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**Working Paper**

# Building a better rat trap: technological innovation, human capital and the Irula

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# Building a Better Rat Trap: Technological Innovation, Human Capital and the Irula

by

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# Building a Better Rat Trap: Technological Innovation, Human Capital and the Irula

June 2007

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## Abstract

This case follows Sethu Sethunarayanan, Director of the non-profit Center for the Development of Disadvantaged People (CDDP), which is dedicated to the improvement of the Irula tribe in rural villages of southeast India. The Irulas specialize in catching rats, an activity which provides the bulk of their income and food. Following a routine visit to a local village, Sethu recognized an opportunity for a "better rat trap" to aid the Irula rat catchers. With feedback from rat catchers, Sethu developed an innovative new trap. His innovation won the prestigious Global Development Marketplace award from the World Bank which provided the funding necessary to commercialize the new technology. The venture's implementation involved site visits to identify beneficiaries, health checks and treatment, preparatory workshops, factory establishment, factory training, production, women's micro-credit collectives, distribution and project evaluation. The case focuses on the relationship between human capital and technological entrepreneurship, considering the knowledge and skills required to commercialize technology for the rural poor and the positive impact on this greatly disadvantaged population.

JEL-classification: L26, O33, O, N35

Keywords: Human Capital, India, Innovation, Irula, Social Entrepreneurship, Technological Entrepreneurship, World Bank

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**Building a Better Rat Trap:Technological Innovation, Human Capital and the Irula**

Sethu Sethunarayanan, Director of the non-profit, non-government organization (NGO) Center for Development of Disadvantaged People (CDDP), beamed as World Bank President James Wolfensohn presented him with the prestigious Global Development Marketplace grant to develop innovative technologies to alleviate poverty. At the podium, Sethu provided a brief overview of his winning project,

> "There are three million poor Irula indigeneous tribal people of untouchable status in India who make their income by catching rats in agricultural fields. They use a clay pot filled with burning straw to smoke these rats out of their burrows. Their mouths and hands touch the pot, and they are severely affected by heart, skin, eye and respiratory problems. They are only successful 40% of the time and are in poverty and unable to send their children to schools. We developed a new hand-operated steel rat trap which eliminates the health hazards completely and enables the Irula to double their income. With this award, we can implement our project and make a complete socioeconomic change in the lives of millions."

As Sethu returned to his seat in the World Bank auditorium, he thought about how this journey began, on a morning walk through impoverished Irula villages in Tamil Nadu, India.

## Introduction

On a sticky morning in January 2003, Sethu walked briskly, anxious to check on the progress of a new drinking water pump well installed in a remote Thiruvallar district village. Sethu

wanted to make sure that the new pump was installed properly, so that the Irula people who live in the village would no longer have to bring water from several miles away.

Seeing Sethu, a tall, stout man wearing a long white mundu robe shuffling down the dusty road, the Irula villagers greeted him eagerly and escorted him to the well. Sethu was pleased to see that the pump worked perfectly, but exhausted from his two mile hike. He asked a lady villager for some water to drink. While she went inside her mud hut to retrieve a cup, Sethu glanced at a clay pot in front of the hut door and noticed a similar pot in front of most of the huts. Thinking he might be able to drink out of this pot, he picked it up, but noticed that, in addition to the top opening, there was a small hole at the base of the pot. He put the pot down and picked up a neighbor's pot which also had an extra hole. Sethu recalled the subsequent conversation,

> "I asked, 'How will you carry water in the holed pot?' She replied with a sarcastic smile, 'This is not for carrying water, but for killing rats… My husband carries this pot when he goes rat catching. He looks for a rat burrow and places the pot at its entrance. He stuffs wet straw into the hole and lights it, creating smoke. On this little hole at the bottom, he places his mouth and blows air through, pushing the smoke out the other side of the pot and into the rat's burrow. The smoke traps the rat. Then my husband digs into the earth and gets the trapped rat. He brings it home and I cook it for dinner. But sometimes he also comes home with burned lips and hands from handling the pot when the straw is burning… He doesn't always catch a rat.'"

