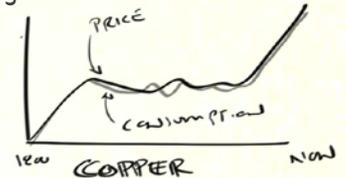
Can we raise the bar of carrying capacity?

Combining Fossil Fuels (nitrogen) and Wheat to raise the carrying capacity of wheat, is only combining the carrying capacity, not actually raising the overall capacity of the planet. The idea that the carrying capacity of life is raised is an illusion.

Can the market self correct for dwindling resources?

The example of cod, we didn't pay attention to the price signals, and collapsed the Atlantic source of cod. Markets aren't perfect systems, and don't have enough information to respond. Markets are not as effective as we'd like them to be.

The example of copper. Price over the last 200 years has not significantly reduced consumption. We have substituted PVC for pipes in houses, but started laying down telecommunications lines.



Techniques

0. Know what resources you're using

What is the context

- Don't talk about general Cod, but cod in the Atlantic

Water Pump in New Longoro

Materials to build

Human Power to Operate

Machines to Make

Water

Transportation

Fuel

Built Land Use

(the land you used, can only be used for this now)

1. Measure Carrying Capacity

Water Pump

Measure ground Water rates

2. Stay below Carrying Capacity

3. Adapt quickly

4. Population

Green Engineering 2

2010.04.14

Ben Linder

There is hope because the WWF Quality of Life / Environmental Impact Graph approaches a sustainable area.

- Some people need to increase their consumption
- Some people need to decrease their consumption



How much Energy can a person output?
100w is an aggressive schedule of mechanical work
How many equivalent oil laborers is that?
50 oil Laborers per Person in US



Calculating Biocapacity

A certain number of people need a certain number of land.
Different lands have different capacities (grassland vs forest).

Looking at Africa and people cooking with solid fuel
80-95% of the cooking fuels in Africa are wood



Argument that a big part of the standard of living is tied to fossil fuel use (increased fossil fuel increases standard of living)

It takes energy to make energy
US in 1970s, for a gallon of oil would get 100

Ghana

Wealthy Kitchen > High quality aluminum pots is a give away of the wealth (embodied in them).

Three Stone Fire

Not very efficient at getting heat from wood fire to water

(is efficient at getting heat out of wood though)

most of it ends up in the air



Response to this:

More efficient stove...

or... I missed this ;/

Life Cycle Analysis / Life Cycle Assessment Exercise

Raw materials > manufacture > distribution > product use > end of life

Do basic material and energy use in each step

What is the fate of each

Calculate relative impacts

Goal is to get a handle on where the impacts are, and attempt to modify the design based upon this.

The basic idea of a LCA is easy, in practice it is very complicated

Doing an LCA for the stove

Ceramic + Steel: 3.5Kg

Steel: 2.25Kg

Ceramic ~ 1.25Kg

Small discussion on setting a scope.

The data set provided is one that is primarily used by the construction industry. A cradle to gate data set (raw materials > manufacture). Construction data is almost always cradle to gate, means some distribution is folded in.

LCA's are just coming online with different design and engineering firms

Most large design firms like IDEO and Continuum have maybe 2 people dedicated to LCA out of their entire business. Very few projects get this though. Firms might go out to other firms to get this work done.

The reason to do LCA may come from various sources, personal beliefs, market pressure, public criticism, etc.

Doing a lifecycle analysis aids in product design:

Example of changing the thickness of the steel to bring impact down (which might also bring cost down)

