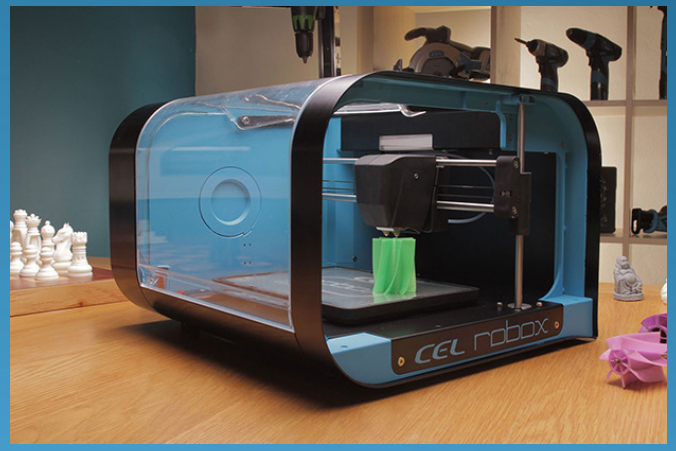
Can 3D Printing be used in Pohnpei to address development issues?



Blue Continent Eco-Trade Alliance, Brennan Purtzer, Research Coordinator

Overview

- Research background
- What is and why 3D Printing?
- Why Pohnpei?
- Varieties of 3D Printing
- Affected Industries
- Process
- Conclusions
- Areas of Focus
- Making it Happen
- Steps and Timeline
- Organizational Structure
- Investments
- Future Growth

Who am I, and what am I doing on Pohnpei?

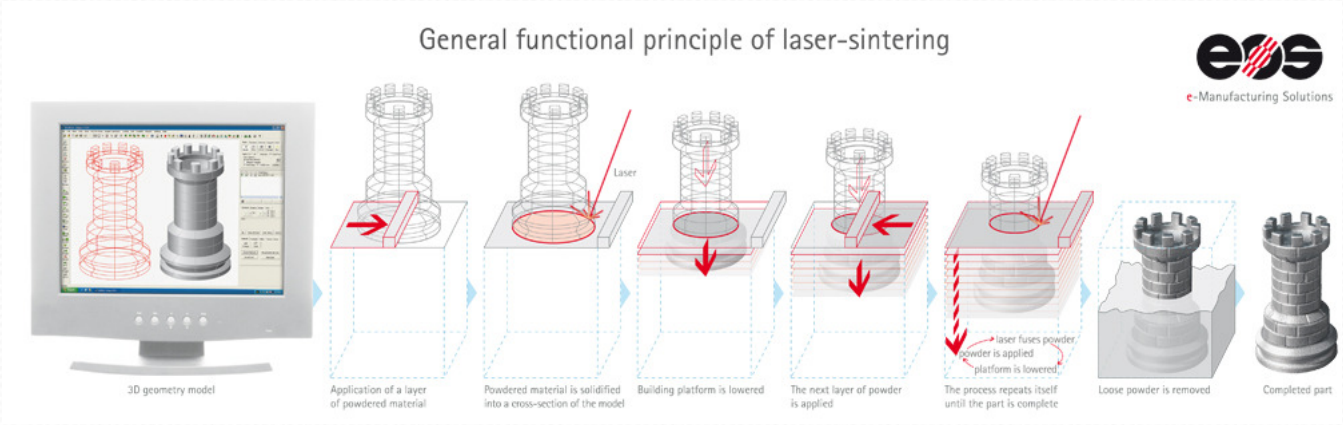
Brennan Purtzer is a graduate researcher who is writing his masters thesis about development management from the University of Agder in Southern Norway. American by birth, Brennan is a former award-winning newspaper publisher from the Hawaiian island of Molokai, who has previously lived in Sri Lanka, Mexico, Albania, Italy and Norway.

Brennan has managed businesses generating over $1 million annually, and served as a board member for the Chamber of Commerce in Washington State.