See Exhibit 1 for an illustration of the clay pot rat catching technique.

* Insert Exhibit 1 about here *

Sethu handed the pot back to the woman, but he did not stop thinking about the inefficiency of this pot and the resulting health problems. As he walked back the dirt path, he contemplated this latest challenge to help the Irula. Sethu had twenty-five years of experience in developing innovative solutions to improve the quality of life for poor and disadvantaged rural people. From a young age, Sethu admired Mahatma Gandhi's efforts to alleviate poverty, liberate women, create economic self-sufficiency and end untouchability and caste discrimination in India. Sethu studied at India's only Gandhian university, focusing on Gandhi's methods for developing and unleashing human potential, resolving conflict and introducing new ideas. Upon completion of his studies, Sethu joined a NGO where he specialized in developing collective self-help, needs-based ventures. In 1998, then 38-year-old Sethu established his own NGO, the Center for Development of Disadvantaged People (CDDP).

Negotiating the byzantine maze of philanthropic management regulations in India is not easy (Sidel, 2001), however CDDP is one of only a handful of Indian NGOs to be recognized by both the United Nations and the World Bank. CDDP's mission is "To develop those who are disadvantaged educationally, economically, socially and culturally through self-help and self-governing collective development activities." Or as Sethu says, "In short, to help them to help themselves." The activities are undertaken on Gandhian lines of organizing constructive development actions through mobilization of human and local resources and often involve technological innovation and entrepreneurship. CDDP's target areas are 80 villages in the Thiruvallur and Kancheepuram districts of the Tamil Nadu state and five villages in the Andhra Pradesh state of India. The programs are aimed at helping women and children

belonging to socially and economically weak sectors, unorganized agriculture labor, small and marginal farmers, youth, destitutes, orphans, physically challenged and other socially and economically disadvantaged people. In 1998, CDDP received the best rural development organization award from the Indian government. CDDP has 23 employees and 56 volunteers, including Sethu's 26-year-old son, Karthick Sethunarayanan, who is an expert in the effective use of information technology for the rural poor. He holds a Bachelor's in Business Administration from Madras University and a Master's in Information and Communication from Bharathidasan University. Karthick also runs his own IT company which has an alliance with Microsoft and clients in India and abroad. When driving to the villages, Karthick uses a wireless card in his laptop to access the internet, providing a striking contrast to the road outside, populated by beggars, wandering cows and women selling giant baskets of produce. A dynamic and engaging spirit, Karthick is keenly aware of the role of technology in transforming the world and the great potential for the world's poor. He is also a talented classical Tamil singer and the villagers often ask him to sing for them.

## National, Local and Community Context

### India

A global survey revealed that India is the world's second most entrepreneurially active country with 17.9% of the adult population involved in some type of entrepreneurship (Reynolds et al. 2002), although this activity is largely confined to members of certain castes and ethnic groups (Dana 2006). Tamil Naduis one of the most industrialized states in India (mostly due to success of its capital, Chennai, India's fourth largest city and the world's 34$^{th}$ largest metropolitan area), however the rural areas which the Irula populate are extremely impoverished (TNG, 2002).

**Irula**

An estimated three million Irula people live in India, including 150,000 in Tamil Nadu and 250,000 in the bordering Andhra Pradesh state. The term "Irula", used for centuries, is thought to refer to either the dark complexions of the people, or to their spotting in forests as silhouettes. The Irula people are considered indigenous and DNA tests reveal their close ancestry to African populations (Watkins et al. 2005). Until recently, the Irula lived in forests and eked out an income by bartering or selling honey, wax and firewood to local villages in exchange for village products. They obtained food by hunting for vegetation and wild animals in the forests. The 1976 Forest Protection Bill made the Irula lifestyle illegal, forcing moves into villages of mud huts with straw roofs and dirt floors. Most Irula people do not have the official right to occupy their lands, and the villages do not have electricity or roads. Sethu described the situation,

> "Irula are tribals and considered to be untouchables and unequal in society. For example, they are not allowed to use the wells of upper castes. They live in interior locations from which it is hard to reach towns and cities, and they do not interact with the community outside."

