Prototyping a Scalable Smart Village by Leveraging Open Innovation

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There has been a great deal of work performed in recent years that explores the design, development and deployment of Smart Cities. This work enables cities to become more livable, to offer new services to its residents, and make better use of city resources. Yet close to half of the world's population does not live in cities. It is an open question whether and how the learnings from Smart Cities might apply to more rural, remote areas.

The Garwood Center for Corporate Innovation at UC Berkeley has developed a process to prototype a Smart Village in collaboration with the Government of India in the State of Andhra Pradesh. Open innovation methods[1] were employed by engaging the villagers in the state, and connecting them with a wide range of external knowledge and resource providers. The process of co-innovation and associated research methods will be refined over the next several months. All stakeholders have committed to develop a scalable prototype that could be employed as a model for 650,000 Indian villages and beyond.

The use case will be published as a part of the UC Berkeley study led by Solomon Darwin and Henry Chesbrough. The publication will be a business case for academic and practitioner consumption to be completed by December 2016. Considerable work toward writing the case is being conducted by Berkeley-Haas Garwood Innovation Fellow, Manav Subodh, in the Mori village that was selected to prototype the smart village.

MISSION:

The focus of Smart Villages is to design a process for external resource providers like technology firms to co-innovate with villagers to build viable products and services to holistically address the pain points of the villagers' everyday life and to sustain the village over time as an ecosystem, a community, a brand, a platform and a business model.

PAIN POINTS FOR THE VILLAGERS

Based on our experience and our interviews with villagers in the pilot village, a number of important challenges or "pain points" affect the villagers' ability to increase their incomes and improve their standard of living. The pain points based on our research fall into four groups:

1. **Employment**

   Primary Farming: Rice, coconut, cashew processing, weaving, shrimp and pottery

   1. Decline of Legacy Industries: Handloom, Pottery and Goldsmiths
   2. Labour Shortage: Emigration of farm labour to middle east to support families
   3. Handloom: Weavers work for a meagre wages (Rs.100/saree)
   4. Government Work Programs: Adds to the labour shortage
   5. Lack of Information: Workforce has no awareness about alternative choices
   6. Lack of Tools & Resources: There is no enablement of people to prosper
   7. Demand for Higher Wages: Rs 450/day vs Rs 200/day
   8. Inventory Backlog: Handloom unsold inventory worth Rs 30-50 Lakhs.
   9. Impact of Machines: Destroyed handicraft, handloom, pottery & goldsmiths
   10. Coconut: Efficiencies in supply chain is required to improve margins.

2. **Agriculture and Livelihood**

   1. Water Grid: Distribution is arbitrary and untimely for farmers to plan
   2. Coconut Farms: Supply Chain Issues - sold at Rs 3/unit vs Rs 50 in cities - middlemen benefit much
   3. Rice Crop: Losses due to imbalances in: soil/irrigation/pesticide/fertilizer & weather forecast
   4. Shrimp Farming: High margin but risky due to diseases that could be prevented
   5. Soil Damage: Increase in man-made salinization from shrimp farming in restricted places meant for rice
   6. Corruption: Shrimp Farming near rice fields is banned -yet practiced
   7. Alternate High Margin Crops: Lentils, Peanuts & Sesame require more labour which is not available
   8. Cashew Processing: Processed in homes - decent margins but furnaces generate carbon emissions
   9. Cold Storage Facility: None available to preserve farm produce – waste is rampant
   10. Land ownership: 80% of the farmers lease land. Pay back is difficult due to poor margins.

3. **Health & Hygiene**

   1. Government Doctors: No adequately government doctors - only 2 in the area
   2. Licenced Health Workers: earn commissions from doctors on referrals resulting in unneeded surgeries
   3. Availability of Doctors: Good doctors not ready to work in the villages due to poor margins
   4. Water Quality: Tap water very hard and salty - drinking water is adequate
   5. Drainage: No system in the village.
   6. Veterinary Doctors: No Vet in the village resulting in sick cattle resulting in loss of revenue
   7. Bus Schedule-No proper schedule –businesses are affected
   8. Waiting Time: Huge time delays in banks, public offices and utility places
   9. Toilets: No toilets in all households, only 800 in the village

