ACKNOWLEDGEMENTS

The Technology Development Board, Global Innovation & Technology Alliance and contributors would like to thank all those who were forthcoming with information, which helped us compile this publication.

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On behalf of the Technology Development Board, Department of Science & Technology, Government of India, I am pleased to share the first volume of “India Innovates - A quarterly publication of Indian Innovations”. This is a compilation of Indian case studies representing the innovative and entrepreneurial fervor of present day India.

Technology Development Board has been at the forefront of encouraging Indian entrepreneurs and companies to take up technology oriented products by way of helping the technology products to be commercialized.

The present volume documents varied case studies representing different domains of innovation and showcasing many unique disruptions and drivers of change. The volume is a testimony to Technology Development Board’s steadfast commitment to igniting, challenging, inspiring, and catalyzing disruptive new ways of thinking and acting that radically increase the chances for all its stakeholders to thrive in our rapidly changing world.

No single publication, no matter how expertly or how earnestly crafted, could cover every dimension of Indian innovation. The effort is to bring to light the significant innovations, which could prove to be pivotal in inspiring and stimulating more innovations on the Indian landscape.

Realizing the importance of disseminating information related to Indian innovations and the very fact that each time frame throws in new innovations, we have decided to make this publication a quarterly publication, to be published 4 times in a year.

I thank Global Innovation & Technology Alliance (GiTA), a Joint Venture between TDB and Confederation of Indian Industry (CII) for developing this publication for TDB.

We hope that this publication will have positive implications for innovators and the innovation ecosystem in the country. We invite you to share your insights and suggestions with us. We welcome your ideas and innovations for future volumes of this publication.

Best Wishes,
Harkesh Kumar Mittal
INTRODUCTION

The classical definition of “Innovation” is slowly getting redefined with some key attributes like “affordable”, “accessible”, “impacting common man’s lives” etc. And India is playing the most active role in this transition.

The innovation players in developed nations have been so far aligned to high cost innovations aimed towards the upper economic strata of society. But most of them are now shifting towards low cost innovations aimed towards the lower economic strata where volumes are very high.

There are many known stories of global players who are innovating new low cost products and services that have a market in India and other nations of similar economic scale. There are also shining examples of Indian players who are also tapping new markets at the Bottom of the Pyramid.

This is a great trend, one that will benefit larger section of society as well as the innovators.

This has impacted the mindset of average Indians to be more entrepreneurial, to be more innovative, and to leverage their own talents for economic benefits. We are increasingly seeing young Indians passing out of premier institutions like IITs and IIMs, who are opting to start their own businesses with innovative products and services rather than take up a plum highly paid job. We are also seeing many Indians who are not fortunate enough to pursue their higher education too far, also developing highly innovative and successful business models.

This is the story of India- Innovations that is slowly emerging— “Innovation by the people & for the people”. We need to publicize to the world such success stories which will become the role models for others to emulate.

This is a first ever effort in India to capture successful case studies of Indian Innovations that are impacting people’s lives and to project to the world the Innovation Prowess of India. This will be a quarterly publication with each issue featuring 10-12 case studies.
The case studies chosen for this compilation are largely those, which have perhaps been known, but have not been discussed adequately. Many of these cases are such that we experience them in our day-to-day lives but they are so intrinsically related to us that we fail to identify them as innovation.

The case studies presented in these covers are a rich source of practical examples of strategies, mindsets, business processes employed by multifarious organizations in India. As a result, these cases will become a rich source of inspiration to many individuals and organizations seeking to improve people’s lives in their own way.

The contributors have chosen these case studies specifically for the purpose of this report. The case studies have not been chosen through any competitive or merit based process. Having identified the cases to be incorporated in this compilation, they went about finding information about the cases. The contributors have compiled the information through secondary research and in some cases spoken to the people connected with the represented organizations. Most of the information presented herein is from secondary sources and is not corroborated. The case studies are chosen to encourage others to learn from the success of others in order to achieve better outcomes. The following pages contain a chronicle of some of the most outstanding and innovative examples.

The case studies all follow a similar format. Each case begins with the background information of the company / organization, followed by the problem / opportunity, the innovation, the impact of the innovation and finally references of the sources of data.

This compilation is a snapshot of innovations that are unfolding before us. A snapshot is defined as an isolated observation or a brief look or an impression or view of something brief or transitory. A snapshot is not the whole story, which would have a plot with characters and a climax. While so much is happening around us, as a snapshot this compilation shows us a glimpse of things in the moment of time.

We believe that this is more than just a publication. This is an advocacy tool to celebrate Indian innovations and also to inspire more innovation. The compilation is to induce people to think and will instigate those who have thought to act. This report we believe will commence a virtuous cycle that will foster growth and improve people’s lives by expanding their choices and capabilities.
Attero Recycling is an integrated end-to-end electronic waste (e-waste) recycling company based in Noida, India.
Attero Recycling is an integrated end-to-end electronic waste (e-waste) recycling company based in Noida, India.

Attero treats e-waste as a resource that can be made useful instead of shunning it as an environmental burden. A fully automated facility for e-waste recycling at Roorkee, Uttarakand handles the complete processing of waste. The company also provides client friendly services like pickup of e-waste from the premises in 100 cities across 22 states in the country and complete data security. Attero has developed a low cost, environmentally friendly electro-hydrometallurgical process for extraction of precious & base metals from e-waste and is also working on extraction of rare earth metals.

Founded in 2007, it is the first e-waste recycler to be registered with the Central Pollution Control Board (CPCB), Government of India, and works towards a socially responsible movement for electronic waste.

Problem of E-Waste

E-waste includes the broad spectrum of electrical and electronic appliances, products, components, and accessories that have reached the end of their life due to use or obsolescence. It is one of the fastest growing waste streams around the world and needs imperative action today. About 42% of e-waste is used home appliances, 34% IT equipment, 14% consumer electronics and rest other small equipment. The traditional way of dumping the waste in landfills does not help, as most of this is non-biodegradable, toxic and radioactive with a potential to pollute both the land and water near the landfills impacting the health of people living in the vicinity. The toxicity is due to lead, mercury, cadmium and a number of other substances. A typical computer monitor may contain approximately 6% lead by weight. Up to 38 separate chemical elements are incorporated into e-waste items. E-waste now makes up 5% of all municipal solid waste worldwide, nearly the same amount as all plastic packaging, but it is much more hazardous. E-waste thus needs to be disposed off in a different way. India generated 3,80,000 tons of e-waste in 2008, and almost all of it is being recycled in many poor urban localities.
Opportunity

Every unused electrical item contains valuable resources and energy that can be recycled instead of throwing away. Recycled energy, is the energy saved or converted into usable products by simply handling the e-waste in the right manner, by re-using the components as far as possible. Disposed off electronics are actually secondary resources suitable for direct reuse refurbishing, and material recycling of its constituent raw materials. This is because during upgrades many fully or partially functional products are discarded.

In 2008 India generated 0.3 Million tons of e-waste and imported another 0.5 million tons, which has risen from 0.5 to 0.8 million respectively in 2012, registering an CAGR of 20%. Various estimates place the size of the e-waste market in India at $1.5 billion and growing at about 30% a year.