The Irula have a life expectancy of approximately 45 years. Only 95% of Irula children under 15 attend school and as a community they are 99% illiterate. Today Irulas in Thirinvallur and other districts make their income by performing physical labor for land owners. For example men, widows and destitute women catch rats in agricultural fields. The farmers pay per rat and the rat catcher's average income varies from $15-30 per month. The rat may be the Irula's only source of meat and grains, usually consumed as one meal per day. In the past, some Irula people have starved.

**Building a Better Rat Trap**

Back in the office, Sethu decided that there might be an opportunity to develop a better rat trap. With the help of a local mechanical engineer, he set about looking for a solution. Together they fashioned a steel cylinder and hand-crank to generate air for pushing smoke into the burrow and a door on the cylinder for straw and a wooden handle to eliminate direct contact with the hot areas of the trap. Sethu provided sample traps to fifteen Irula rat catchers whom he met with regularly to get feedback. After six iterations over an eight month period, Sethu was satisfied that the trap met the villagers' rat catching and safety needs. See Exhibit 2 for an illustration of the new trap.

* Insert Exhibit 2 about here *

The rat catchers brought Sethu to the fields. He remembers watching the men,

> "I asked the catcher, 'How do you find the rat'? He said 'The rat keeps his house like my wife does— very tidy, including the area outside the door. So I know when I come across a burrow hole with a clean entrance, there is a rat inside.'"

Sethu observed as the rat catchers filled the steel trap with straw. The men located a hole on the bank between two fields, and two other holes about five feet away which they covered with dirt to prevent the rat's escape and to cause its suffocation. The lead rat catcher dug a larger entrance to the first hole, and put the trap's pipe inside. The other two men guarded the covered holes and watched as the lead rat catcher opened the trap's door, lit the straw and cranked the handle. The trap chortled as smoke filtered down the hole, emerging from another hole in the earth which was then quickly covered. It became clear that if there was a rat inside

the hole, it had been deprived of oxygen. The lead rat catcher then removed the trap and began to dig on the side of the hole, following the winding burrow. He reached down the hole and pulled out a dazed rat, stunned by smoke. The rat was then humanely killed with a blow to its head. Sethu and the rat catchers were excited— the trap was a success!

Sethu realized that he had identified a suitable technology for this opportunity and decided to seek funding for its commercialization. From past experience, Sethu knew that he would need to convince outside organizations of the merits of such an investment. He outlined the problems with the traditional pot method and the advantages of the steel trap and the project objectives. See Exhibits 3 and 4.

* Insert Exhibit 3 and 4 about here *

Sethu applied for a grant from the annual World Bank Global Development Marketplace. Since 1988, the World Bank has distributed over $40 million to 1,100 projects in more than 60 countries. Sethu presented the rat trap project at the marketplace in December 2003 and received a grant for $98,500, enabling him to implement the project.

## Implementation

The rat trap project was undertaken from January to December 2004 and incorporated the following key components: site visits to identify beneficiaries, health checks and treatment, preparatory workshops, factory establishment, factory training, production, establishment of women's micro-credit collectives, distribution and project evaluation.

**Site Visits to Identify Beneficiaries**

Sethu and CDDP volunteers began by visiting 170 Irula villages in order to identify the most needy individuals. The visits were conducted simultaneously in order to reach the target deadline, but the visits were not without their problems. As Sethu explained,

> "We needed to take extra time to explain the project to the villagers. The Irula are especially sensitive to political matters, and at first they thought the CDDP volunteers were politicians... We encountered this problem in every new village."

The selection criteria were health and socioeconomic need, with priority given to those suffering health problems from the old pot fumigation method and whose entire income is based on rat catching. Destitute, deserted and widowed women were also a priority and comprised 15% of beneficiaries. The selectors included members of the local government and community and farmer groups. A total of 1500 beneficiaries were identified. One volunteer reported,

> "The enthusiasm and interest among the beneficiaries is more than we had expected. They feel this device is going to be a turning point in their impoverished life conditions. The response was really exemplary so we added 278 more beneficiaries in our reserves in case the others dropped out."