4. **Education**
    1. Government Schools: Only two in the area – private schools are expensive
    2. Teacher availability: Dearth of good quality teachers
    3. English Medium Schools: No government English medium school for classes 1-5.
    4. Distances covered by students: Travel-10-20 kms to get access for higher education
    5. Midday meal schemes: Ineffective implementation of mid-day meal schemes

Summary of the Pain Point Analysis

The primary pain points based on our research relate to the lack of access to:

1. Information that timely and transparent:
2. Communication Channels and Platforms within and outside the community.
3. Practical Education: Apprenticeship for self-development and to further their skills.
4. Tools and Technology the empower them to carry on their entrepreneurial activities.
5. Energy Resources that are dependable and affordable to power their homes, shops and schools.
6. Connectivity – wireless connectivity that will save them costs and time

OBJECTIVES:

- To empower villagers with access to: a) smart and lean technology, b) transparent information, c) easy to use digital tools, c) resources to develop entrepreneurial skills with direct access to global markets to improve their rural standard of living.
- To demonstrate the viability of solutions, small and relevant sample sizes will be utilized. Lean prototyping approaches will be implemented for rapid pivoting to develop: Minimum Viable Products, Services, Platforms, and Ecosystems.
- To enable villagers to become economically independent by providing them access to information and knowledge resources and technology tools.

EXPECTATION:

- To address the known pain points of villagers.
- To improve the happiness index of the villagers.
- To benefit both the villagers and sponsoring firms as the model scales to more villages.
- To discover challenges and barriers that must be overcome to meet the project's objectives.

Profile of the Village Selected

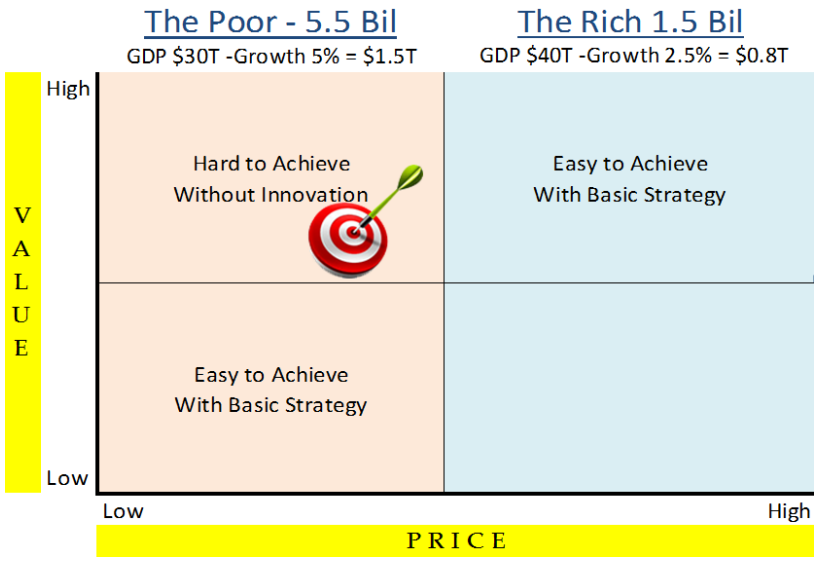
- The Village: Mori Village, East Godavari District, Andhra Pradesh
- Population: 8,000 (typical village size in India)
- Surrounding Villages: Over 40 adjacent villages will be exposed to the prototype for potential scaling.
- Co-Innovation Area: Project India Compound – 2 Acre enclosed gated property adjacent to the village
- Dates for Prototyping: Sep – Dec 2016 (Villagers will be invited back 3 times for pivoting)
- More facts and details of the village are in the attached appendix

What is a Smart Village?

1. **An Ecosystem:**
   - A village that leverages its resources as well as those of surrounding villages, distant places and entities to generate revenue and lower its costs and risk.
2. **A Platform:**
   - A village which is an Economic Development Platform that allows many external businesses to access its resources to profit from them.
3. **A Brand:**
   - The village creates an identity and be known for something of value that is unique – grassroots.
4. **A Community**
   - Self-organized network of people who collaborate by sharing ideas, information and resources to build a strong ecosystem - when all else fails the community remains to rebuild itself.
5. **A Business Model**
   - A village that creates value for its people and others outside its ecosystem by utilizes lean and cost effective state of the art technologies and capture some of that value for itself.
6. **A Sustainable Unit:**
   - The village that generates triple bottom line: a) people b) profit and c) planet

Why are villages the future engines of growth?