Make/Use

Is the product 80/20 or 20/80

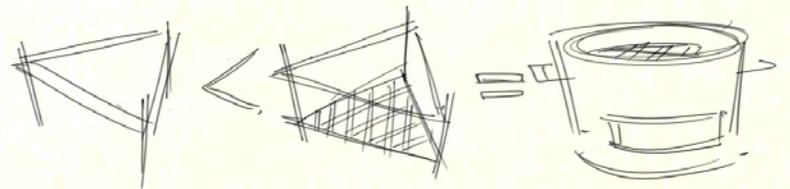
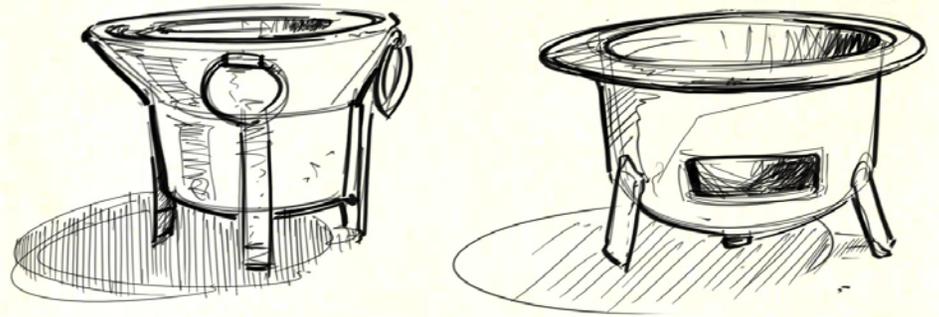
The strategies for improving a product depend on which type of product it is

Stoves don't matter what they are made out of. They will use so much energy over the course of its life, the materials don't matter.

> 71mj to make it

> 250,000mj to use it

Using less fuel, is that much time women are not out collecting fire wood. And that much wood that isn't burned.



Prototype Presentation

2010.04.21

Guest Mentor Ralph Hotchkiss

Stove Design

Spiral Design for a longer burn, concentrated underneath where the pot goes

Testing efficiency with a cold start and a hot start.

Safety concerns of current design
Considerations of two people operating

Vegetable Cutter

Have community partner feedback, they want 1cm cubed potatoes

Why? Don't know. Small pieces cook quickly, but preparation is longer.

Big questions:

Why 1cm cubes? (I'll be satisfied not knowing this)

How hard is it to manufacture Knives/grates?

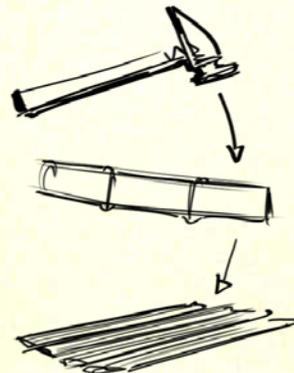
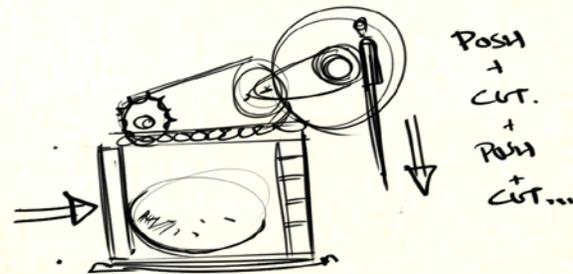
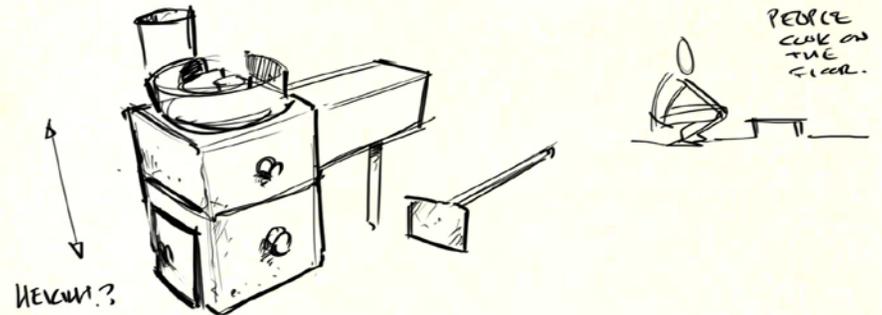
(this seems key, but high precision)

Ralf's suggestion of using old car parts instead of old bike parts for the precision of a camshaft at low cost.

Bamboo Pencils

2 Different Ideas

Bamboo fiber mats that are very malleable



Suprio Das

2010.04.26

Victor asked him to share some of the projects he works on. Also asked to reflect on how innovation happens in the field in India.



Motivation. How did I get into this?
The billion rupee garland versus island cyclone

Inspiration from the everyday.
Cow dung cakes on a wall. Cow dung Kabobs (a recent innovation).
Clever innovations that are necessary.

Bicycle Rickshaw innovation. Date Palm innovator.

There are interesting things everywhere if you just give it a second look.