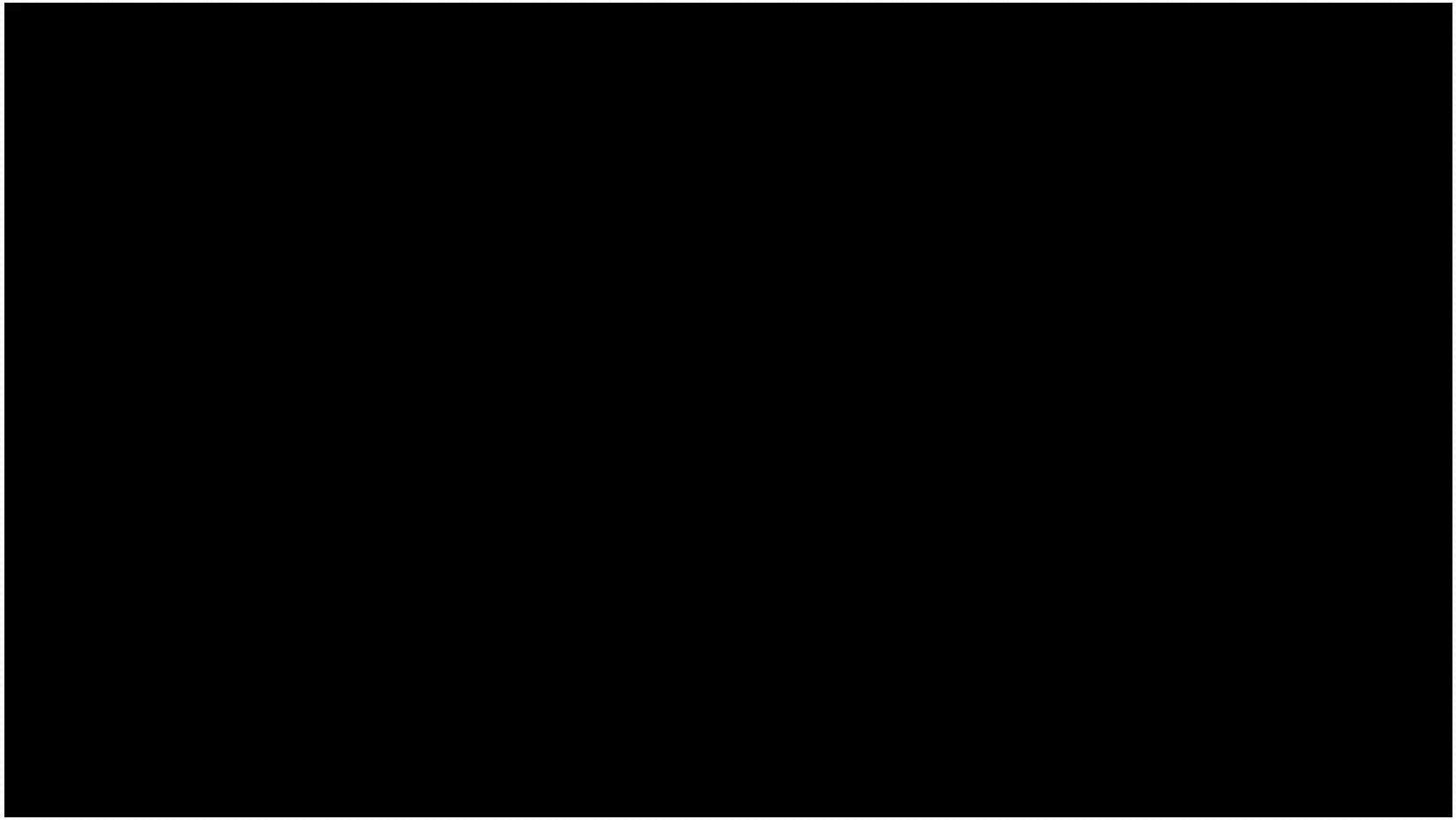
Brennan has had a lifelong obsession with Micronesia, and saw Pohnpei as potentially the perfect environment to apply new manufacturing technology called 3D printing, seeing the isolation of the ocean as a potential business advantage if optimized by islanders.

What is 3D printing?

A process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material – Oxford Dictionary, 2014



3D printing video



Why Pohnpei? Why FSM?

Population Size: 115,000

Land Area Size: 702km2 (607 islands)

Size of: Andorra

Size of: Singapore

Over a sea area of 2.6 million km2

Size of: Argentina

Economic Challenges facing Pohnp

- Supply chain: long, slow and expensive
- Lack of local mineral resources or manufacturing base
- Lack of economic opportunities, high wage jobs and weak buying power
- Lacking work force with technical capacity
- Import/export imbalance (81% of National GDP spent on imports)
- Infrastructure (old, decaying, insufficient)
- Relatively small population (lack of critical mass)

Why do 3D printing solutions work in FSM better than the U.S.?