**Health Check and Treatment**

A basic health check was completed for 1500 beneficiaries. In some cases, special tests for tuberculosis and diabetes, as well as ECG, X-ray and optometry exams were conducted. Treatment was begun for all affected villagers.

**Preparation Workshops**

Individual and collective meetings were held in the villages. From his experience working on the water pump and other projects, Sethu knew that he would need to work closely with the Irula to elicit interest in the new technology. Sethu explained,

> "In the past, the Irulas have been given things by other NGOs and the government, but these things have basically been useless. So they do not like to get things for free. The only things they consider useful are those that they work for. Irula want to be involved and to express their needs… We asked about their health. We tried to find out if the pot fumigation method was causing problems and to get them to see the link between the old method and their health troubles. We ask them if they would like to solve these problems. We talk about how important it is to be healthy and how the new technology can help them. Sometimes it takes weeks to reach a level of understanding and commitment."

**Factory Establishment**

A factory was established in a 60 square foot building adjacent to CDDP's field office in the Nedumbaran village. Based on 50 workers, 8 hours a day, the factory has a monthly capacity of 400 traps, but can easily be expanded. Sethu calculated that each trap would cost $30 to produce, including $25 for raw materials and $5 for labor. Karthick negotiated wholesale prices from Tata Steel, lowering costs by $3, a savings which was reinvested in the factory. In the event of a drop in demand for traps, the factory is equipped to make other steel items to be sold to farmers, including knives, sickles, ploughs, grill gates, chairs and benches.

**Factory Training**

Sethu faced an important decision regarding the manufacturing of the traps: which Irula should run the factory? Rat catching is predominantly undertaken by men, sometimes accompanied by their sons, while wives and older women have a historical role cooking and caring for family members. Selecting men, boys or wives for factory work would upset traditional tribal roles and create friction in the community. Sethu opted to create new opportunities for young, unmarried women who were unemployed. Fifty young women were invited to work in the factory. The women organized themselves into the "Tribal Women Technotrapper Producers Society" and registered as a small industries cooperative. They appointed officers and took responsibility for the factory's daily operations. CDDP transferred whole ownership of the factory to the workers so that the women could control the profits. CDDP hired two technical people to provide three months of training in manufacturing, marketing and finance. The young Irula women, who did not have any business or manufacturing training, took great delight in their new roles. They were paid $35-70 a month, very high for village standards and were able to provide for their siblings and parents. Sethu shared in a progress report,

> "To our surprise, the tribal women who were illiterates and totally new to industrial type of work grasped the industrial techniques very quickly... It is a source of great pride among all the villagers that the devices are made by their own women. The villagers can go to the factory anytime to watch them make traps."

**Production**

To make the trap, the girls first trace rectangular shapes on the sheet metal. A compass and chalk were then used to mark a 15 inch diameter circle. Next, a team of girls pull a heavy handle to cut the metal and drilled holes for smoke ventilation. The rectangle piece of steel is

rolled through a machine to make it cylindrical. From here, two girls work together to weld the cylindrical rectangle to the circle. Finally, the door and hand crank are added. See Exhibit 5 for an illustration.

* Insert Exhibit 5 about here *

**Women's Micro-Credit Collectives**

In parallel, CDDP launched a number of women micro-credit funds, each comprised of 12-15 women. The fund enabled the women to obtain small loans for urgent household needs or to begin self-employment activities, reducing dependence on exploiting moneylenders. Each micro-credit group had a revolving fund collected from their monthly saving and also from the interest accrued from the loan. Each woman's initial contribution was $1-2. Fund availability ranged from $200-500 depending on each group's prerogative. The micro-credit groups were often used to purchase the new trap. Once a woman raised 50% of the payment for the trap, she received the trap and paid the remaining half in loan installments according to a timeline agreed by the group.