Dugwells for Arsenic Safe Water

What are the options for the villagers?

Surface water with bacteria

Ground water with arsenic

It is complex to remove arsenic, and difficult to dispose.

There are known methods to remove bacteria.

The technology has to be appropriate to the people.

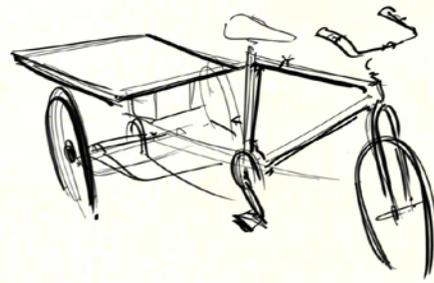
Problem of bringing in foreign machine, dependent on foreign parts when breaking down.

Going into villages and seeing other problems.

Education. Health. Lighting. Etc

Domestic power through human powered devices.

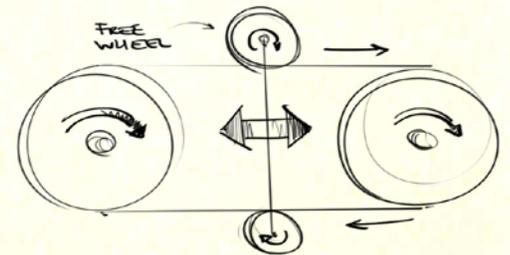
Bicycle with change over switch and charger.



Getting power from Hand Water Pumps

How to convert random amplitude motion to circular motion.

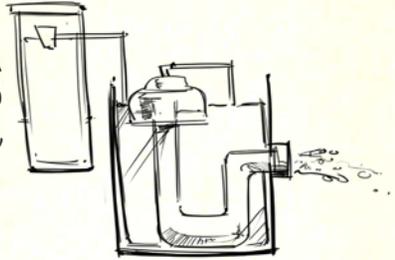
I ended up re-inventing the wheel



There is a scope of invention. It is not so bad to reinvent the wheel, so long as you find a new purpose for it.

Chlorine Doser

It is not necessary to be an expert in everything I do. Use the Knowledge you share in some field, apply it to another, and then ask those who know.



Designing for Failure

Example of the bolt in a plow.

Electrical Fuses

Think of other examples.

Beams in a building (so you can see it before concrete fails)

Cars are designed to compact and crush.

This process of thinking helps
Keep your brain healthy and active.

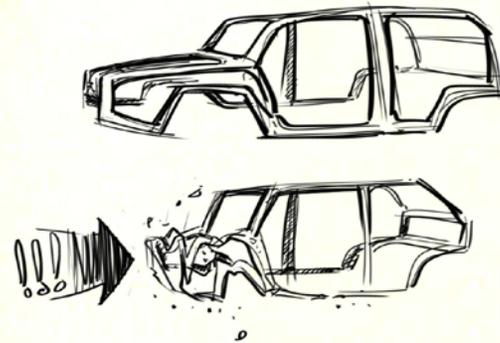
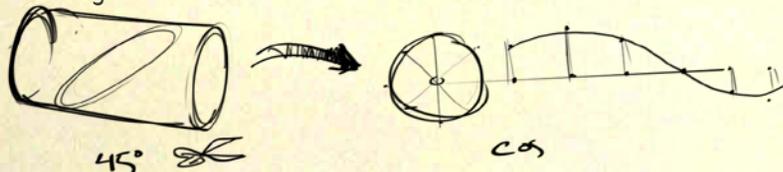
There are more issues beyond design that come into play.

When I designed the bike light, at first it was great for the rickshaw cyclists. And then they got used to having light, and realized it was easier for them to steal it. So the project was successful, but had an unintended result.

“Common Sense is common.
Wanting to do something isn't.”

Difference between MIT and Village Solutions

Because people don't have education, often solutions are simple. At MIT, have more resources, so should take advantage of those



Bernard Kiwia

2010.04.28



Victor Introduction - What does it take to be an inventor in Tanzania, and how does he see it changing over the coming years.

Bernard Talks

Background in bike mechanics, 3 years before IDDS. After IDDS, switched from bike mechanics, to making things, for the community and myself. Now now works with Global Cycle Solutions. Have cellphone charger and corn sheller. Now are working on grinding corn to make corn flour for Ugali. Looking to make a cellphone charger for motorcycles.