USA	Vs.	FSM
Huge populations		Tiny populations
High demand		Low demand
Products are available nearby		Products frequently UN-available
Convenient, reliable and fast supply chain		Long, slow, inconsistent supply chain

3D Printed manufacturing turns everything you've taken for granted as a disadvantage to serving small islands on its head

How 3D Printing can help

- Shortening the supply chain:
  Through same/next day on-island product procurement, reducing inventory demands
- Manufacturing base:
  Offering limited, on-island production
- Higher wage jobs: Producing high-wage skilled employment opportunities
- Technical training: Stimulating technical training programs at the College of Micronesia and public schools
- Helping to balance imports and exports: Reducing the overall expense of imported goods through value-added on island
- Providing limited infrastructure to outer islands: Bringing simpler printing devices to smaller islands through expansion
- Environmental impact: Reduces total shipping volume, and is capable of using recycled plastic materials

The Old Way – Pohnpei Style

Last month, when Jose San Nicolas (VCS Construction) had an excavator break a bearing, it held up business at Pohnpei White Sand. He ordered the replacement part, and it took more than 4 weeks to arrive. This stoppage cost him $____ because _____.

The NEW way, using 3D printing

When Jose's excavator bearing breaks in 2016:

1) He will call Eco-Miracle Micronesia (EMM), and order a new part.
2) The EMM expert will arrive to claim the old part.
3) The expert will scan the old part
4) Then correct the imperfection in the broken piece
5) Then build the new part
6) And deliver it to Jose the next day, at a price that is less than the cost of shipping it over a one-month period
7) And Jose will resume the job his company was working – no more costly delays!

What has 3D Printing done elsewhere in the world?

3D printing in Development has already been used in:

China, India, Brazil, Sudan, South Africa and even Haiti

It has been used FOR:

Manufacturing medical equipment (umbilical clamps for hospitals, replacing amputated limbs)

Water pumps, piping and microscopes.

Water test measures.

Civilians have used it to build boats from recycled milk cartons, and functional toilets.