Electronic Lifestyle

<table>
<thead>
<tr>
<th>Resource Recovery Value</th>
<th>Discard / Replacement Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Refrigerator, Toaster, Electric Shaver</td>
</tr>
<tr>
<td>High</td>
<td>AC, Washing Machine, TV</td>
</tr>
<tr>
<td></td>
<td>Computers, Mobiles, IT Accessories</td>
</tr>
</tbody>
</table>

Opportunity

Electronic Lifestyle
E-Waste Mining: This is a simple technique where e-waste can be dumped in an open pit and then using the usual mining techniques the metal and mineral components used in the electrical and electronic products can be extracted. In fact e-waste has far higher concentration of the metals than raw ore. This mining is both economically and environmentally sustainable.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mining (Primary Source)</th>
<th>Recycling (Secondary Source)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other metal interference</td>
<td>Low - less than 5 metals extracted</td>
<td>High - contains about 70 metals as part of scarp</td>
</tr>
<tr>
<td>Volume extracted ( % of pure metal)</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Technology to extract metal</td>
<td>Simple</td>
<td>Complex</td>
</tr>
<tr>
<td>Impact on environment</td>
<td>Negative impact</td>
<td>Positive impact in processed responsibly</td>
</tr>
<tr>
<td>Cost of production</td>
<td>High</td>
<td>Very low</td>
</tr>
<tr>
<td>Risk of not finding/ non availability of metal in the input</td>
<td>High</td>
<td>Very Low</td>
</tr>
<tr>
<td>Local dependency</td>
<td>Needs to be in proximity of the mine</td>
<td>Can be established anywhere</td>
</tr>
<tr>
<td>Energy consumption</td>
<td>Very High</td>
<td>Low</td>
</tr>
</tbody>
</table>
Attero uses a two-pronged strategy to tackle the problem of e-waste – refurbishing and recycling. If a product received by Attero can be refurbished it is repaired, tested, packaged and re-sold. If refurbishing is not an option, the product goes to the recycling routine.

**Refurbishing:** Attero operates a full-fledged hi-tech refurbishing center at Roorkee and Bangalore. The center deploys refurbishing processes to ensure highest quality working components at lowest cost. Once all tests are successful, then the systems are cosmetically enhanced, stickers placed (that clearly inform that the system is a refurbished item and after its relevant end-of-life should be brought back to the recycler) and packaged for sale. Key here is data wiping from all used equipment, and ensuring performance as close to OEM standards.

**Recycling:** Recycling also operates in an integrated state of the art recycling facility where Attero has indigenously developed environment friendly recycling processes that are largely automated. Through the processes Attero recovers pure (99.99%) copper, lead, tin, nickel, zinc, silver, gold, palladium and platinum. R&D is working towards enhancing the recycling process. They have in house established metallurgical processes for smelting of different e-waste and established electrolytes for separation of metals from mixed metal ingots. They have developed environment friendly electro-hydrometallurgical process for enrichment of precious metals and for refining of gold and silver and have established methods of recovery of metals from the liquid waste of the processes.
The Automation

Attero has set up an automated and integrated Electrical & Electronic Waste recycling plant in Roorkee, Uttarakhand spread over an area of more than 100,000 sq. ft. It processes WEEE (Waste Electrical and Electronic Equipment), that includes products like used computers, cell phones, network gear, TVs etc. in an environmentally friendly manner with very high recycling efficiency. They have a technical collaboration with a leading US company for mechanical separation processes but have a first-of-its kind indigenous metallurgical process developed in-house. Hazardous substances recovered during the process of recycling of e-waste are being disposed off through the Common Hazardous Waste Treatment Storage & Disposal Facility, commonly known as CHWTSDF, authorized by the Pollution Control Board in the prescribed manner. Attero’s recycling process is a balance between disassembly, mechanical separation of complex materials and metallurgical treatment, resulting in a minimization of the labor-intensive manual disassembly. Well-defined In-Process Quality Control systems are in place, which ensure that the required quality level is achieved.

Process

The end-to-end process involves picking up the e-waste from its source to complete end of life management with zero landfill. Process extracts maximum value from the e-waste by first dismantling the materials and then treating it in the metallurgical unit and extracting valuable materials like copper, iron, glass, aluminium and plastic.

The keys steps are:

- Mechanical Separation: Separates ferrous, aluminium, plastic and non-ferrous materials
- Plastic Recycling: Plastics separated are then recycled by plastics recycling process
- Metallurgical Treatment: Non-ferrous metals are separated into constituent metals at metallurgical treatment plant. This increases the efficiency of the recycling and yields better recovery rates across the different WEEE categories. This is an indigenously developed process by Attero to transform non-recyclable plastic to carbon black.
Service

Attero helps organizations manage the business, legal, and environmental responsibilities associated with e-waste disposal and make it a hassle free process for them. Through a well-defined process they take care of logistics, data security and final de-manufacturing.

Material recovery process ensures the destruction of sensitive information or hardware through the size reduction, separation and refinement of individual materials. Data is erased from all possible data recording devices and the process is video recorded for the client certification. An audit trail is maintained of all transactions and process points.

Sourcing: Sourcing the e-waste is a big activity for Attero for both recycling and for providing services to their clients. Material is sourced from manufacturers, bulk consumers, retail consumers, corporate organizations and the informal / unorganized sector. They have been increasing their sourcing base over years.

Attero Bay is another initiative to collect re-usable equipment from end users. As of now they are collecting only used mobile phones, and other products can be added on the platform. The idea is to buy the phone that you are not using, refurbish it and sell it again. Selling on the same platform will be added in future.

R&D: Since a lot of processes used are home grown, a constant investment is done to improve the processes and to analyze efficient extraction from various components. It has developed a patent pending process for smelting and electro-refining, and is in the process of developing a plastic re-cycling process.
Carbon Credits will eventually be part of the revenue for Attero.

**Key Data**

- Series A funding: of $6.3 million from IndoUS Venture Partners and Draper Fisher Jurvetson during its inception (2008) used for setting up of recycling plant and other infrastructure.
- Series B funding: $8.3 million from International Finance Corporation, Granite Hill Capital Ventures and existing investors in September 2011 and used for expansion.
- FY 2010-11 turnover: Rs. 20 crore up from Rs. 4.2 crore previous year.
- Revenues vary from $1000-2000 per ton of waste recycled, with margins in the range of 10-20%.

Attero Bay is another initiative to collect re-usable equipment from end users. As of now they are collecting only used mobile phones, and other products can be added on the platform. The idea is to buy the phone that you are not using, refurbish it and sell it again.
The Daily Dump is a for-profit social enterprise based in Bangalore.
The Daily Dump is a for-profit social enterprise based in Bangalore and its focus is sustainable waste management in urban areas by providing simple tools to compost organic waste at source. Poonam Bir Kasturi, an NID graduate, founded the Daily Dump in 2006 in Bangalore. Daily Dump promotes waste management, it provides education in addition to design-based tools and offers a clone model, which allows others to duplicate the business.

An average urban citizen generates over half a kilogram of solid waste everyday, which is disposed off without being segregated. There is a need to work towards reducing waste going into landfills and Daily Dump shows it is not very difficult to do so.

Problem

India is home to many big and mega cities. As the prosperity increases in urban India, the problem of waste goes up.

The World Bank’s estimates put the figure at 150 million tons of waste per year by 2025.

Indian cities produce waste with a high level of organic content most of which is organic waste from food preparation. Acting on this waste at the source by composting can reduce upstream waste handling needs while also making the upstream journey more efficient by enabling easier reclamation of recyclable materials. Municipal agencies responsible for waste management face the problems of incomplete garbage collection, open lorries that leak garbage, paucity of dumpsites and other operational inefficiencies. They have also not been able to scale up their facilities for the growth in waste generated.

Solution

Daily Dump’s simple solution is use of terracotta pots that are designed to convert household waste into useful high-quality, nutrient rich manure. Replacing dustbins with these pots is an easy solution for customers to do their share of environmental friendly work. Different base materials including plastic were explored for the pots before Poonam decided that terracotta is the best suited for decomposition due to its ability to naturally aerate and its resonance with the
Daily Dump’s simple solution is use of terracotta pots that are designed to convert household waste into useful high-quality, nutrient rich manure. Replacing dustbins with these pots is an easy solution for customers to do their share of environmental friendly work.

decorative crafts of Indian culture. She used design ethnography and prototyping to come out with the first product - the Kambha composting pot. Initial investment of Rs 400,000 to set up the business came from the founder herself. This included the cost of research, sourcing material, prototyping and publishing product manuals. Manufacturing of terracotta pots is done in rural villages that keep manufacturing costs down while also creating a new income stream for the potters. It also allows Daily Dump to focus on the product design and customer management. Customer feedback was collected from housewives who were the most probable users of the product and the major concerns they had to address were ease of use and cleanliness. Accessories like aprons were designed to address the user concerns, reference material on composting and handling the pots was printed and bundled with the product. They also keep in touch with new customers for any troubleshooting required and to get their feedback that can be incorporated in the future products or services. This is how they discovered and addressed the problem of bad odours and pests.