What people in Tanzania like, and things to keep in consideration when designing for them:

- People like things that last a long time
- Things that they can repair
 - > How are people going to repair
 - > General tools are better
 - Hammer, saw, welder > drill press
- Greater ideas (you have access to more knowledge)

After seeing what Carlos [from Maya Pedal] did with the bicycles, inspired him me to do something with it too.

Instead of just selling bicycle parts for scrap, start making things out of them to sell for a higher price.

First product: bicycle wheel truer

Following products: adjustable chair, water heater, toilet paper holder, water pump, picture frame, windmill, pedal powered drill press

Water Pump, taking advantage of children playing on it. Locate it near the river and then have them pump the water for you.

Cellphone charger user feedback:

People are aware of how long it takes to charge a cellphone now that they are charging while on the bike. Before they just plug it in the wall, and don't think about it.

People like to wrap the wire, and it breaks if you do that.

Trying to make the cellphone cheap enough, that its not worth stealing.

Currently costs 5USD, about 7,000 Shillings.

Electric chargers costs about 2USD

People have to travel to get phone charged costs 200 Shillings.

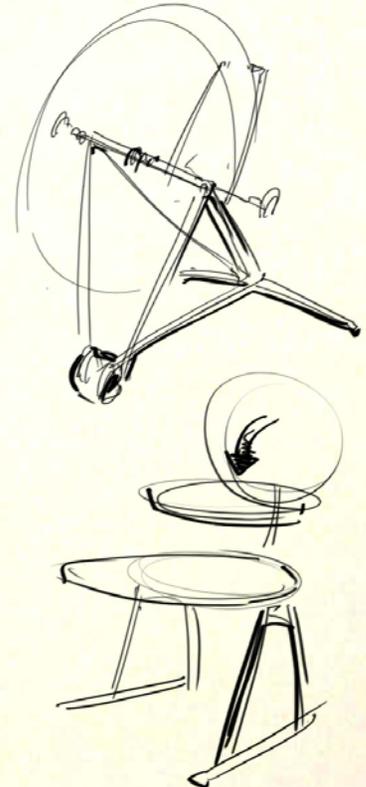
Focusing on quality and price (to make it tough for competition)

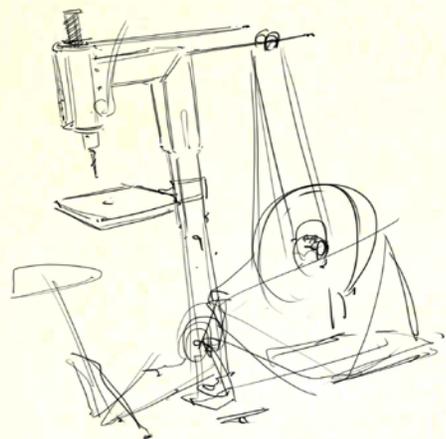
All of these come from my head.

Need to know what people need.

For me, its easy, because I live there, and now what problems people face. For you, you have to do a lot of research.

For instance, I used to have cold water everyday. And it costs a good amount of money for kerosene. That is why I searched for a way to make a hot water heater. Don't make for someone else, make it for yourself. If you like it, then someone else might like it. If you don't like your idea, then nobody else will.





How do you make these things? Do you read books or...

Sometimes, I see one thing, and apply it to another. Coming across a thing, and think how can it be used somewhere else. Fresh ideas are difficult to come across. The goal is to modify it.

"You need to try things."

A lot of people have ideas, but they don't try them. When I think of something, I like to try it. Some people have lots of questions, and have ideas, and ask you to try it, but are not willing to do it themselves.

Design something that you know. That is just for you. Now assume you are in Africa, will that device help you when you are there.

I want to try because I know that I can do it. If I don't think I can do it, I don't try.

What is missing in other people that they don't want to try. For you, I don't worry about you, because you come to this class. From the beginning, not all MIT students are here. But you are here, because you want to design something. From that point, that is where you can start designing.

Something you can do as a designer, is see how things work, and ask people.