There are 650,000 villages in India where close to 70% of the people live; in China, there are over 1 million villages. GDP of emerging nations consisting of 5.5 billion poor represent a $1.5 trillion opportunity for business enterprises even if they grow at a nominal rate of 5% (see adjacent chart). Generating wealth from people at the bottom pyramid cannot be achieved without "Open Innovation" and "Open Business Models"[2]. For large firms to succeed, they will need to create value for the majority of the poor and go where the poor are located (in the villages). Empowering the villagers with technology will enable them to create value that could be incorporated into the business models for large firms.

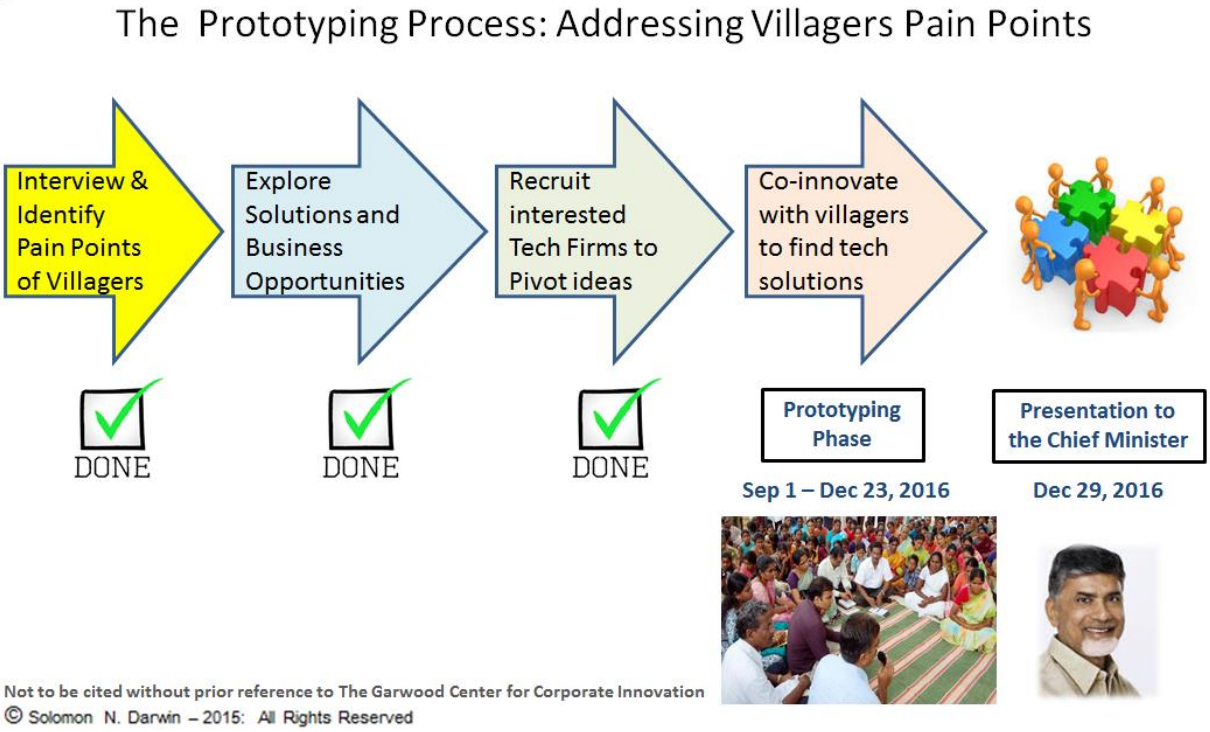


GDP Source: Compiled from IMF Reports

How does the Prototyping Process work?