Design is the cornerstone of Daily Dump’s model. It recognized that urban families, many of who live in tall multi-storey apartment complexes, have hardly any gardens and there is limited space to accommodate something like a composter. They designed the terracotta pot composters in such a way that it takes minimum space, and can stand as a piece of art in a balcony, corner of the kitchen or any other part of home.

They designed the terracotta pot composters in such a way that it takes minimum space, and can stand as a piece of art in a balcony, corner of the kitchen or any other part of home.
Pots come in various shapes and sizes – gamla or the flowerpot style, leave-it-pot, leaf composters, kambha resembling a small pillar and mota lota a round pot. Customers can choose based on their tastes.

Daily Dump also offers service plans where a Daily Dump personnel comes on weekly, fortnightly or monthly basis to help with the maintenance and to educate users on using the product. This is helpful for customers who buy into the philosophy of ‘waste is a resource’ but are not willing to commit to a change in routine.

Open Source Model: The designs and idea of the composting pot could have been patented to lock the commercial value for the organization, but Poonam chose to keep it open source i.e. to allow other players to venture into it. In this way they create small entrepreneurs and allow them to take this idea forward across geographies. Daily Dump helps its clones in setting up the business, locating the suppliers, and gives technical assistance related to composting. Clones can copy the business model, use the promotional material and replicate the core product. This is different from being a franchisee as Daily Dump clones are completely free to establish their own for-profit business under their own name with no dues or fees. They may set their own prices and even alter the products as they see fit. They always have an option to buy ready-made products from Daily Dump at a wholesale price. Realizing the magnitude of the problem they think that there is so much space for everyone to contribute that having competition is not an issue.

They are even sharing the idea with women in other developing economies like Brazil and Chile both as a business as well as environment responsibility. As a business opportunity, an investment of Rs 50,000 in this concept coupled with some effort in marketing can deliver profits within three months. Clone meets are organized to share knowledge, address common issues and device business strategies to acquire new customers.

The clone model gives Daily Dump access to multiple sites that now work together in a collaborative fashion and bring in the unique social, cultural, and business contexts from their regions making it like an in-built R&D system with almost no cost.
Marketing is primarily done through a well designed and well equipped website, that educates people about the magnitude of the waste management problem, tells them that they can play a role in managing the waste that they generate and also contribute to environment preservation in their surroundings.

It gives detailed information on the various products that are sold by the company along with all the allied information required on use of the products as well as on general queries. It also lets people access information in case they want to become clones and cascading entrepreneurs in the chain of the Daily Dump.

Revenue

Apart from the direct revenue that comes from the sale of products, these are the additional revenue streams for Daily Dump:

- Wholesale sales of products to clones when they choose to buy from Daily Dump
- Royalty payment on sale of modular Manthan composting unit from the manufacturer

Other Products

As the acceptability of terracotta products went up, Daily Dump came up with new products, some of which are:

- Manthan- modular composting unit designed for 12-300 families that can be used in apartment complexes, restaurants, hotels, offices, schools etc
- Store and Compost – Leave-it-pots
- The Harm-Less Home range of products - a 100% organic, natural, and non-toxic alternative to cleaning products
- Collection of illustrated books, posters, online videos with a special focus on children
- Miniature sets for kids, aprons, rakes, spoons and spatulas
- Trash Trail- A day tour travelling with the waste including visiting a landfill and meeting people to who handle waste – aims to sensitize people for waste management

Impact

Daily Dump offers composting and recycling products and services actionable on an individual level. Daily Dump’s bottom up approach to the solution complements the centralized top-down approaches to waste management by municipal authorities.

Key Data

- More than 10,000 active customers keeping 8000 kgs of waste away from landfills everyday
- 16 Clones in 3 countries
- Fastest moving product - Kambha costs Rs 600.
Daily Dump offers composting and recycling products and services actionable on an individual level. Daily Dump’s bottom up approach to the solution complements the centralized top-down approaches to waste management by municipal authorities.

More than 10,000 active customers keeping 8000 kgs of waste away from landfills everyday.
Tata Consultancy Services (TCS) is arguably India's best known, oldest and largest Information Technology Services company.
mKRISHI
Revolutionary Innovation for Farmers

About TCS

Tata Consultancy Services (TCS) is arguably India’s best known, oldest and largest Information Technology Services company. This Tata Group company was established in 1968 and has a mission statement that reads, “To help customers achieve their business objectives by providing innovative, best-in-class consulting, IT solutions and services; and to make it a joy for all stakeholders to work with us.”. True to its mission of being innovative, TCS indeed led several first-in-class innovations in the IT industry and in the Indian market. The company is perceived as a pioneer of the Global Delivery Model (now called the Global Network Delivery Model™) and is one of the first IT firms in India to adopt an Open Model of Innovation through its Co-Innovation Network (COIN™). The Co-Innovation Network, together with its global network of TCS Innovation Labs gives TCS a unique advantage in domestic as well as global markets in both products and services. While most of the Indian IT firms have done reasonably well riding on the offshoring wave and the cost-arbitrage being offered, very few have indeed innovated for India. Being one of the fastest emerging economies in the world, and with an increasingly heterogeneous population, India offers some of the most testing conditions for technology companies to develop and commercialize new products. One such area of pursuit is agriculture, which in India is still unorganized, fragmented and mired with inefficiencies, and that’s where TCS cross-pollinated its technology prowess with this local insight. The outcome was mKRISHI. The case narrates the story of this highly useful offering from TCS to Indian farmers.

Genesis of mKRISHI

Agriculture is India’s largest employer with an employment share of 60%, versus a GDP contribution of 14%. While agriculture’s share in the country’s economy is progressively declining, India remains a global agricultural powerhouse. We have the world’s largest area under wheat, rice, and cotton, and are the world’s largest producer of milk, pulses, and spices. But the agriculture productivity remains a concern.
For instance, estimates of yield of rice as of April 2011 in India was 3.2 tonnes per hectare as against 7.5 tonnes per hectare in the United States, 6.7 tonnes per hectare in China and an average of 4.3 tonnes per hectare for the world. Some of the key reasons cited for this dismal productivity are: Small and fragmented land holding with the cultivators; Lack of awareness on newer technologies and means; Unavailability of timely information and of quality seeds and fertilizers; Inadequate incentive systems; and Low levels of public investment, among others.

These were some of the challenges that TCS saw as opportunities and sharpened its insight gathering. What follows is the actual innovation and the approach TCS took to arrive at it.

**About mKRISHI**

mKRISHI® is a patented Mobile Based Personalized Service Delivery Platform. In simpler words, the device combines a host of technologies to bring vital information regarding local weather, fertilizer requirements based on soil conditions, pest control, and current food grain prices in local markets in a rich content format to the farmer’s low-end mobile handsets. It allows farmers to send queries in their local languages, as well as images and voice queries through a mobile phone application and IVR and provides personal responses with advice or relevant information in these languages.

Launched in 2009 in the states of Punjab and Uttar Pradesh, where it serves over 1,000 farmers, the product costs a farmer between $1 and $2 a month. Post the technology pilot in 2009, the services have been piloted with multiple ecosystem partners in various regions across India. The services are available in various format to cater to the different types of the handsets and operator variations.

The farmers or the field agents download the mobile applications from the “mini-mobile sites” and can then follow the instruction and menus in the local language.

Through these farmers can access multiple services such a recommended agriculture practices for their crops for their entire cropping lifecycle, weather forecast, farm management etc. Through this online platform, farmers’ queries are assigned to local experts with an identification number and an ‘open’ status. This is supplemented with FAQs and best practices shared on the farmer’s mobile phone. mKRISHI also enables farmers to send crop images to the experts which enables experts to better understand the problem faced by the farmer.
In simpler words, the device combines a host of technologies to bring vital information regarding local weather, fertilizer requirements based on soil conditions, pest control, and current food grain prices in local markets in a rich content format to the farmer’s low-end mobile handsets. It allows farmers to send queries in their local languages, as well as images and voice queries through a mobile phone application and IVR and provides personal responses with advice or relevant information in these languages.