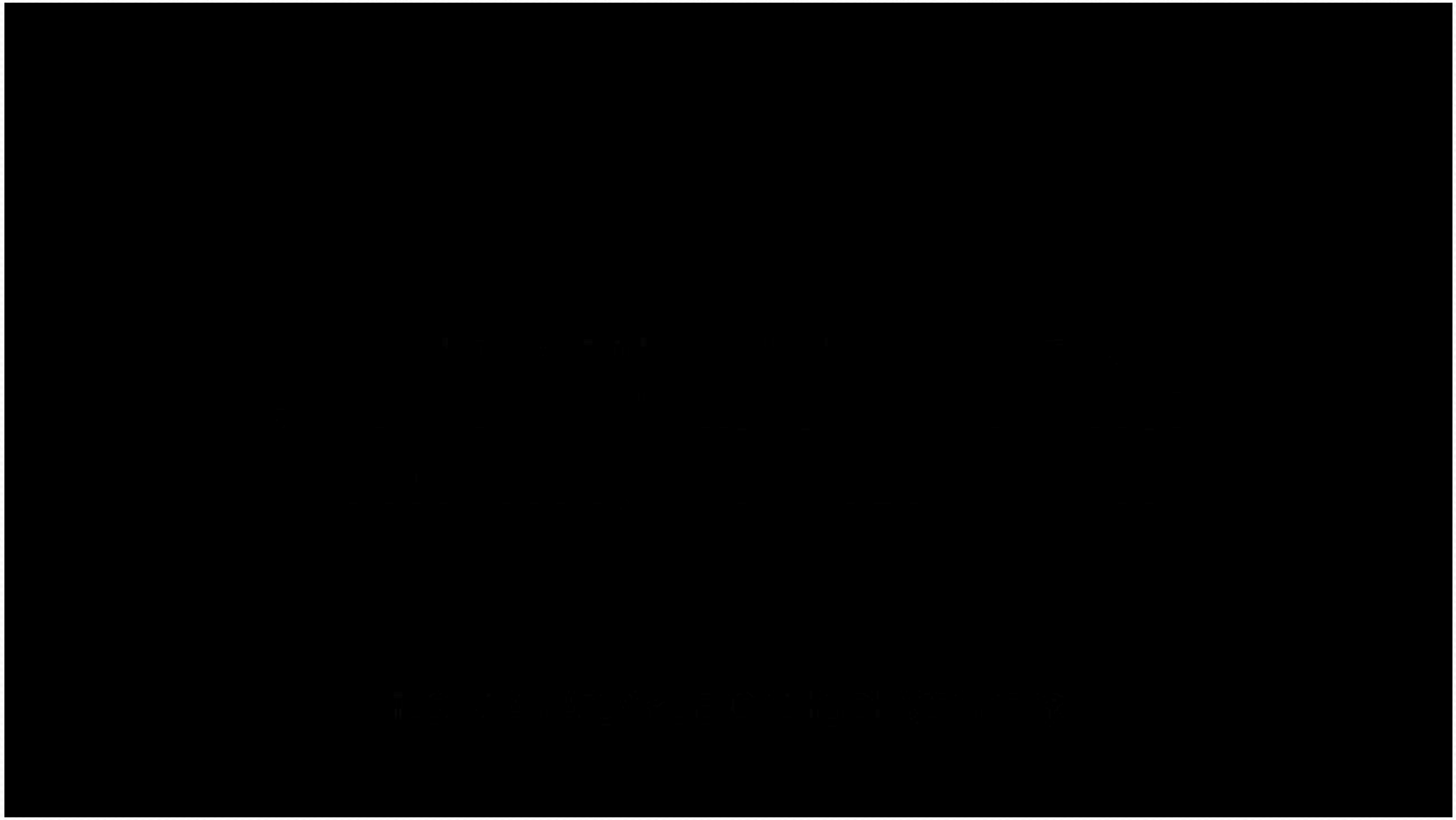
Building entire buildings

Rapid 3D printing development is only about 5 years old. The future is everything you can imagine – and more!

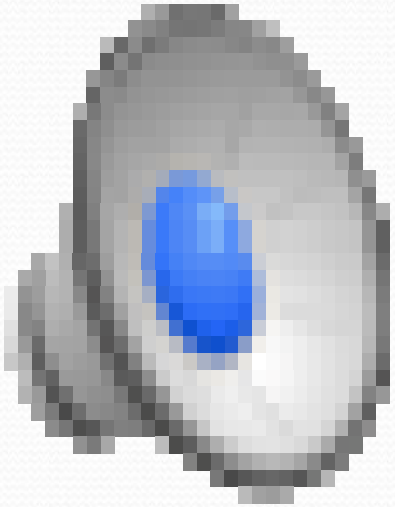
What types of 3D printing are currently available

- Plastics & Rubber-like materials
- Metal
- Electronic Assembly
- Ceramics, Porcelain, Glass, Clay
- Powders, Composites, Plasters
- Bio-printing, Organs
- Food