The co-innovation process demands exchange of ideas and knowledge flows from villagers, the village ecosystem, local governments, academic research and partnering technology firms committed to utilizing open innovation in their own innovation processes. The process demands exchange of ideas and knowledge flows from villagers, the village ecosystem, local governments, academic research and partnering technology firms committed to open innovation.

Manav Subodh, Garwood Innovation Fellow at UC Berkeley- Haas School of Business, is the project director who will guide the co-innovation process in the village during the prototyping period.



How does Co-Innovation work?

The villagers will be invited to interact with proposed technologies, processes and solutions offered by sponsoring firms and research and educational institutions. Stations will be erected in the co-innovation area located in the village where technologies and solutions will be displayed for interaction with the villagers. The interactions and feedback from villagers will be documented for pivoting the solutions to improve the value to the villagers. Villagers will be invited back 3 times for pivoting

Display stations for villagers' interaction:

- Station 1: Information Center
- Station 2: Resource Center
- Station 3: Tele-Medicine Center
- Station 4: Education Center
- Station 5: Community Engagement Center
- Station 6: Virtual Classroom
- Stations 7 -21: Corporate Sponsors – List attached

How is the value created?

Providing Access

1. Energy/Resources
2. Communication
3. Information
4. Tools/Technology
5. Education: Apprenticeship for Employment & Entrepreneurship
6. Connectivity

Solution Offerings by Corporate Sponsors

DONE

Emergence of a Smart Village

1. A Business Model
2. A Platform
3. An Ecosystem
4. A Sustainable Unit
5. A Brand
6. A Community

Prototyping Phase Co-Creation with Villagers

Sep 1 – Dec 23, 2016

Value Created

1. Time Save
2. Cost Elimination/Save
3. New Sources of Revenue
4. Risk Reduction
5. Scalable Models
6. Improved Happiness Index

Results: Sustainable Outcomes Presentation to the Chief Minister

Dec 29, 2016

The Solution Providers to the Smart Village Prototype

I believe that scalability of smart villages is an untapped source for revenue growth for Global MNEs in the future and it will impact many more people than building a few more smart cities. Village models focus investment in people when compared to smart city models that often require huge investments in infrastructure.

Solomon Darwin,
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[1] Open innovation is defined "as a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (source: Henry Chesbrough and Marcel Bogers, "Explicating Open Innovation", in Chesbrough, Vanhaverbeke and West, New Frontiers in Open Innovation, Oxford University Press, 2014.
[1] "Open business models enable an organization to be more effective in creating as well as capturing value. They help create value by leveraging many more ideas because of their inclusion of a variety of external concepts. They also allow greater value capture by utilizing a firm's key asset, resource or position not only in that organization's own operations but also in other companies' businesses." (source: Henry Chesbrough, "Why Companies Should Have Open Business Models", Sloan Management Review, Winter, 2007).