Some of the firsts TCS achieved through the mKRISHI project are: Adoption of sensor network technologies for agriculture; User interface in local language by allowing farmers to send a query by either keying in digits or selecting a menu item; Font rendering engine for Indian languages which takes inputs as phonetic strings and displays it in Roman script; and data aggregation over villages, blocks, districts and states and display on Google Maps.

The Approach

Sometime in 2007, a team from TCS, led by Dr. Arun Pande, Head of TCS Innovation Labs, travelled to various parts of country to talk to farmers while gathering first-hand insight on the factors plaguing agricultural productivity. One of the key insights was the lack of mechanisms of getting up to date, accurate and personalized answers to queries, and consequently overt reliance on traditional knowledge. Information was also sought by farmers around poultry, cattle, micro credit, crop insurance, government policies, storage and selling of crops. Two years of extensive market study led TCS to see if its existing technologies could offer a solution to this pervasive problem.

In 2008, TCS declared the call to action and set itself up with two broad objectives. First was to enable farmers to send queries specific to their land and crop to receive personalized replies from agricultural experts, and secondly to build a consortium of partners to provide integrated services to farmers that generate fee-based revenues for the company. The product was developed by the Mumbai based TCS Innovation Lab and mKrishi service was launched as a pilot in 2009 in the Borgaon region of Maharashtra. Till date with the involvement of 100s of persons, years of the in depth field research, more than 20 pilots done successfully this patented platform offers a host of services, unique for this industry.
Since 2008, more than 20,000 farmers in 400 villages have subscribed to the mKrishi service. TCS has seven pilots running and will continue to offer its services in the six other locations where it previously had pilots. The impact of mKRISHI is multifold.

**The Challenges**

While the high teledensity in India acted to TCS’ advantage, there were several problems in making a solution accessible and amicable to the cause at hand. Some of the technology challenges narrated by Dr. Pande included establishing communication of server with the sensors in the field, issues with solar powered chargers during monsoon season, and in compressing multiple technologies in a small footprint.

Other challenges included motivating local experts, government agencies and above all farmers to try out the solution and have sufficient incentives to pay for the services, creating a social impact by alleviating the families below poverty line (BPL) to above poverty line by way of combining and offering integrating agricultural intervention. The purpose was not to limit to offering an “app”, but an “impact”. All this called for focused efforts and dedicated leadership in the form of Dr. Pande.

**The Impact**

Since 2008, more than 20,000 farmers in 400 villages have subscribed to the mKrishi service. TCS has seven pilots running and will continue to offer its services in the six other locations where it previously had pilots. The impact of mKRISHI is multifold. Not only does it impact the agricultural productivity and reduces waste, it also enhances farmers’ confidence, collaboration and dissemination of knowledge which lies with the various agricultural institutes and experts in the country. More specifically the farmers are able to arrive at the appropriate type and quantity of pesticides to be used, knowledge about the best harvesting seasons, access to real time market prices, and pricing information for NCDEX, future prices and global rates, and now have availability of local information, such as bus timings, train timings, etc. The device also gives a low cost channel to agro product companies, banks and insurance companies, government
bodies, and local entrepreneurs to expand their reach. Further, micro-level data from farmlands offers useful information for policy makers and researchers. The possibilities are infinite, for once TCS establishes connect with the local farmers, a host of services could be offered at a very low marginal cost.

The impact is fortified by the numerous accolades the product has garnered. Some of the marquee ones include: Qualcomm's Wireless Reach Initiative Award (2007), Golden Peacock Award for Innovation (2008), Wall Street Journal Global Innovation Technology Award (2008), Business in the Community (BiTC) Coffey International Award (2010), Best CIO Awards (2012) among others.

The Future

The service has garnered accolades from technology and social critiques alike. The first phase of launch at Punjab and Uttar Pradesh has helped the team learn about the local nuances, such as installing FAQs on mobile phones and ways to reduce repeat queries, covering multiple more services and to offer it in an integrated way. The plan is that once the number of farmers and number of queries increase, agricultural workers with three to five years of field experience would be involved to respond. Further, TCS hopes to partner with other major agri companies, bank and social organizations and generate thousands of micro enterprises in villages serving 50,000 farmers. The purpose is to create a chain of these entrepreneurs or the producer companies who can implement these services in a self-sustainable way. The challenge would be to get the right business model to make it sustainable.

The platform could also be potentially expanded to mobilize primary healthcare in rural India. As for the global reach, the firm has already been invited to the Philippines and Ghana to demonstrate the platform in local languages. That’s a true global impact ‘Innovated in India’
Eko India Financial Services Private Limited is a Delhi based provider of payment infrastructure that enables instant financial transactions over a mobile phone.
Eco Banking
Business Correspondent and Technology Service Provider for Leading Banks

Eko India Financial Services Private Limited is Delhi based provider of payment infrastructure that enables instant financial transactions over a mobile phone. It was established in September 2007 and the services started in early 2009. It works as a ‘Business Correspondent’ (BC) and ‘Technology Service Provider’ (TSP) for various leading banks like State Bank of India (SBI), ICICI Bank, YES Bank and IndusInd Bank in India by leveraging the existing retail shops, telecom connectivity and banking infrastructure to extend branchless banking services to a common man.

It raised $ 2,00,000 seed capital from the founding team and further got grant of $1.78 Million from CGAP – a subsidiary of World Bank and Bill & Melinda Gates Foundation through 2009. In mid 2011, the company raised $ 7 Million Venture Capital from Creation Investments, a Chicago based Venture Fund.

Using Eko’s technology and network a customer can simply walk in to a retail shop next-door, fill a form, hand over the simplified KYC documents and have a bank account within few minutes. Retailers also facilitate deposit, withdrawal, money transfer transactions and other query handling for the customers on behalf of bank. A low cost mobile phone acts as the point-of-sale device for retailers and customers. There is no extra hardware or software that is required for doing the whole transaction either by the retailer or the customer, making this a no cost solution for them, given that a basic mobile phone is available with almost everyone today.
A large percentage of the target population is illiterate but it was safe to assume that they knew numbers as they dial those on their phones. Banks on the other hand needed an easy to plug and play technology that would ride on top of their core banking systems and provide the reach for the new customers.

**Opportunity**

RBI guidelines require the banks to reach out to the unbanked or under banked customers in both urban and rural India. The need was to create a solution that is low cost, easily accessible, secure and yet profitable for all the entities involved. Mobile phones were the obvious choice, but the type of phone or network could not have limited the solution, otherwise the reach would be limited. A large percentage of the target population is illiterate but it was safe to assume that they knew numbers as they dial those on their phones. Banks on the other hand needed an easy to plug and play technology that would ride on top of their core banking systems and provide the reach for the new customers.

To meet this goal, two pieces were required – A mobile phone based technology and a distribution network to reach out and service the customers.

**Solution**

Eko came out with a solution in two pieces - a patented technology that allows safe transactions over any mobile phone and across networks and a model for distribution that bridges the gap between banks and the intended customers.

**Technology**

Eko’s technology enables financial transactions by simply dialing of numbers and emulating missed-call behavior over USSD (Unstructured Supplementary Service Data) channel. It also provides SMS and IVR approach to perform a transaction. Use of this technology requires no application on the phone, no special SIM card, no SMS exchange and hence the service works across all phones i.e. lowest to most sophisticated handsets. The platform doesn’t require any capital expenditure on the distribution channel unlike traditional models like brick-and-mortar, ATM, Biometric device etc.