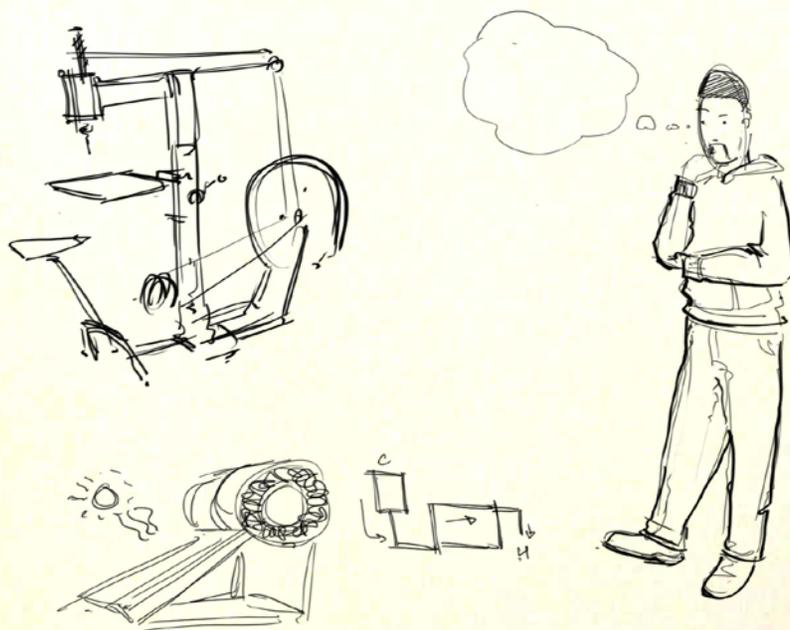
How do you want to move forward?

For me, I like a challenge. I want to work with people. I need more challenge. I need to sit with people with the ideas also. Working with people, who maybe tried, and have failed, and that is when you start to think about how to solve it.

What do you want to be doing 25 years from now?

I want challenge, so that I can make something that is great. So people remember it.

After first IDDS, I was on the magazine, so I thought, I go there the first time, and do good, so I have to keep working on challenges.



Scaling Up

2010.05.03

Saaf Water - Providing affordable clean water to urban poor
Sarah Bird (From the original Haiti class before it became the D-Lab)

Its tough to make testing water a interesting case.

Breakthrough thought of tying together water treatment with water testing. Having a woman walk around and testing water, and selling water treatment products when she comes across dirty water.

Became a failed attempt at selling a phase change incubator, because it wasn't necessary to convince people that their water was dirty.

Saaf Water closed at the end of November last year. We weren't on the road to scalability, we were loosing money. So it didn't make sense anymore. We learned a lot, and have lessons learned.

If you want to have impact, and if you want it to be scalable, you really have to think about how you're going to get to that level.

Most of the problems that we're concerned with this in this room, are problems that have been solved, they just haven't been solved in context. They depend on executing in specific manner.



Started in Kurachi in Pakistan, with women going door to door with chlorine tablets. Weren't prepared to deal with a day to day structure that included rocket propelled grenades, so it made us realize that we shouldn't have our eggs in one basket.

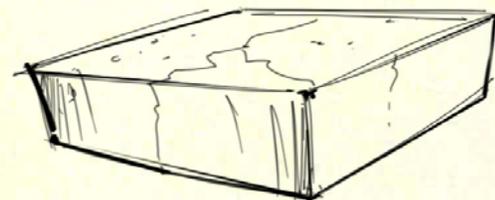
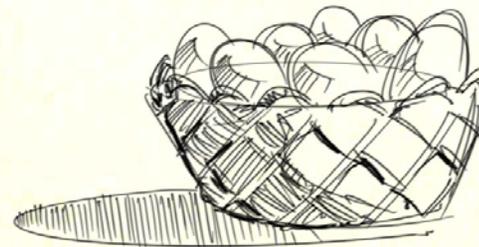
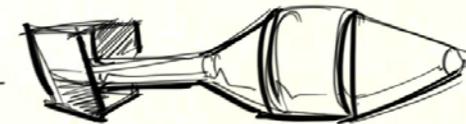
Were doing really well, and our graph looked like you wanted it to, when you're about to break even. Securing the deal with the new supplier. Then started supplying to USAID and Refugee camps from Afghanistan. Then USAID pulled out with four days notice.

