D-Lab Development

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Problems and Solutions
Try and come up with solutions that others have been grappling with for years

Public Health - large centralized infrastructure to keep the general population healthy
- Access to doctors, medicine, awareness, preventative, treatment
- This exists in many places in the developing world (government)
  - Also other organizations that take care

Humanitarian Aid -
first measure responses to humanitarian situations
- Tsunami, refugee camps, humanitarian evacuation system
- This is how a lot of people get into Public Health initially
- Many humanitarian aid responses are reflective of the reaction in everyday life

Burden of Disease

Potential life + productive life = Disability Adjusted Life Years
- Measuring how healthy a country is. Measuring the work of a healthy individual against disabilities (disease, permanent injury) and mortality

What people die from and suffer from on a daily basis are different

Gives people an idea of where they might want to have an impact

D-Lab Approach

How can you come up with more tactical approaches that can have a result/impact within 2 years. (Other options might be impacts over 30 years)

90% of medical equipment is hand me down that fails within 6 months

- environmental issues
  - (leaky roof that shorts equipment)
- technicians not taking care of equipment
  - (world cup / ultra sound / color monitor)

Dual-Use Technologies

- Find things that can be developed here and used in developing world
  - Military is a huge source of this
  - Camping gear
    - Similar parameters of a lack of infrastructure
- Medicines
  - Two-market pricing systems
  - Major reason to compete with local production that can reverse engineer and make a generic alternative (India, Brazil, China all have very good capabilities in this)
  - Balancing IP with the needs of country and people
- Vaccines
  - Military going to places where soldiers are exposed to some of these diseases

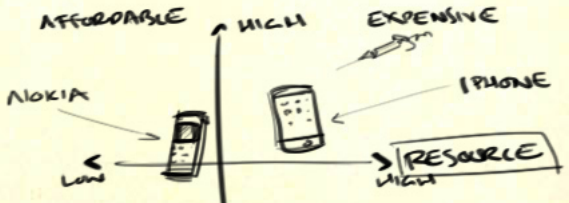
Solutions
- Many diseases have solutions (drugs/devices/diagnostics)
- BAD NEWS
  - Not all are easy to deploy
    - (Cost/infrastructure/education/regulation)
    - People work on solving this aspect the most
- MORE BAD NEWS
  - Infrastructure isn't always easy or cheap to respond to

Case Study

Jet Injector (Peace Gun)
- No needle
- People started to use for other reasons
  - Found it spread Hep B among people being vaccinated
    - Vacuum formed in chamber that draws small amount of blood from patient, that can infect the next customer
- Device since improved with a spacer, so device isn't against skin

With simple design approaches, you can recover technologies

Elements for Device Design Success
- Select appropriate design attributes
- Map to design?
- Missed the slide



Impact/Resource Scale

Technology as intermediate solution while vaccines/cures researched

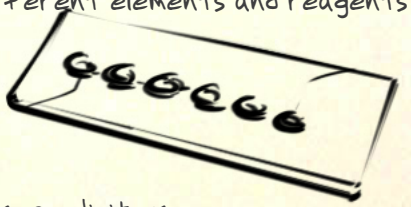
XoutTB
- Cellphone + encrypted diagnostics to see if people have taken their drugs
- Rewarded with cellphone minute credit
  - Paying for minutes is cheaper than having health worker go and check
- 1600 patient trial in Pakistan
- Patients like it
- Health Care workers jobs?

Free them up to do what they are trained for
- Not trained to write down compliance

Compliance is a big issue
- $300 Billion lost in US because of non-compliance
- Google: compliance and adherence

Aerovax
- Maintaining the vaccine in a different state
- Don't need to refrigerate for 7 days

Microfluidic Chip
- Replace electricity with liquids
- Liquids run to different elements and reagents



Why Pakistan?
- Because of this serendipitous networking occurance

Attributes for Medical Devices

- Essential
  - Safe
  - Accurate
  - Robust (vials get dropped on floor all the time)
  - Longevity
  - Cheap (first thing to go is devices, consumibles are purchased, vaccines, while syringes aren't)
  - Reliable
  - Reusable/Disposable (varies depending on context)
    - Auto-disable syringe (cheaper to buy vacuum pack machine and fake new than buy new syringes)
- Enhancing
  - Mobile
  - Connected (enough affordable electronics to make things connected, and there are many reasons why it should be made connected, devices that talk to each other)
  - Smart
  - Plug n'Play (with other devices)
  - Backup via Redundancy
- Long-Term
  - Local Mafg
  - Local Innovation

Approaches

- Vintage Technology + New Function (old patents)
  - Nerf Gun + Syringe Device
- Improvisation -> Design
  - Coke Bottle + Inhaler OptiChamber
- Context Shifting
  - Taking device for one setting and apply in another

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