It brings down the cost of transaction many times compared to any of the other channels. This also brings the overall cost of building, operating and distributing the technology for all the stakeholders while making the architecture very scalable both in terms of cost and time to market.
Eko's technology platform called ‘SimpliBank’ connects the telecom infrastructure to the bank’s Core Banking System (CBS), leverages a user’s cell-number as a unique identifier to map the bank-account number to it. Though it leverages the mobile technology and mobile instrument, there is nothing that is stored on the mobile phone itself, making it a safe against the potential loss of mobile phones or use of a single mobile phone by multiple members of the family or a group.

Performing a transaction only requires numeric literacy for number dialing. The solution assumes that India has high level of numeric literacy i.e. ability to dial a number and very high familiarity to missed call behavior. Balance check is a heavily used feature across 95% prepaid mobile subscribers. Entire experience for account opening is similar to that of purchasing a SIM card, while deposit/withdrawal transactions are similar to that of recharging the prepaid mobile account. There is a two factor strong authentication to complete the transaction. It has created and patented a low cost One Time Password (OTP) generator called ‘OkeKey’.

Eko’s other inventions involve digitization of a cheque- a universally accepted mode of financial transactions and an extremely low-cost paper equivalent solution to RSA token device to authenticate the user.
Distribution Network:

A network of retailers spread across the region take the banking services to the masses. Using low cost mobile phone as the point-of-sale, retailers facilitate deposit, withdrawal, money transfer transactions and other query handling for the customers on behalf of bank. Eko works as a Business Correspondent (BC) for the partner banks and distributes the network on their behalf in the regions selected on the basis of need and the business potential.

As a model its innovation involves prepaid cash-management in the distribution channel. A retailer has to hold the cash in his account to the extent he can do transactions as a retailer on behalf of the bank. This eliminates the risk at the bank's end and brings in serious involvement from the retailer.

For every transaction there is a small fee that the customer has to pay and this fee is shared between the bank, Eko and retailer with the retailer getting the maximum share. Different banks have different revenue models, some charge a fixed fee per transaction and some charge a percentage of the amount transacted.

Evolution through Continuous Improvement

Eko's initial technology enabled only opening of accounts, deposits and withdrawals within the limits provided by RBI for the no frills accounts. The system operated on Eko's system, but was not linked with the bank's core banking system. It was then extended to connect with the core banking system so that customers are linked to other bank facilities and can transact with other customers. Now the transactions at Eko's retail points are real time and the balance is updated instantly after every transaction. Banks have slowly started offering other products to these customers like recurring deposits and fixed deposits, making the retail points an alternative to the bank's teller and making the whole eco-system an alternate to branch based banking sys-
Key Milestones Data:
1. Network of more than 2600 retail outlets (grocers, pharmacies, stationers, cybercafé(s) etc across 11 states in India.
2. Serves more than 1.5 Million customers.
3. Processed more than $400 million across 4 million transactions.
4. Handled daily peak of more than $2 million across 25K transactions.
5. Largest mobile based transaction processor in India.

Eko also offers Cash Management Services to various Micro Finance Institutions, Technology Services to various BCs, disbursement of government incentives to health workers, across the counter bill payments and across the counter micro insurance premium collection through its network.

It has been recognized by several National & International forums and has won multiple awards like Tech Award, NASSCOM - Emerge 50, PCQuest - Best IT Implementation, mBillionth Award by Digital Empowerment Foundation, World Summit Award by UNGAID, IAMAI Award, Prerna Award IIM Lucknow, Leap of Faith Award by ET NOW, CXO Award by UTV Bloomberg.

"By taking existing infrastructure and spare capacity among mobile networks, your model could dramatically reduce costs for service providers and customers alike".

Bill Gates, Chairman, Microsoft
Royal Philips Electronics, commonly known as Philips, is arguably one of the most widely known brands in the world and so in India.
About Royal Philips Electronics

Royal Philips Electronics, commonly known as Philips, is arguably one of the most widely known brands in the world and so in India. This Dutch multinational, headquartered in Amsterdam, was found in 1881 and with revenues of over USD 30 billion, is one of the largest electronics companies in the world.

The firm has broadly three divisions: Philips Consumer Lifestyle, Philips Healthcare and Philips Lighting, and is the world leader in the lighting business. The firm has a remarkable history of innovation, talking of which, it boasts of about 60,000 patent rights, 29,000 trademark registrations, 43,000 design registrations and 2,000 domain name registrations.

In India, Philips has had a very long history. The company started its operations in Kolkata in 1930 under the name of Philips Electrical Co. (India) Pvt. Ltd, and became a public listed company in 1957. Today the company has over 10,000 employees in India and has a strong presence across its core segments of healthcare, lighting and consumer lifestyle. One of the primary imperatives for Philips in India has been innovation-led growth, and towards this effect, the company opened its dedicated innovation centre site in Bangalore in 1996, which today is called Philips Innovation Campus (PIC). PIC is responsible for developing new products for all the division of Philips, and works collaboratively with the firm’s various global locations. PIC is headed by Dr. Wido Menhardt, a long timer at Philips, and a techno-manager who is leading his team to make novel solutions for the Indian market, especially in healthcare.

Most innovations at PIC aim towards serving the emerging markets, such as India, and this stems from the local insight that the firm has garnered over its years of presence here. In the past two years alone, the firm has launched a host of innovative products, including the ultrasound machines called e-ICU and IntelliHospital, and more recently ClearVue.
This case narrates the story of ClearVue, from the commitment of Dr. Menhardt to the realization by his team and the future prospects of the ‘India Strategy of Innovation’ that the PIC has been adopting for quite some years now.

**Origins of the ClearVue**

Philips was one of the early companies to have an India-centric strategy of innovation. The focus is evident from the statement Dr. Menhardt made in 2010 – “While the cost structure is important to address the Indian market, the traditional approach of selling the lowest priced products from the US in India will not work. Things taken for granted in the Western world - such as power and the Internet, are not available uninterrupted in India. Our intention is to develop more products for India, developed in India.” The impetus is evident by the dedicated resources the centre has towards healthcare innovation and the host of recently launched products.

The Indian healthcare market is expected to reach USD 79 billion in 2012 and USD 280 billion by 2020. Large population, prevalence of various diseases, untapped market, increasing urbanization, rising life expectancy, and active private sector participation are some of the leading factors that have supported the industry growth.

One of the most important markets, that of ultrasound systems, is expected to grow at a CAGR of 13% during 2008 – 2015 and this demand would largely be driven by miniaturization and newer applications of the devices. That’s where Philips spotted the opportunity to grow. The idea was to conceive an ultrasound product for the value segment of the Indian market which is expected to be around USD 300 million and itself grow at 8% year-on-year. The original idea was conceived in 2005 at the Bangalore campus of Philips and the work started sometime in end of 2009.
About ClearVue

Philips' ClearVue Ultrasound range of solutions offers high-quality imaging at a significantly lower cost. Designed and built at Philips Innovation Campus (PIC) in Bangalore, the product took 20 months from drawing board to market. This cross-functional, cross-site team was led by Ms. Pallavi Kaiwar, from the PIC Bangalore. The heart of the solution is the transducer system based on innovative ActiveArray™ Technology that allows users to capture high quality images in 2-D as well as in color. The innovative transducers have allowed the product to have a much smaller footprint. Weighing less than 52 kilograms, the machine comes up with a 17 inch display and a rotatable arm for ease of use. As compared to the existing products, ClearVue uses 40% less keys on the control panel, 20% less plastic and promises to be 70% more energy efficient. The product is priced at the range of INR 10-14 lacks, as compared to INR 22 lacks for a comparable product.

The Impact

Since its launch in November of 2011, ClearVue has given Philips a steady revenue stream. Designed initially for the Indian market, the product has witnessed success in other developing markets with similar socio-economic conditions and also tasted success in certain developed economies. Though the sales figures weren’t available at the time of writing this case, the qualitative and anecdotal evidence speak volumes about the product performance. Apart from India, the product has performed very well in the African market, especially in Egypt and Kenya, and has also found a good reception in Germany. The product has been very effective in child and mother care and has proven effective in addressing mortality rates in developing markets.