**Distribution**

The trap was distributed in special village ceremonies. As most Irulas are illiterate, Sethu began by reading a ten commitment pledge. This pledge included a promise that their families will use the rat trap or else return it to CDDP for distribution to other families. One by one, villagers' names were read and they came forward, signing the pledge with a thumbprint and receiving the new rat trap.

**Project Evaluation**

An evaluation committee, composed of local World Bank employees, government officials and development experts, met with beneficiaries, staff and concerned communities to ascertain the impact of the project. The committee learned that many families are now able to send their children to school. Based on the evaluations, the World Bank considers CDDP's rat trap venture to be a success and used the Knowledge Exchange to share lessons learned with other projects and to suggest appropriate policy responses. In the final progress report to the World Bank, Sethu shared,

> "We estimated that the income of the tribal rat catchers would be doubled. To our surprise, income is more than tripled. There is great enthusiasm among the families. Another important unexpected positive development is that the rat catchers could use the trap for catching rabbits, foxes and other small animals which live in burrows. This fetches very high income for them."

The total project spend is provided in Exhibit 6.

* Insert Exhibit 6 about here *

## Conclusion

Driving back from an Irula village visit with the case author, Sethu and Karthick discussed the future challenges for the rat trap project and their development work. Quoting Gandhi, Sethu said, "I do not wish to study history, I wish to make it." Sethu and Karthick identified the following major challenges: factory expansion, NGO alliances, micro-credit developments,

providing support for special projects, continuing to develop technology-based solutions, fundraising and spreading Gandhi's message.

With over 100 million small farmers in the Tamil Nadu and Andhra Pradesh states seeking the Irula rat catchers' help, the trap is in great demand. CDDP has taken orders for over 2,000 devices. Sethu considered the factory expansion options,

> "We could expand the factory to more than 50 employees, but then it would need to be registered under the Big Industries Act and we would incur enormous taxes and other bureaucratic problems. Instead, we could create a number of small factories across the villages. Each could cater to the needs of people in those locations. We would also reduce transportation costs and the local people would be employed… If the demand for traps ever falls, these small factories can produce steel products for farmers instead… We also need to figure out a way to lower our overall costs to make the traps so we can have more profit."

CDDP has received requests for assistance and alliances from over a dozen NGOs, based locally and as far afield as Sri Lanka. Sethu contemplated the best way forward,

> "This technology is the best available to control rats and the project will boost agricultural community living anywhere. But we want to make sure that we identify and train good partners. It is not easy to organize."

A third challenge is to determine the best loan structure that will enable the Irula to buy new traps and repay their loans. Relatedly, Sethu is eager to explore other possibilities with the micro-credit.

Fourth, CDDP would like to continue to devote resources towards special projects such as the release of children who are bonded laborers in other villages. CDDP has already helped some children attain their freedom. These children now attend special programs and holiday camps, including competitions in literature, dance, drama and sports. Some special projects are not planned in advance. For example, when the December 2004 tsunami devastated oceanfront villages in Tamil Nadu, Sethu immediately organized CDDP assistance in the form of food, shelter, grief counseling and self-help collectives.

Sethu and his team continue to use technology to create innovative solutions for the poor, including a smokeless oven and a natural water purification system that uses materials, such as indigenous plants, which are easily found in impoverished areas.

Karthick noted the need to attract fundraising to expand the projects, "What we have achieved is very little and the demand on us is so heavy that we have to continuously seek patronage from various quarters." CDDP has received other international funding, including the 2004 $50,000 San Jose Tech Museum Innovation Award and a $10,000 grant from the Rachel Golden Foundation.

This case concludes with comments from the villagers whom the author interviewed, using a Tamil translator, during her site visit 18 months after the completion of the World Bank initiative:

- "As a man living with severe respiratory problems due to mouth-blowing for rat catching, I found the new device to a God-sent property. I wish this device to be given to more people of our community."

