

Outline

- 1 **Abstract** – GVCS in 2 years & \$2.4M with parallel development
- 2 **Introduction**
 - 2.1 Simple statement from Isaiah
 - 2.2 8 main points of GVCS uniqueness
- 3 **Context and Applications**
 - 3.1 Substitution of existing infrastructures
 - 3.1.1 Global Village: Integrated, Lifetime Design Communities (appendix on enterprises involved. lloyd)
 - 3.1.2 Ecotechnology, Relocalization, Permaculture, Permaufacture
 - 3.1.3 Infrastructures
 - 3.2 Economic Development
 - 3.2.1 The Vision of Decentralized Production
 - 3.2.2 Transition Towns, One World Villages, [Village Towns](#)
 - 3.2.3 3rd and 4th Worlds
 - 3.3 Reinventing Education
 - 3.3.1 Towards Integrated Humans: K-PhD Experiential Education with Augmented Reality
 - 3.3.1.1 Experiential Education: DIY Scouts
 - 3.3.1.2 Shifting Culgure: DIY in 3D and Remaking the World
- 4 **Product Ecologies** – descriptions and diagrams of packages; General Problem Statements (with significant data)
 - 4.1 General: LifeTrac (Agriculture, Housing, Utility), RepLab I and II, Solar Turbine, Fuel and Power
 - 4.2 Food – General Problem Statement
 - 4.3 Electricity – same topics as Food
 - 4.4 Housing -
 - 4.5 Transportation
 - 4.6 Fuel and Power Cube
 - 4.7 Power Electronics
 - 4.8 Fabrication – RepLab up to Hot Metal Processing
 - 4.9 Materials – Aluminum from Clay
- 5 **Replicability**
 - 5.1 Lowering Replication Cost – OS, and digital fabrication
 - 5.2 Self-Replicability of plants and machines
 - 5.3 Immersion Education
- 6 **Development Strategy**
 - 6.1 Parallel Development Strategy
 - 6.2 Publicity and Outreach Presentations
 - 6.2.1 Simple GVCS site (presently being designed)
 - 6.2.2 5 Minute Talk/Ignite Talk
 - 6.2.3 18 Minute Talk/Exploratorium
 - 6.3 Funding
 - 6.3.1 Viral Kickstarter/True Fans campaign for Funding
 - 6.3.2 Nonprofit Sector
 - 6.3.3 Production Earnings
 - 6.4 Collaboration Platform – Bettermeans with Wiki
 - 6.5 Team

- 6.5.1 Team Development – Outreach Presentations, Schedule and Outreach Team Development
- 6.5.2 Core Roles – Media Advisor, Resource Developer, CFO, Technical Director
- 6.5.3 Subject Matter Experts and Reviewers
- 6.5.4 Prototypers and Fabricators

7 Technical Development

- 7.1 Need-Based Product Prioritization Strategy
 - 7.1.1 CAD Work
 - 7.1.2 Production Facility
 - 7.1.2.1 Co-worker Investement
 - 7.1.3 Continued Research and Development
 - 7.1.3.1 Project Proposals
- 7.2 LifeTrac Package (strategy and problem statement)
 - 7.2.1 ***LifeTrac***
 - 7.2.2 ***MicroTrac***
 - 7.2.3 ***Bulldozer***
 - 7.2.4 ***Power Cube***
- 7.3 RepLab: Flexible and Digital Fabrication
 - 7.3.1 ***Multimachine***: CNC Mill, Drill, Lathe, Surface Grinder, Cold Cut Saw, Abrasive Saw, Metal Bandsaw; includes indexing head, vertical and horizontal position
 - 7.3.2 ***Ironworker Machine***
 - 7.3.2.1 Hole Puncher
 - 7.3.2.2 Metal Shear
 - 7.3.3 ***RepTab***:
 - 7.3.3.1 CNC Torch Table
 - 7.3.3.2 CNC Router Table
 - 7.3.4 ***RepRap***: 3D Printer
 - 7.3.5 ***3D Scanner***
 - 7.3.6 ***CNC Circuit Mill (10 total)***
 - 7.3.7 ***Robotic Arm***: welding and moldless casting
 - 7.3.8 ***Laser Cutter*** and Power supply
 - 7.3.9 ***MIG Welder*** and Power Supply
 - 7.3.10 ***Plasma Cutter*** and Power Supply
 - 7.3.11 ***Induction Furnace***
 - 7.3.11.1 Alloying
 - 7.3.11.2 Surface treatments
 - 7.3.12 ***Hot rolling*** – flats, angle, tubing
 - 7.3.13 ***Moldless Casting***
 - 7.3.14 ***Wire Extrusion***
 - 7.3.15 ***Forging (simplest is an anvil) (19 total)***
- 7.4 ***Modern Steam Engine - 1 kW Off-Grid Generator***
 - 7.4.1 ***Gasifier burner*** – pellets or other
 - 7.4.2 ***Steam generator***
 - 7.4.3 Steam Engine Power Cubes
- 7.5 ***Solar Turbine*** – Solar Thermal Electrical Power
 - 7.5.1 Reflectors
 - 7.5.2 Tracking
 - 7.5.3 Receiver
 - 7.5.4 Steam Engine