The Risks and Approach

Being a product to be fully built in India from scratch, ClearVue had its own share of organizational, technical and economic constraints. The initial idea that got conceived in 2005, took some pursuing to be accepted by the company's headquarters and this called for clear commitment and leadership. Ms. Pallavi Kaiwar provided that leadership and through her personal commitment she made the project take-off from the ground. The sheer complexity of the challenge in terms of size, cost and reliability, imposed significant technological and process related challenges on the product design. Designing components such as the ActiveArray™ Technology was a major breakthrough, as well as designing the system for erratic power and ruggedness was quite challenging. With a peak-team size of 20 and in flat 20 months, the product was launched in the market.

The Future

The team at Philips Innovation Campus in Bangalore has lived up to the promises of Dr. Menhardt, and ClearVue is just a case in point. In a growing healthcare market, Philips finds India to be the beachhead of developing newer products, and ClearVue's success in African countries and in Germany proves the power of ‘Made in India’ label of innovation.
Tanishq is India's premium jewellery brand and is a part of Bangalore based Titan, a Tata Group company.
About Tanishq

Tanishq is India’s premium jewellery brand and is a part of Bangalore based Titan, a Tata Group company. The division was launched in 1994 to produce jewellery and jewellery watches for the European and American markets, but soon got traction in the domestic market. Today, Tanishq is a well-known brand and enjoys a leadership position in the otherwise highly fragmented and unorganized jewellery market. The jewellery company has a 1,35,000 square feet production factory at Hosur, Tamil Nadu which employs a highly skilled workforces of over 300, among whom are award winning designers.

Tanishq has infused a much awaited vitality in the Indian jewellery market with innovative designs, ethical business practices, exceptional customer service, educating customers on jewellery, and other firsts in the industry. For instance, in 2007 Tanishq launched Anuttara, a customer relationship programme, where customers earn with every purchase and get special care for their old Tanishq jewelry, exclusive shopping privileges and access to premium social events. Today the programme boasts of over 1.7 million unique customers. Other firsts include an online wedding planner, a successful online shopping store, and an X-Ray Fluorescence (XRF) Spectrometer based Karat Meter to check purity of jewellery in a non-destructive fashion. While the Tanishq brand has done very well in the luxury and high-end of the market. In 2005, Titan launched the GoldPlus range for the value segment and this brand has done very well riding on the trust garnered by the Tata brand. All the operations from back-end to the showroom are efficiently tied up with an Integrated Supply Chain Management.

These are the innovations that the customer experiences, but what about the one she doesn't, and that’s where Tanishq has taken a leap of faith. Showcasing a sparkling piece of ornament is something, but managing the grueling process that the ornament goes through from a commodity to a piece of adornment is quite something, and that’s what Tanishq has been able to perfect over the years. More specifically, the case focuses on the engagement Tanishq has with its numerous karigars or the unorganized sub-contractors who were hitherto living a marginalized life.

The case focuses on how Tanishq, through its Mr. Perfect Programme achieved the triple benefits of economic, social and environmental benefits while constructively engaging with its extended labor force.
Some of the social benefits include: wellbeing of the karigar community and preservation of the art form as the working span increases significantly, reduction of child labor and health hazards, and awareness generation towards better living.

The Origins of Mr. Perfect

Jewellery manufacturing in India isn’t organized the way automotive, consumer durables and other engineering sectors are. It’s a cottage industry where people work with primitive unsafe facilities, primitive layout and with primitive tools and techniques. Safety and environment friendliness is totally absent in the work areas, and cases of child labor are rampant. Such unhealthy work environments cut the workable lifespan of karigars to 45 years of age. While the Hosur factory is responsible for production of all diamond jewellery, manufacturing of plain jewellery is completely sub-contracted to such workers mostly from Kolkata and residing at Hosur. Such an arrangement exposes Tanishq to a very high risk of giving gold without any bank guarantee, and with a typical 30 day lead-time, thus exposing gold worth over INR 150 crores to risk. Further, as the facilities adopted are primitive, in-process quality and hence quality of the final product can’t be ascertained.

Keeping these concerns in mind, sometime in 2008, Tanishq created a statement of purpose comprising of broad objectives such as:

• To reduce the manufacturing lead time from 30 days to 3 days
• Provide a safe, environment friendly professional working environment to karigars
• Double the earnings of karigars through productivity improvements
• Extend this learning to other manufacturers, benefiting jewellery trade

The outcome and the approach adopted are shared in what follows.

About Mr. Perfect

Dubbed as Mr. Perfect, the project aimed at influencing the sociological, psychological and economic wellbeing of the Tanishq’s numerous karigars. In disciplining the karigars the first thing the project did was preparing a Bill of Material (BOM) for all jewellery in consultation with karigars as only they have the requisite information. Further, last three years of variant wise sales were mapped with the BOM and consumption patterns were arrived at component level. Then taking insights from the Lean Production System, a two-bin system was implemented at each of the karigar’s location, which could assist him respond effectively to the purchase order released by Tanishq on a daily basis with variant number of jewellery and consolidated list of elements. Apart from these process level changes, and one may call innovations, as nowhere in India karigars use such sophisticated processes, the Mr. Perfect programme introduced product innovations. One was to introduce first-of-a-kind RTV mould to eliminate the old method of preparing jewellery in black wax, and de-skilling the labor, while providing an exact pattern match. Equally effective was the application of scientific techniques to lower the curing time for Plaster of Paris from 80 minutes to 10 minutes.
The results from the above interventions wouldn't have been sustainable unless the work environment had been influenced systematically.

The Mr. Perfect program invested in creating ergonomic working conditions for the karigars, trained them on safety and health care measures, ensured adoption of proper lighting, and institutionalized a host of welfare initiatives, such as health insurance, eye camps, annual medical checkup, education to karigars’ children, motivational and entertainment programs, welfare funds, and housing facilities.

Over the past half decade, the program has touched over 1,000 karigars working with Tanishq.

The Approach

Bringing about such a fundamental change in a traditional art form wasn't easy. While the actual implementation of process and product innovation started in 2008, the preparation was underway since 2003. In the three phased approach, spanning 2003 to 2008, the programme was able to build the necessary formal and informal 'rules of the game' to finally bring about the desired changes. The first phase in 2003-05 aimed at vendor rationalization and creation of a vendor manual clearly setting the measurement metrics. This was followed in 2005-07 by implementing karigars’ basic needs and creating a competitive environment through Partner Meets and Karigar Camps. The final phase in 2007-08 focused on actual behavioural and technical training and setting the stage for large scale transformations.

While the actual implementation of process and product innovation started in 2008, the preparation was underway since 2003.
The Impact

The table below summarizes the explicit benefit of the Mr. Perfect programme.

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Benefits</th>
<th>To Karigar</th>
<th>To Tanishq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>30 days to 3 days</td>
<td>Overhead is reduced by 50 %</td>
<td>Reduced inventory and reduced risk (Inventory reduction by INR 40 crores in 2009 – 10 (INR 111 crores to INR crores))</td>
</tr>
<tr>
<td>Lead Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>750 grams to 2000 grams</td>
<td>Earning doubles</td>
<td>Reduction in lead time resulted in sales forecast (5 weeks to 2 weeks)</td>
</tr>
<tr>
<td>Gold Loss</td>
<td>0.7 % to 0.35 %</td>
<td>Earning INR 4 / gram</td>
<td>Delighted karigars</td>
</tr>
<tr>
<td>Retirement Age</td>
<td>From 35 years to 60 years</td>
<td>Increased work life span.</td>
<td>Effective utilization of karigar's skill</td>
</tr>
<tr>
<td>Safety</td>
<td>Best work environment</td>
<td>Safe environment</td>
<td>Karigar retention</td>
</tr>
<tr>
<td>Environment</td>
<td>All aspects taken care of</td>
<td>No toxic fumes etc., Free from illness</td>
<td>Enables Corporate Social Responsibility</td>
</tr>
<tr>
<td>Friendliness</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Apart from the economic benefits, the programme also accrued significant social and environmental benefits. Some of the social benefits include: wellbeing of the karigar community and preservation of the art form as the working span increases significantly, reduction of child labor and health hazards, and awareness generation towards better living. Some of the significant environmental benefits are: adoption of cadmium free solders in facilities, usage of environmental friendly packaging and proper scrubbing of acid fumes before diffusion to environment. The images below depict the transformation.
Over the past half decade, the program has touched over 1,000 karigars working with Tanishq.
Madrat Games

Madrat works towards designing games where learning is rightly balanced with the fun and rewards mechanism.
MadRat Games Pvt Ltd is a company engaged in developing board games in Indian Languages. They not only design board games but also market them innovatively both as games and as language learning tools. It was founded two years back by a group of three IIT graduates who moved from the software world to teaching children. Seeing the efficacy of learning through games, it was evident that learning games were a much-needed and also held tremendous untapped business opportunity.