- "My husband brings more rats home which I skin and cook. It tastes very good. The grains that the rat kept in its hole also taste very good. Because the rat has chewed on them a little, they have a special taste which is better than ordinary grains. Would you like to come to my house for dinner with me and my family?"
- "My son and daughter now go to school in the evening. When they come home, sometimes we learn something from them."

**Exhibits**

**Exhibit 1: Traditional Rat Trap: Pot Fumigation**

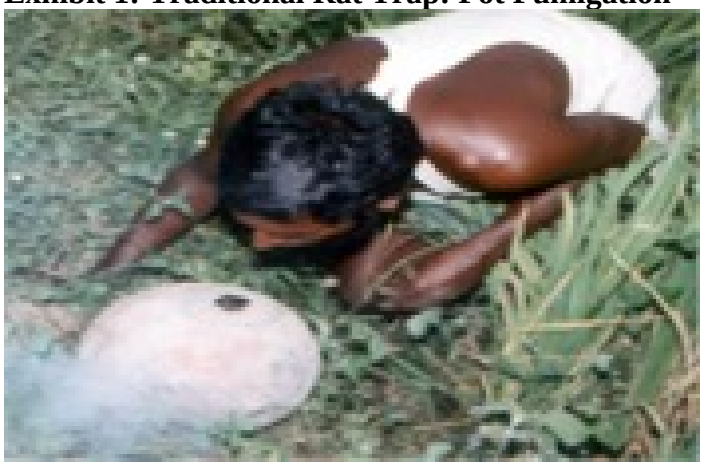

**Exhibit 2: A Better Rat Trap**

**Exhibit 3: Disadvantages of Traditional Fumigation Method and Advantages of New Trap Technology**

***Disadvantages of Traditional Fumigation Method***

Occupational Health: When mouth blowing, the rat catcher inhales heavy amounts of smoke, leading to severe respiratory, heart, eye and other health problems. Forty percent have one or more health complications, particularly burns to lips, hands and fingers.

Poor Efficiency and Limited Income: The method is only effective in 40 of 100 attempts due to the limited air pressure and lack of constant or even distribution of smoke. Thus, the rat is more liable to escape. Irulas are paid per rat and income ranges from $15 to $30 a month, less than the $35/month required to meet their family's minimum requirements for food, shelter, medicine and education.

Mud pot breaks: In the course of their work, the Irula carry the pot over long distances. The pot breaks about once every two months and a new pot costs 50¢.

Drudgery of work: The rat catcher's lack of success makes work a drudgery, leading to disinterest in the work, which in turn leaves him impoverished.

Rat menace in agriculture fields: Fewer kills lead to a greater rat menace. Rats destroy about 25% of grains in agricultural fields. This is economically devastating in a country where 85% of the population are involved in agriculture. One estimate indicates that if the rat menace were alleviated, India would be able to feed its entire population thrice a day.

***Advantages of New Trap Technology***

Complete elimination of Occupational health hazards: The hand-operated, wooden-handled trap eliminates burns to the lips and hands. No problems with smoke inhalation.

Doubled work efficiency: Rat catchers achieve 95% success. The rat is instantly stunned and unable to escape. The trap is easier to operate, enabling participation by older men and widowed/destitute women who did not have the stamina for mouth blowing.

Doubled Income: The success rate improvement more than doubles rat catcher income to $60, enabling the Irula to send their children to school and attend to health care needs.

No breakage: The steel trap is impossible to break.

Release from work drudgery: The rat catcher is able to undertake his work with ease, comfort and efficacy. The Irulas take pride in working with a machine, rather than a dirty pot. They are willing to work and earn more.

Social and educational change: The additional income enables the Irula to send their children regularly to school. Members of higher castes in neighboring communities may develop respect due to the decent professional type of device.

Reduction of rat menace: The rat menace is reduced although it is impossible to eliminate entirely as each female rat produces up to 1,000 offspring in her lifetime.

Affordable cost: The new trap costs just $25 and is affordable for the rat catcher.