- 7.6 **50 kW Wind Turbine**
- 7.7 **Extraction of Aluminum from Clay (25 total)**
- 7.8 Agriculture and Utility Implements
 - 7.8.1 **Pelletizer**
 - 7.8.2 **Universal Seeder**
 - 7.8.3 **Tiller**
 - 7.8.4 **Spader**
 - 7.8.5 **Microcombine**
 - 7.8.6 **Universal Auger** (String Trimmer, honey extractor, posthole digger, tree planting auger, slurry mixer, washing machine)
 - 7.8.7 **Materials-moving Auger**
 - 7.8.8 **Hay cutter**
 - 7.8.9 **Baler**
 - 7.8.10 **Hay Rake**
 - 7.8.11 **Loader**
 - 7.8.12 **Backhoe**
 - 7.8.13 **Chipper/Hammermill/Stump Grinder**
 - 7.8.14 **Trencher (39 total)**
- 7.9 **Open Source Car**
- 7.10 Built Environment
 - 7.10.1 **CEB**
 - 7.10.2 **Dimensional Sawmill**
 - 7.10.3 **Cement Mixer**
 - 7.10.4 **Well-drilling Rig**
- 7.11 Agriculture
 - 7.11.1 **Bakery**
 - 7.11.2 **Dairy**
- 7.12 Other Technology
 - 7.12.1 **Inverter**
 - 7.12.2 **Battery Charger**
 - 7.12.3 **Electrical Motor/Generator**
 - 7.12.4 **Hydraulic Motors and Cylinders (50 total)**

Appendix A. Core Team

Appendix B. Development Team – Subject Matter Experts

Appendix C. Fabricators and Prototypers

Appendix D. Community Design – Enterprises

Appendix E. Reinventing Education – K-Ph.D. Experiential Education Program with Augmented Reality

Prioritization:

The suggested order of development until August 1, 2011 is as follows. (1) The Liberator (FPR); (2) LifeTrac; (3) Power Cube; (4) Soil Pulverizer; (5) CNC Torch Table; (6) Ironworker Machine (holepuncher and metal shear for flats and angle); (8-12) Multimachine (mill, drill, lathe, cold-cut metal saw, abrasive metal saw, and surface grinder combination machine), and (13), RepRap, and (14) CNC Circuit Mill.

Completion of these tools covers the basic RepLab tool set of RepRap, CNC Torch Table, CNC Circuit Mill, CNC Mill-Drill-Lathe, Cold Cut and Abrasive Metal Saws, and Surface Grinder – minus the Torch (either oxy-acetylene or oxy-hydrogen) and MIG Welder. These RepLab tools cover the basic fabrication infrastructure minus the Induction Furnace and Hot Metal Processing,

Milestones for this phase include: (1), FPR of the Tractor, Power Cube, Pulverizer by June 1, 2011; (2) FPR of the Torch Table, Ironworker, Multimachine, RepRap, and Circuit Mill by August 1, 2011; (3) completion of the 3000 sq ft modular CEB workshop facility by August 1, 2011; (4) \$80k/month earnings from production for bootstrapping completion of the GVCS. To this point, we have covered 14 of the GVCS technologies.

Phase 3: Plan for Aug. 1, 2011 – Dec. 1, 2011

With access to the production infrastructure, massive parallel development of the remaining mechanical technologies can now begin. This is relatively straightforward due to the modular nature (Power Cube is a snap-in module) of the life-size Lego Set devices, and can occur via simultaneous design-build-testing cycles for the following: (15), sawmill; (16) cement mixer; (17) universal auger; (16) OSCar; (17) microcombine (harvester/thresher); (18), haying mower, (19) string trimmer; (20) baler; (21) oil expeller; (22) well-drilling rig; (23) chipper/hammermill; (24) seeder; (25) backhoe; (26) trencher; (27) materials-moving auger; (28) rototiller; (29) pelletizer; (30), MicroTrac. The build of these should take about 2 weeks for each device per prototype, assuming access to Phase 2 RepLab tools.

Phase 4: Plan for Dec. 1, 2011 until End of 2012

In the year that is left, we can now handle the remaining projects. These are: (31) hydraulic motors; (32) electrical generator; (33) steam engine; (34), pellet gasifier; (35) heat exchanger; (36) solar turbine; (37) wind turbine. Then we complete the RepLab (38) induction furnace; (39) hot metal rolling; (39) continuous casting; (40) wire pulling; (41) moldless casting; (42) robotic arm for welding and moldless casting; (43) MIG welder; (44) plasma cutter; (45) laser.

Then we complete the power electronics package with (46) inverter; (47) charger and charge controller, as well as (48) nursery, (49) bakery, and (50) dairy for completing the food processing infrastructure.