The existing educational games the founders reviewed were all either too ‘fun’ oriented for the teachers’ taste or too ‘educational’ for children’s interest. Madrat works towards designing games where learning is rightly balanced with the fun and rewards mechanism. Their inclination towards making this USP of their games arises from their background combining technology, education and design gained by studying Computer Science & Design at IITs and teaching at Rishi Valley School for 4 years.

The word game Aksharit is their flagship product, and they wish to keep their focus on creative world-class games from India that are value based. They can be board games, card games or mobile games. Today they employ 22 full time and 10 part time employees that includes product designers and visual designers.

The Game

Aksharit is the first Indian language word game and/or board game. English has had many popular word games, Scrabble being the most famous one, which is available in 30 other world languages but none of the Indian Languages. If no one has attempted a word game in Indian languages till now there must be challenges in doing so, here are some of them:

- Unlike the 26 letter set of English, Hindi has more than 40 Aksharas & 15 Matras, thus having more than 600 unique combinations of possible characters (e.g. ka ik kl ku ku kO). The same holds true for most other Indian languages. Thus if a Scrabble like game is to be made in Hindi there would probably be more than 4000 tiles that you would have to hold in a sack & the game board the size of a double bed.
- Concept of Half Letters which each Indian Language deals with differently For example Telugu and Kannada have a separate character Vottulu, in Hindi the shape of the consonant itself changes e.g na in nyaaya in its half letter form
• English has just 4 difficult to use letters like x q j z, but Hindi has about 16 such letters like: Na Xa Ya ? & etc., thus these appear much more frequently in the users letter tray, making it all the more difficult to make connecting words.

• English is a non-phonetic language hence the same vowel can take more than one sound, e.g. the sound of vowel “A” in LATE is different from that in GRASS, so it is much easier to connect words in English as compared to an Indian Language. In any crossword style game connecting words is the key element so tackling this issue also turned out to be very crucial for the game to be fun.

• Being a game the solutions had to be very simple & intuitive for it to be accepted as a fun game.

Madrat solved all the above issues and more to make an authentic Indian Language Word Game that they called Aksharit. They came up with transparent horizontal and vertical tiles for Matras that can be added on top of the full letter, a hider tile for half letters and a concept of spacer and wall. They tweaked the game to accommodate the large set of difficult letters. The solution set makes it possible to play the game in any of the major 11 Indian languages with the same ease & fun, thus making it the first Tamil, Kannada, Bengali, Telugu, Marathi etc. word game.

Other Products

My Toy Factory: A do-it-yourself kit for kids to create their own games
Games on Demand – Customized Games for Corporate Clients based on requirements
Idea Board – E-Learning Tool

Business Model

Madrat worked on identifying the key learning gaps and created low-cost, outcome driven game to address them. While the Hindi was obvious choice to begin with, restricting the game to one language was not a good idea so they designed the Game for many Indian languages apart from Hindi.

As a learning tool, games have been devised in various versions for various age groups. So as the children gain proficiency in the language they move on to the next level. This ensures the simplicity at beginning levels and also ensures the repeat customers for the game.
Digital & mobile versions of the games are sold through App stores and corporate tie-ups. This involves one time investment in building a game and then letting the partners take it to the audience.

Physical games are sold through tie-ups with governments and private schools, where they act as fun learning tools for children. This is coupled with the standard approach of selling the game through retail stores, toy stores and e-commerce portals.

**Engaging the Audience**

MadRat Games approached the schools and organizations engaged in the space of education like UNICEF and Azim Premji Foundation. They pilot tested the learning potential of the games for children to learn languages using the fun games. At the same time they used the digital platforms very effectively to take the game to the masses.

**Schools**

The first pilot was done with the help of UNICEF in 1000 schools of Chhattisgarh, there after it was adopted by other states like Rajasthan, Bengal, Madhya Pradesh, Uttar Pradesh etc. with a very positive response from the teachers. With every game that they sold they bundled pre-paid post cards for collecting feedback from teachers. 100% teachers reported an increase in interest in learning the language amongst students using Aksharit. They said it helps children to learn identifying the Matras and also acted as a factor for the kids to come to school willingly as they perceived it as a game rather than a learning class. Teachers said “the game has brought back life to our language classes”.

Aksharit has also been adopted by a number of leading educational organizations like Eklavya, Digantar, Vidya Bhawan Society, Azim Premji Foundation & also internationally in schools of Dubai & Singapore & Institutes like American Institute of Indian Studies.

MadRat Games approached the schools and organizations engaged in the space of education like UNICEF and Azim Premji Foundation.
Technology

They developed an online and a mobile version of the game and put it through some very potent channels to reach the technology savvy audience. They tied up with Nokia to pre-bundle the game in their touch screen smart phones. They positioned the product as a way for the International brands to add Indian content and present an Indian face to their Indian customers especially to the vast non-English speaking population.

Aksharit’s mobile version was launched in collaboration with Nokia and it comes bundled with their 5 lakh touch phones. The desktop version is being launched with Intel on their AppUp Store.

Recognition

Aksharit appeared on the Cover Story of The WEEK, and was published by Education World, Entrepreneur, DARE, Inc India magazines & dailies like MINT, The Hindu, Hindustan Times, Economic Times etc.

Impact

- Aksharit reached 200,000 children in 3500 schools in a short time frame of one and half year.
- Mobile version launched by NOKIA on 500,000 touch phones
- Partnership with Google & Intel to reach 1 million online users by 2012
- Already clocking a revenue of 1.5 Crores

Milestones

- Won IIM Calcutta biz plan comptt – Jan ’09
- Aksharit adopted by Chhattisgarh in 1000 schools – Oct ’09
- Registered MadRat Games – Jan ’10
- Partnered with NOKIA – Oct ’10
- Adopted by MP, Rajasthan, Bengal based on Chhattisgarh’s reviews – March ’11
- Partnered with INTEL – Dec ’10
- One of 6 worldwide partners for GOOGLE Chromebook’s India launch – Jul ’11
- Won App4India contest at INTEL’s TechSparks event – Jul ’11

They developed an online and a mobile version of the game and put it through some very potent channels to reach the technology savvy audience.
Tata Motors is one of India's first automobile companies and today the largest in India.
In 2008, Tata Motors acquired British manufacturers Jaguar and Land Rover, which gave the automobile giant access to two state of the art engineering and design facilities and three manufacturing plants (Solihull, Castle Bromwich and Halewood) in the UK. This acquisition not only gave Tata Motors a broader product portfolio, and healthier profit margins, but also market access and above all access to newer technologies and innovations. Further Tata Motors has been able to generate local jobs in UK owing to the turnaround story of Jaguar Land Rover. While the Jaguar and Land Rover cars command a market premium, there is always room for improvement, especially in shaving off costs by adopting newer technologies. The current case talks about the industry – first stop/start system innovated by a group of engineers at Jaguar Land Rover’s R&D facility and the ways they challenged the engineering of automobile engineering.