Appendix Attached for More Detail

Participating Firms & Their Contribution

Name of the Company	Contribution
IBM	**Smart Rural Aggregation Weather Platform**- Installation of weather stations to make weather data freely available to villagers who depend on it for their livelihood
CISCO	**Virtual classrooms for villages**- Use of technology to virtually connect students of the village to reach out to tutors and teachers in the nearby cities
TYCO	**Safety and Security of Assets-** Real time location monitoring and tracking of assets of the village in terms of intrusion detection, monitoring, perimeter protection, etc.
SAHAJ	**Setup of Information Center** in collaboration with the E-seva center(Govt. of Andhra Pradesh) to provide seamless delivery of G2C, B2B and other banking and financial services
EVX	**Ecosystem of Self-Service SME Apps-** Enabling SME's and local college students to easily create custom mobile apps through which they can offer services, connect with buyers and make businesses prosper
POTENTIAL.COM	**Ecosystem of Self-Service Apps-** Entrepreneurship and Employability opportunities for preserving the traditional handloom industry in Mori. Besides this educational sessions and practical workshops to enhance villager's skills in different industries.
TECHMAHINDRA	**Micro Grid as a Service-** Sustainable, clean energy and reliable low cost alternative that can provide access to electricity to local villages.
APPSCAPE	**Smart Agriculture - Better** farm yield by monitoring and advising on the right Soil quality / composition. Monitoring water quality, flow and water-level for farmers and shrimp cultivators
GOOGLE	**Makani Power-** Making clean energy accessible to villages. Energy generation and distribution using energy kites which run using high speed winds at high altitudes- Data Collection Phase
ERICSSON	**Water Grid Management**
	Aquaponics- An new method of organic farming to be prototyped in Mori, thereby providing a new business opportunity to the farmers and entrepreneurs
MTUITY/PARADIGM	**System integrator**- Integration of sensor data from various service providers to remotely monitor, control and optimize all the modules of Smart Village infrastructure
	Polling App- A mobile application to enable villagers to give feedback and opinion eventually leading to good governance and collaborative participation
FACE BOOK	**Open Cellular Network** - connectivity anywhere everywhere all the time
TATA	**Eco-housing**- Highly successful low cost housing (TBD)
JANA BANK	**Largest Microfinance** Firm in India providing financial support to Women Entrepreneurs
1M 1B	**Improvised Health care-** Setup of tele-medicine center to run by the women SHG and village
KANEKA	**Grid Technology** (TBD)
NASA	**Challenging the Next Generation** - Competition & Materials
NEURO MINDERS	**Children Educational Programs**
QUALCOMM	**Connectivity & Mobile Educational Technology -** TBD
SABSE TECHNOLOGIES	**Mess Communication Network**
HELLA	**LED lighting**
STORE KING	**Retail E-Commerce made easy**
HEAD HELD HIGH	**Entrepreneur Training & Empowerment**
Daily Dump	**Home Waste Management systems**
INST. OF TRANSFORMING TECH	**Smart Toilets, Solar Grid & Tele-Healthcare**

Project Inauguration

Congressman (MLA) G. Surya Rao & JA Chowdary, Special Chief Secretary (IT) of the State

Endorsements & Support from the Top

President of India

Minister of Urban Development, Government of India

Prime Minister of India

Mr. Naidu, Chief Minister of Andhra

MoU Approval - Office of the Chief Minister:
Mr. JA Chowdary, Special Chief Secretary (IT)
Mr. Pradyumna, Jt. Secretary, Rural Development and Higher Education

Village President & Rural Development Officers work with the US Smart Village Team