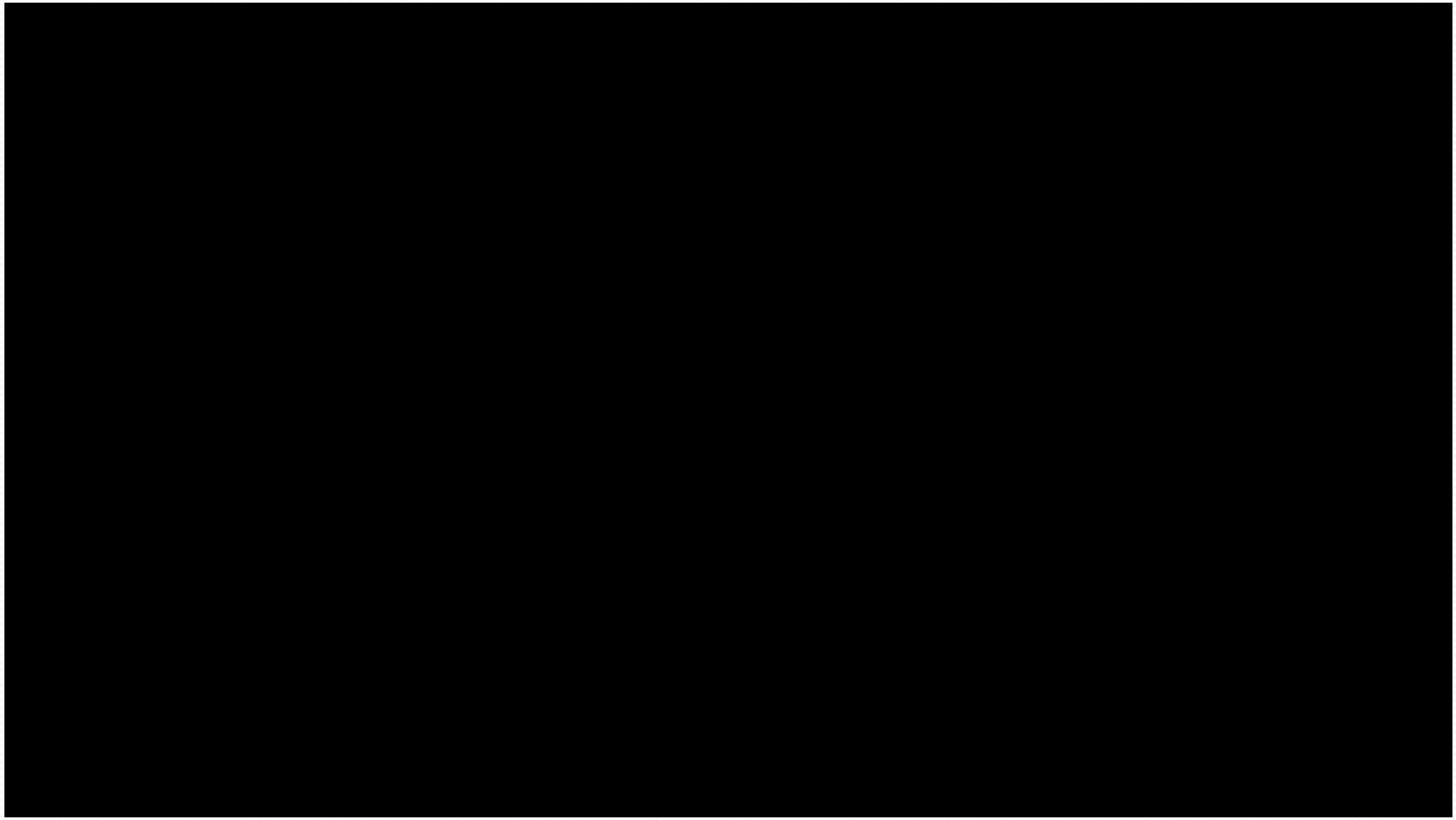
Demonstration 1: Rubberlike



Demonstration 2: Metal



Demonstration 3: Dental



Industries Affected by 3D Printing here in FSM

3D printing has been called "disruptive technology" because it will affect (positively) the way business has been done in the past.

Let's discuss 10 industries which will change as a result of 3D printing.

Information from a Tech Republic Article, Feb 2014

Transportation

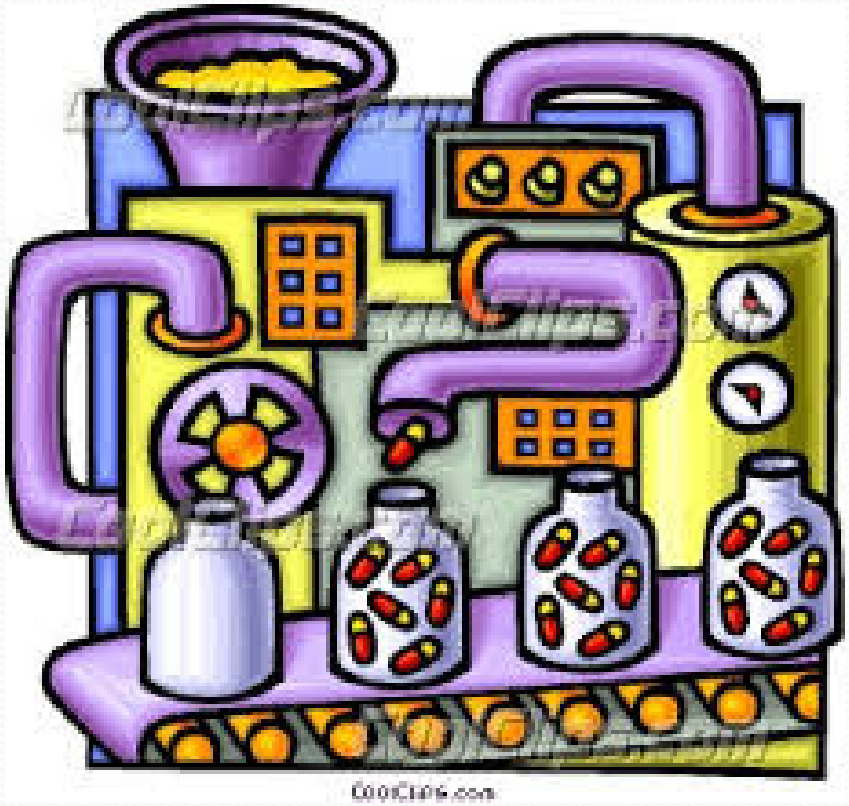
- Reducing the total volume of shipping, as only raw materials need to be imported

Waste/Recycling

The end result will be less waste products, and the beginning of plastics recycling on Pohnpei

Manufacturing

- For the first time, it will be possible to manufacture on the small scale demanded by Micronesian islands for domestic consumption



Education

Job opportunities within 3D printing and because of it, will require educational institutions to respond to development of the industry

Electronics

New printers on the market are capable of assembling complex electronic components