Problems we could have prevented:

1. Extension of paying for product

Tried to crack down on this. And it backfired, got a number of half used bags back. Came to realize customers weren't using product as much as they should.

It's not hard to keep track of numbers, we should have done this.



Proctor & Gamble's Pur?

Was a competitive product, but failed for a number of reasons. Process was hard to do, customers didn't like it. Saaf did benefit from P&G's marketing campaigns to tell people they had dirty water. Saaf tablets were half price of Pur, but perceptually the same (5 Rupees to clean 10L Pur or 20L Saaf)

Running a venture like this

"It's just a little worse than being an undergrad at MIT, but more lonely... and everybody hates you"

Rescuing Saaf from the position it was in (no investors, no customers, no product) was not possible within in the time frame I could deal with (emotionally or financially after the having stock stolen and multiple investors pulling out).

USAID pulling out, is something I am upset about. There were 200,000 households getting clean water everyday, and that just ended, as USAID pulled out deals they had going on in Pakistan in preparation for the next gravy train rolling in (change of Ambassador, President).

Started Saaf water to do one thing well, and lost sight of that (focusing on the community based sales). I take blame for that, it's my fault.

Why not get some number crunching job to make a lot of money, then go do this with your own money (given the risk of countries like Saaf)?

I'd rather kill myself. I want to spend every day of my life doing what I want and what makes me happy. That works for some people, it wouldn't work for me.

If you had been wildly successful, you couldn't take all the credit. Having a spectacular failure, you can't take all the blame. Write down your lessons learned. [so I did] And there was nothing I wrote down that I shouldn't have known. You can't read a recipe and be a gourmet chef.

Start a business, because there is an opportunity, not because you want to just do something.

Gwyn Jones

Co-Founder Merlin Bikes (late 1980s)

In preparation for today, I started reading Art of the Start by Guy Kawasaki (recommended by Paul Hudnut).

When Merlin started, there was a limit to high bikes of being about \$1500. Anything more, and you're paying for expensive paint job. We started using a titanium alloy that was used in aircraft hydraulics. People had tried to make titanium bike frames before, but they didn't have this alloy. We pitched it to the mountain bike company we were working for. Didn't persuade them, but realized we persuaded ourselves.

Harish Hande and Selco, talked about being afraid of growth, because what they're good at is knowing their customer. Finding your customer can be a defining focus for a business.

You really have to listen to your customers with complaints. In the bike industry, if you're bikes aren't breaking, then there is a problem, because people aren't riding them. I got tired of dealing with warranty issues.

Tried to build them up, work with the customers who are really pushing the bike to its limits, and use that to make the bikes better.

Guy Kawasaki talks about this, and having the customer do the testing. Ultimately, the customer is going to do the testing. Working with the customer this way was something I felt we did differently, and that made a difference. Typically in the bike industry, companies are defensive about problems like that, because it could be problems for the rest of the line.

Seizing an opportunity vs coming up with a technology (windows)?

If you look at successful entrepreneurs, most of them have other start ups that have failed in their history. Most people are successful have done it before [and failed].

Design is such a small part of the project, and how its implemented counts for so much more.



Penultimania

2010.05.10

Saturday's Presentations

- What's next
- Working in the community
- Evaluations

What's Next?

Project Work

- Prototyping
- Research and Development
- Testing

Team Work

- Commitment
- Resources

Funding

Travel

Working with Communities

Encourage Participation

How can you empower people to bring their stuff to the table?

It takes conscious thought

Bring communities up to date with what you have learned over semester

Uganda Results

our Creative Capacity Building Workshop

It's like trying to squeeze this entire course into 3 days... in a foreign language

Exercises

- Ice Breaker (corn paper stacking)
- Build-It Module (corn sheller)

What people did 4 months later

- pedal powered knife sharpener
- water cart
- rat traps
- grinder
- ground nut thresher

It was interesting to watch the change of ethos in people.

Water Carrier, can take 8 Jerry Cans instead of a woman carrying one. Water source is 3km a day, so this device allows one trip to get water for the entire day in one trip.

Next goal was to use technology to address gender disparity, men want to make a paste maker so that they can help the women with their work. Men don't want to do it the traditional way, but do want to help the women with their work.

Its not just about the technology, its about people and creating engagement.

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EC.720J / 2.722J D-Lab II: Design
Spring 2010

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