Profile of Mori Village

Working & Living in the Village



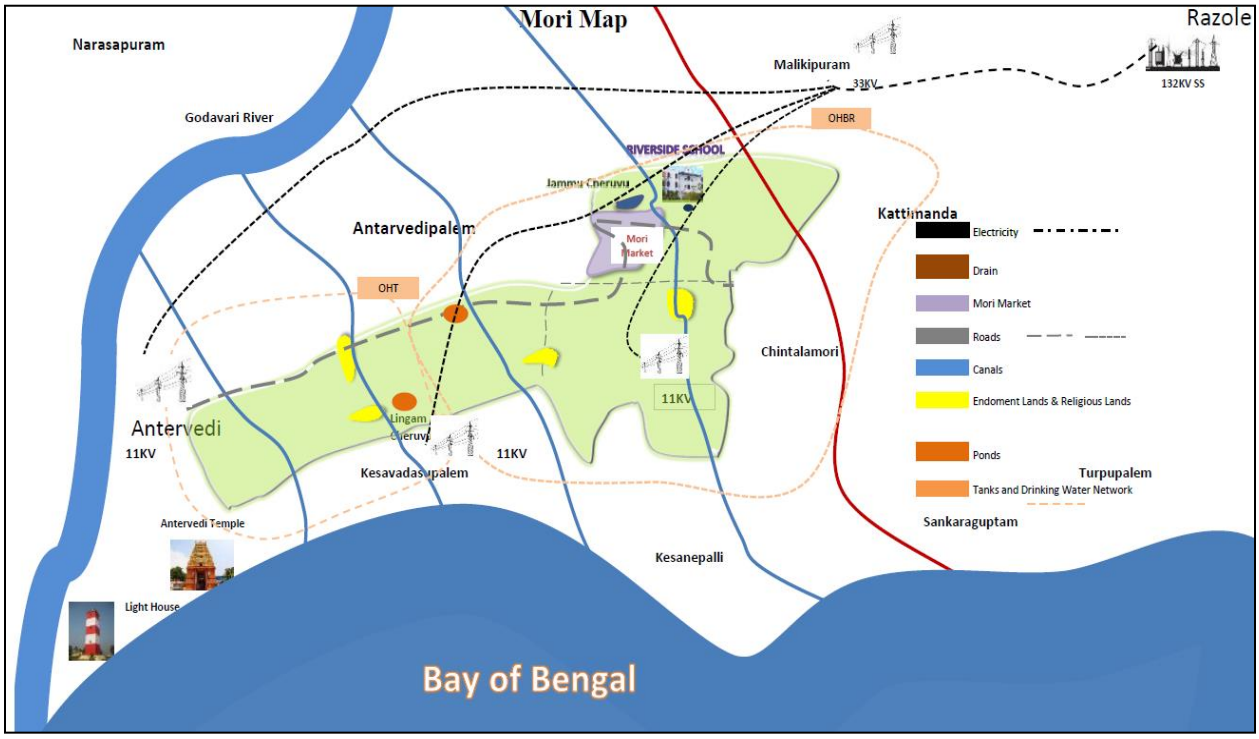



Working & Living in the Village

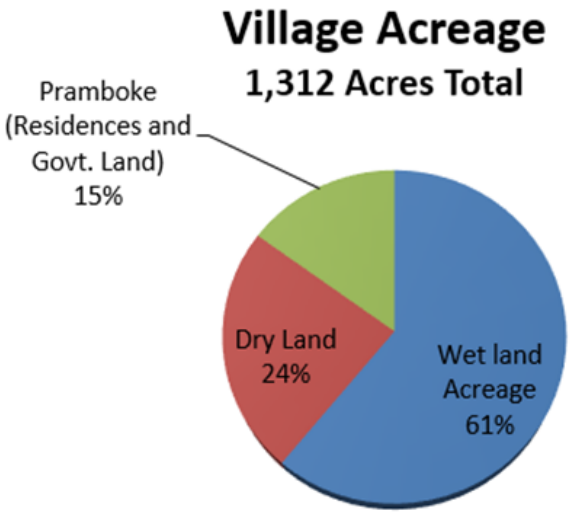


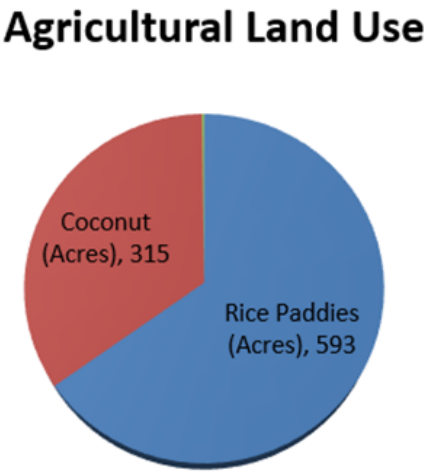

Mori Village, East Godavari District, AP

1. Land Mass: 1,316 Acres
2. Population: 8,000
3. Dwellings: 1,080
4. Major Industries: Rice, Coconut & Textiles
5. Small Industries: Cashew Processing



Profile of Mori Land





Key Housing Statistics

	Totals
Population	8,000
# of Families	1,565
Avg. Household Size	5.5
# Total of Dwellings	1,080
- Huts/ Thatched homes	350
- Brick Homes	250
- Concrete Homes	480
Village Acreage	1,316
New Homes Being Constructed	60
Poor Dwellers Sq. ft residence *	3.7

Economic Base

	Totals
Economic Base	1. Rice 2. Coconuts 3. Cashew Processing 4. Weavers 5. Shrimp 6. Mangos
# of Residents Working Abroad	500 residents
Government Grants: Road/Water/Drains	Rs 240,000
Number of Internet subscribers	250
Number of shops	85
Telecom service provides	Idea, Airtel(3G) and BSNL

Tax Base

	Totals
Tax Collected per Hut/ Thatched Home Rupees/year	100
Tax Collected per Brick Home/ Tiled roofs Rupees/year	200
Tax Collected for Concrete Homes Rupees/year	300
Additional Revenues in Rupees	200,000
Total Tax revenues – Rupees/year	**430,000**