Automotive

It is now possible to replicate automotive replacement parts

Construction/Heavy Machinery

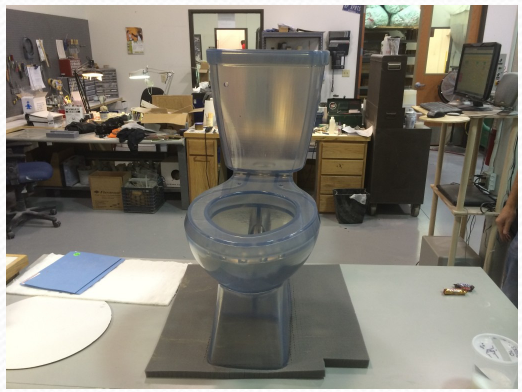
Mechanical components need to be replaced frequently, and breakdowns slow down projects and increase costs – being able to use replicated parts can be much cheaper and quicker for this industry

Dentistry

Utilizing digital scans and 3D printed models can make denture and bridgework much quicker, cleaner easier and cheaper

Government

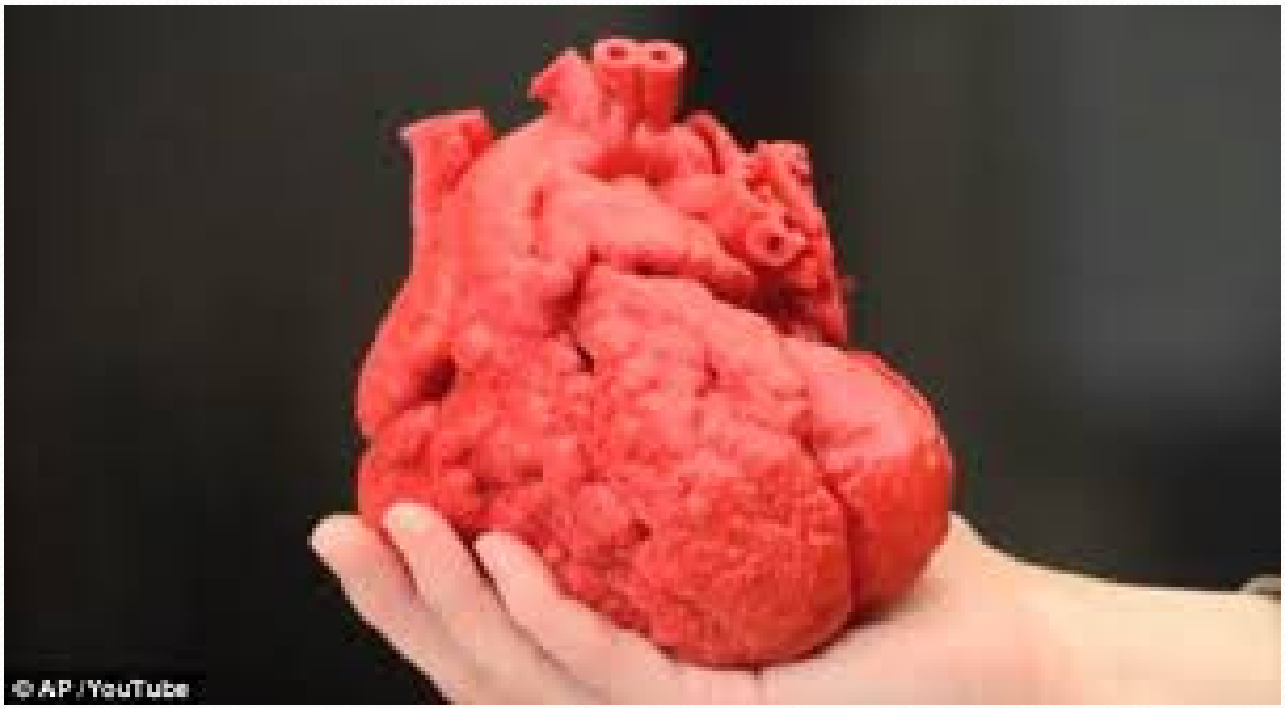
As an outreach to smaller islands, 3D printers may help the government to provide services, including medical services, previously out of reach



Health & Medicine

Replicated parts can extend the life of otherwise functional equipment, and possibly be used to replicate organs in FSM at some point in the future.

The heart is the easiest organ to print because it is made up of so few cells and only has one major function - to contract or beat



Process: How did I reach my conclusions?

1st Studied the development history of Pohnpei/FSM and its import/export imbalance

2nd Studied the available 3D Printing technologies

3rd Studied what Pohnpei is importing

4th Spoke with government leaders & business owners about their needs and struggles when doing business here

5th Identified business needs within the import data which could be addressed with the new technology

6th Priced out the costs of 3D Printing interventions against the current market procurement methods

7th Prepared and presented this data, seeking investment funding to bring this technology & community feedback

Which industries did we choose to address first?