**Exhibit 4: Project Objectives**

1. To remove the occupational health hazards of Tribals undertaking rodent control activity through pot fumigation method by introducing new trap technology.
2. To improve the income levels of the poor tribal rat catchers through the use of the new trap technology.
3. To undertake a comprehensive occupational health-check up and follow-up treatment for the severely affected beneficiaries.

4. To organize a collective income generation self-employment micro-enterprise venture for the poor tribal women and youth in the making of the new device and also to produce other types of agriculture tools and instruments.
5. To conduct non-formal life education activity for the beneficiaries in order to increase their education and awareness levels.
6. To promote Self Help Groups and micro-credit activities among the beneficiaries.
7. To disseminate the information and technology of the project to other interested individuals and organizations.
8. To help farmers reduce the rat menace in their agriculture fields, through tribal rat catchers using upgraded technology.

*Source: CDDP*

**Exhibit 5: Trap Manufacturing in the Factory**

**Exhibit 6: Project Expenses for January – December 2004 (in US$)**

| | |
|---|---|
| Materials and Equipment: machinery and raw materials to make 1500 traps | $67,197 |
| Training: making traps and other steel items to be sold to farmers | $9,435 |
| Health and Self-Help Groups: identification and treatment of health problems, formation of micro-credit groups, societies and workshops | $7,529 |
| Personnel | $7,053 |
| General Administration | $2,930 |
| Travel | $2,300 |
| Information Dissemination | $2,056 |
| Total Expenses | $98,500 |

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## Note to Instructors: Building a Better Rat Trap

This case examines technological entrepreneurship and human capital in a remote village in southeast India. Sethu Sethunarayanan, Director of the non-government-organization (NGO) Center for the Development of Disadvantaged People (CDDP), uses technology to improve the lives of impoverished people, focusing in particularly on the indigenous Irula tribe. The Irulas' rat catching activities constitute a primary source of income and food, however the Irulas are often unsuccessful in catching rats and suffer many health problems from mouth-blowing a clay pot filled with smoke. Sethu developed a "better rat trap," improving success rates and income and eliminating health hazards. In parallel, CDDP established a factory and self-help,

micro-credit collectives to enable other villagers to improve their socioeconomic condition. The case chronicles the project's development, including opportunity recognition, and new technology development and implementation. An overview of the skills and experience of Sethu and the CDDP team, and the national, local and community context is also provided.

## Key Issues and Discussion Points

The case raises a number of issues, including the use of technological entrepreneurship, human capital, micro-credit and sustainable development.

### Technological Entrepreneurship

To date, most research and cases on technological entrepreneurship focus on extremely high technology ventures in developed countries, for example, the biotechnology and software sectors in the United States. An estimated one-third of the world's population lives below the poverty line (less than $2 a day). Poverty and other societal problems are market failures which create opportunities for entrepreneurs (Coase 1974; Dean and McMullen 2006).

Schumacher (1973) and others use the term "appropriate technology" to describe technology that is suitable to the environment and culture it is intended to support, and is not excessively mechanized, triggering human displacement, resource depletion or increased pollution.

Key discussion questions include:

- What makes Sethu's new trap an appropriate technology?

- What are some examples of societal problems and market failures that present an opportunity for entrepreneurs?
- What technologies and entrepreneurial efforts could help the disadvantaged in your community?

**Human Capital: A 'Noble' Nobel Contribution**

University of Chicago Professor Gary Becker received the 1992 Nobel Prize of Economics for his contributions to human capital. In contrast to earlier thinking of men as machines and labor power as given, Becker's research revealed that labor power is augmentable and investments in human capital provide increasing returns. He also distinguished two types of human capital: general (applicable in a range of situations and across organizations) and specific (e.g. to a firm, organization). Becker assumed that individuals can decide to invest in education, training, medical care and other additions to knowledge and health, and that this human capital is cumulative and can impact productivity in both market and nonmarket sectors. Becker also examined the relationship between human capital and inequality, using "discrimination coefficients" to describe the prejudice and hostility to members of particular groups. The amount of distribution against such a group depends on the combined discrimination by employers, workers, governments and schools. The perception of the minority members as less productive can be self-fulfilling with minorities under-investing in education, training and work skills, and thus less productive.