Because the most advanced technologies are available and can be profitably applied to these fields, I choose:

- Heavy Machinery
- Automotive/Marine
- Dental/Orthodontic

A combined $3.5 mil imported to Pohnpei in 2014

Breaking down the interventions

Heavy Machinery/Construction

2014: **$2.968 million** was spent on imported “Machinery; Parts”
-FSM Customs Data

Potential customers:
PTA, PUC, VCS, ABCorp, Vital, FSM Telecom, APSCO, Pacific White Sand, Future World Construction

Breaking down the interventions II

Automotive/Marine, Plastics

2014: **$257,767 for auto parts**

+ a share of the "machinery; parts" category + unspecified marine machinery

Plastic Household

Waste bins, toilets, achievement trophies, etc.

-FSM Customs Data

Potential customers include High Speed Auto Parts, Pohnpei Mascot, NAPA, Ram Auto Parts, Ocean Care Company, Caroline Fisheries Corp, FSCO, National Fisheries Corp, ABCorp, Hardware Stores

Breaking Down the Interventions III

Dentistry

2014: $285,256 was spent importing dental cements, modeling pastes, artificial teeth and appliances

Potential Customers include: Pohnpei State Hospital Dentistry, Genesis Dental Clinic, Island Smile

Making it all happen

Bringing 3D Printing to affect multiple industries on Pohnpei requires several steps

1) Secure local investment
2) Purchase equipment
3) Assemble and test equipment
4) Ship machinery to Pohnpei
5) Hire/train local staff
6) Operate profitable enterprises
7) Invest profits in identifying new industries/technologies to expand services
8) Partner with CoM/DoE to expand technical education program
9) Expand services to other islands/states

Business Timeline

- March 2015: Secure investment commitments
- April 2015: Order required equipment
- May-August 2015: Assemble, test equipment, interview Pohnpei-based employee candidates and lead engineers who will train employees and establish business operations
- September 2015: Ship equipment to Pohnpei, hire Pohnpei-based employees to begin in October
- October 2015: US based contractors will assemble Equipment in Pohnpei, begin training new employees required skills
- November 2015: Begin serving clients on Pohnpei
- 2016: First investment dividends, hire additional workers, expansion to new industries, expansion to Chuuk, Yap and other islands, Development of educational training partnerships

Key Team Personnel
Ivaylo Guenkov & Matt Coughlin

Ivaylo is a young physicist, with certifications in lasers, optics and 3D modeling. At 20 years old, he has already personally engineered and designed the most advanced, functioning metal 3D printer in the world under $1 million.

Matt has been working professionally as an engineer for the past 9 years, including 6 years as a product development specialist with Solar Turbines. He holds Bachelor's degree in Manufacturing Engineering from Cal Poly, SLO

Proposed, initial organizational structure

Local Shareholders – 51%

Foreign Shareholder – 49%

Executive Director/General Manager
(Focused on marketing/client relationships and product delivery)

Metal replication specialist
(full time)

Plastics Development Specialist
(part-time, initially)

Dental program specialist
(part-time)

Required initial investment: $350,000

- Metal printing business

$150,000

- Plastics & Rubber business

$15,000

- Dentistry business

$50,000

- One-time setup costs

$135,000

(Item-by-item details available in investment packet)

Growth Industries: $3.6 Mil+ in current annual Pohnpei imports

- Assemble-able, plastic furniture, including coffee tables and chairs (to put furniture within the affordable grasp of most citizens): $430,000+ imported furniture in 2014
- Medical Equipment: $650,000+ imported in 2014
- Instruments & Apparatus: $1.2 million imported in 2014
- Ceramic & Glass products (made from sand/clay): $300,000+ imported in 2014
- Household items: $450,000+ imported in 2014
- Footwear: $450,000+ imported in 2014
- Fishing Rods: $190,000+ imported in 2014
- Utility poles
- Custom Jewelry
- Low cost housing

Growth in other FSM States

Annual imports of some of our core industry areas from:

Chuuk: $1.24 mil

$166,000+ Machinery parts

$139,000+ Automotive parts

$410,000+ in household imports

$97,000+ in dental pastes and appliances

$170,000+ in furniture imports

$200,000+ in footwear imports

$62,000+ in fishing poles

Yap: $534,000

$65,000+ in machinery parts

$77,000+ in Auto parts

$69,000+ in household imports

$157,000+ in furniture imports

$166,000+ in footwear imports

Eco-Miracle Micronesia Business Plan

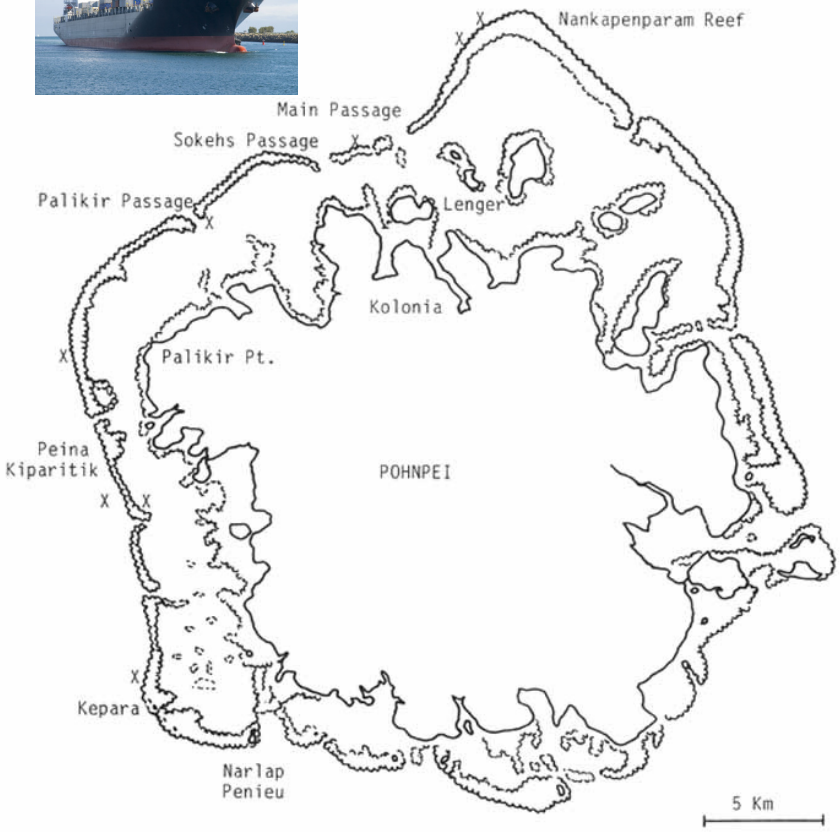
Available tonight, please grab a copy of the business plan while you are here.

Plan impact on overall imports

- $59.1 mil total in annual non-food Pohnpei Imports
- Primary industries are going after the biggest share of the $3.5 million, and in secondary industries another $3.6 million.

Altogether 3D Printing is targeting **12.1% ($7.1 mil)** of the $59.1 mil in annual non-food imports.

These savings STAY on the island, BOOSTING the local economy.



Research Questions

Economic

- What kinds of new economic opportunities will Micronesians look for from a package of broadband ICT and 3D printing?
- How will established industries, which stand to gain or lose from 3D printing (i.e. shipping, retail, etc.), engage in the ICT4D process?
- What impact might widespread use of 3D printing have on the national trade deficit? The GDP?

Government

- In what ways could the technology be implemented in public education?
- What physical infrastructure would be required to extend access to 3D printing to *all*
- citizens of The Federated States of Micronesia? To most?
- What administrative mechanisms will be needed to bring about public infrastructure
- service expansion?
- What other areas of government policy might change as a result of expanded access to
- 3D printing?
- In what ways could government administrators utilize this technology to fulfill public
- service commitments? Will future costs be more or less than current methods of
- service provision?

Lifestyle

- In what ways will 3D printing change lifestyles, without the delay and cost of traveling or shipping items from distant places?
- Will it affect positive or negative health outcomes?
- What effects will widespread adoption have on the native culture?

Research Objectives

- Build a broad coalition of stakeholders dedicated to taking action to improve citizen access to information, technology and opportunities.
- Determine if access to this new technology will change the life options and possibilities for people living on Pohnpei.
- Collectively develop the most appropriate implementation strategy based upon findings from participatory research and initiate development.
- Determine what *industrial* economic opportunities may be created through universal broadband expansion, via 3D printing.
- Determine specific economic opportunities which may be generated related to 3D printing specifically.
- Determine who the "winners" and "losers" may be when 3D printing is made broadly available in The Federated States of Micronesia.
- Determine what national goals might be achieved through new technology in the near, intermediate and longer terms, and if these relate to 3D printing.
- Determine what must be accomplished in order for universal (or nearly universal) access to be achieved.
- Evaluate what roles 3D printing might have in the daily lives of citizens of The Federated States of Micronesia.
- Determine the anticipated effects of 3D printing, via universal broadband access would have on government and services provided by government.

Presentation Summary

- Micronesia has unique challenges related to its small population, low earnings, and distance from major markets.
- New 3D printing technology presents the opening of a whole new world of development, commerce and opportunity – digitally eliminating many natural challenges
- Do the benefits of pursuing this intervention outweigh the risks of doing nothing?