A discussion can be facilitated about the human capital required to implement the rat trap projects, the investments in human capital and the resulting contributions to human capital and economic development. Key discussion questions include:

- What characteristics of Sethu, CDDP and the Irula villagers enabled their success?
- What skills did the Irula villagers develop from their training in health awareness, manufacturing and business?
- What might be the implications of this training on other aspects of the Irulas' lives?

**Another Nobel Idea: Micro Credit**

Dr. Muhammad Yunus and the micro-credit Grameen Bank he founded were the recipients of the 2006 Nobel Peace Prize. The Grameen Bank has issued more than US$5.1 billion to 5.3 million borrowers in developing countries, of whom 97% are women. To ensure repayment, the bank uses a system of micro-credit groups who apply together for loans and act as co-guarantors of repayment, supporting one another's efforts at economic self-advancement. The Norwegian Nobel committee's announcement read, "Lasting peace cannot be achieved unless large population groups find ways in which to break out of poverty. Micro-credit is one such means. Development from below also serves to advance democracy and human rights."

Students could read more about the Grameen Bank and micro-credit, reflecting on the following:

- Why was micro-credit so effective for the Irula village women?
- What other needs could micro-credit collectives fulfill?
- How could micro-credit activities be expanded to other parts of the economy?

**Sustainable Development**

There are three major successive approaches to sustainable development in indigenous communities: (1) modernization or assimilation, (2) dependency and (3) contingency (Anderson et al. 2004). Modernization theory implies that in order to develop, traditional societies must become more modernized. Quality of life is measured by monetary income and economic growth. The model also assumes that individuals will be motivated by self interest or rational economic behavior, and that traditional culture and structures can be barriers to progress. Most programs following the modernization model failed. The dependency model viewed the developed world's actions (e.g. conquest and colonization) as the drivers of continued underdevelopment, but led to import substitution and other programs which have also been largely unsuccessful. The contingency model emerged in the last part of the 20$^{th}$ century and focuses on human agency and creating social relations, incorporating experience, perspectives and culture.

A growing stream of research examines the role of community based enterprise, defined as "a community acting corporately as both entrepreneur and enterprise in pursuit of the common good" in which the community creates and operates "a new enterprise embedded in its existing social structure." (Peredo and Chrisman 2006:310).

Sethu and his team are interested in developing projects that will be self-sustaining after the international funding is depleted. The Irula village community takes a lead role in organizing activities. Students could explore the following ideas:

- How can poverty alleviation programs evolve from charity to building local, sustainable self-reliance?

- How can NGOs work in villages without weakening or replacing local conventions?
- Think of a community you belong to. What entrepreneurial activities could your community initiate to improve itself?

## Potential Uses and Audience

The case calls attention to technological entrepreneurship and human capital, making it suitable for students of entrepreneurship, strategy and leadership classes, particularly those with a special interest in technology, economic development or social entrepreneurship.

## Suggested Teaching Approach

Please contact the author for a complementary, digital three minute video of the village, factory and a rat catching expedition. The case can be divided into several parts, including opportunity recognition, development of technology solutions and implementation. The case can also be used in a unit on the contributions of Nobel Prize winners in Peace and Economics to our understanding of entrepreneurship. Finally, combined with an overview of Gandhi's philosophy on the development of human capital and potential, the case is also suitable for a discussion on leadership.

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## Role of the Author

The author gathered data from several sources. First, she reviewed extant electronic and print media and research about the rat trap project, Irula people and southeast India. Second, CDDP and the World Bank provided access to project documentation. Third, the author interviewed key stakeholders by telephone every six months during the period of April 2004 to December 2006. She also followed up with regular e-mails. Finally, the author visited the project, including a factory demonstration, village tour, rat-catching expedition and distribution ceremony. She met Sethu, CDDP team members and Irula villagers and was invited to distribute traps to twenty-five villagers and give a lesson at the school. Using a Tamil translator, she conducted interviews with Irula villagers.

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