The Genesis of the Innovation

Stop/Start system is an integral component of any automobile. A good stop/start system not only enhances performance, but also saves on fuel and provides an engine with better life. The stop/start system in diesel cars is currently based upon Belt Integrated Starter Generator (BISG), a technology that takes up significant fuel and delays the start. The technology used in the petrol car is that of a starter motor. But such a technology can’t be adopted on a diesel engine due to concerns of engine start times missing the targets. The task for engineering at Tata Motors was to develop a new stop/start system for the automatic transmission vehicles in Jaguar Land Rover range of vehicles.
...this innovation could lead to cost savings of ~£550 per vehicle and in the lifetime volume of Jaguar XF a cost save of ~£20,000,000. The intelligent Stop/Start capability delivers incredible power and performance with impressively low emissions and fuel consumption.

The Innovation

The innovation is in using a standard started motor to start the engine well within 350 milliseconds, from 700 milliseconds. Such a feat was thought to be impossible by automobile experts, as a started motor was conventionally only used on petrol engines. Utilizing a Tandem Solenoid Starter, the system comprises of an upgraded starter motor with twin solenoids that allow it to achieve instant restarts. Intelligent Stop/Start represents the first use of such technology in its sector and has the engine running at optimal ‘pulling away’ speed in less time than it takes for the driver’s foot to move between the brake and accelerator pedals. The team has released the Jaguar XF featuring this technology and the innovation has already received rave commendations.

The Approach

It took a small team from Jaguar Land Rover’s Gaydon office eight weeks from concept to realization to deliver a fully functional stop/start system. This feasibility study was broken down into several parts. The team conducted a study by physically examining diesel engine start times and sought to improve the start time using a conventional starter motor and a highly revised unique and ground breaking start fuelling strategy. The new strategy was to combust at the second TDC of the engine cranking, dramatically reducing the diesel engine start time to idle. A methodical
It took a small team from Jaguar Land Rover’s Gaydon office eight weeks from concept to realization to deliver a fully functional stop/start system.

approach was taken and real data collected showing the capability and comparison of this system to BISG technology. The results highlighted there were a real opportunity to meet the start target without BISG technology. In parallel, the team led discussions with Denso UK Ltd. (JLR starter motor supplier) as to whether a starter motor implementation would be containable for Jaguar XF. A cost comparison strengthened the team’s belief that there was a real business case to examine the alternative technology as there were massive cost benefits to the business. With some initial trials, the team was ready with the innovation.

The Impact

Tata Motors anticipates that this innovation could lead to cost savings of ~£550 per vehicle and in the lifetime volume of Jaguar XF a cost save of ~£20,000,000. The intelligent Stop/Start capability delivers incredible power and performance with impressively low emissions and fuel consumption.
Mera Gao Power

Mera Gao Micro Grid Power Pvt Ltd (MGP) is a lighting utility company set up in 2010 by two entrepreneurs Nikhil Jaisinghani and Brian Shaad.
Mera Gao Power

Mera Gao Micro Grid Power Pvt Ltd (MGP) is a lighting utility company set up in 2010 by two entrepreneurs Nikhil Jaisinghani and Brian Shaad. It is registered in New Delhi but at the moment has all its operations north of Lucknow in UP. It is a leader in Microgrid based power solutions and provides off-grid households with quality, dependable lighting and mobile phone charging services. It builds and operates priority service solar powered micro grids in the state of UP with a goal to replace the product model for lighting with a service model. MGP had 1700 clients in over 70 villages as of the end of September 2012 and their aim is to reach 6,000 customers by the end of 2012 and 10,00,000 by 2017.

Model

MGP’s business model is unique as they provide power as a service. They are not a full-scale power utility company and they are not a lighting product company. They focus on the services that can be provided most cost effectively and that are of highest priority or value for the customers - lighting and mobile phone charging. They combine the solar power based energy efficient technology with a distribution cum installation network to provide electricity to off the grid villages.

With clarity on services to be offered and clientele to be served, they chose the idea of using micro grids as the base of the model though it required adopting a number of innovations on the typical micro grid design to make it simpler so that it requires lower maintenance and costs less. MGP’s energy efficient, renewable energy powered design uses off the shelf components for a cost effective design that allows MGP to offer a low cost solution to its customers. MGP’s design uses solar panels to generate power. Because of the low energy design, four panels are sufficient to power an entire village of 100 households with quality light and mobile charging. These panels are installed on the roofs of existing households, thus eliminating the need for land. Power is generated during the day but consumed at night. To bridge this gap, a battery bank large enough to provide two days back up is installed inside the same house that the panels are installed on. MGP’s design only requires four batteries for an entire village thus reducing the footprint of the battery cabinet in the household. Power is distributed over a short distance from the battery banks to the village and then to households within the village. Low voltage electricity is distributed according to a set schedule agreed between the village and MGP. Using LED lights makes MGP’s micro grid design ultra energy efficient. This is also the key to reducing the size of power generation and storage equipment. Each household is provided with two or four LED lights. These lights provide better light through more light points and for a longer duration each night than the customers are able to get through kerosene.

Each micro grid generates and provides power to customers for seven hours every evening. This power is sufficient to run low wattage appliances such as lights and mobile chargers. Customers pay Rs. 25 per week for seven hours of service per night or about 100 Rs a month. This is
costlier than the grid power, but customers are happy to pay for a dependable service. While the off-grid households MGP services may be poor, they are avid mobile phone users. Without other electricity-based gadgets, mobile phones with integrated radio and music players offer much needed entertainment. Mobile phone charging, therefore, is a highly demanded service that often requires traveling to towns and expensive recharging costs. MGP offers a more convenient and lower cost mobile charging service as a compliment to its lighting service.

Collections are done weekly at predefined times and points within the village. Prior to service, new villages undergo a survey and engagement process to ensure they are good candidates for service. One of key criteria for choosing a village for micro grid is that it should be off the main power grid. Villages on grid are used to a certain behavior where they want to extract maximum value from the little window of time when electricity is available and have big energy consuming appliances that cannot be supported on the micro grid. Next criterion is that there should be about 35 houses or willing customers in close vicinity for the viability of the service. The operational system is community based, where a quantum of power is available to a set of houses or customers, and they need to balance their usage. If one house draws more power from their line others may suffer an outage. Total power that can be consumed by a set of customers is limited.

MGP faced challenges around community issues, particularly power theft and payment collection. They resolved theft by modifying the technical design and addressed payment by hiring a payment specialist and hiring full time collectors from outside of our network of villages.

**Market**

There are 400 million people living off grid in India, 600 million in South Asia, and 900 million in Asia as a whole. The market in India alone is estimated to have a potential cap of $2 billion per year. Off-grid demand continues to be unmet by modern power services; and communities resort to low quality sources of energy such as kerosene, wood, diesel, and disposable batteries. Communities detached from the grid represent market gaps, and these gaps present opportunities for commercial delivery of socially beneficial solutions.

Initial setup cost for each micro grid costs around Rs 65,000. It would take about three years to recover this cost. The operational cost is negligible as there is no major maintenance that is required and no manpower is required to run it. In case the village they are operating in is added to the power grid, they can simply uproot the systems from that village and move on to the next village, equipment is re-usable and easily movable.

Given that the villages being targeted by MGP are off the grid, there is virtually no competition for them as there is no other alternate for their customers other than kerosene lamps or battery operated torches.

MGP has been seed funded by the founders and has subsequently received a grant of $300,000 from development agency USAID to build and operate micro grids in 40 off-grid villages of Sitapur district, Uttar Pradesh and evaluate the impact of MGP’s services on health, income, and education. It has also partnered with The University of California Davis’ D-Lab that focuses on innovative technologies and business models that allow people at the bottom of the pyramid to save or earn more money.

It is too early to assess the impact of the venture but some of the obvious impacts include:

- Children can study at night
- Indoor air quality is improved with the reduced use of kerosene
- Shops are able to stay open till late
- Reduced used of disposable batteries
Communities detached from the grid represent market gaps, and these gaps present opportunities for commercial delivery of socially beneficial solutions.
redBus™ is India’s first organized online bus-ticket booking service based in Bangalore, India.
redBus™ is India's first organized online bus-ticket booking service based in Bangalore, India. Three engineers, Phanindra Sama, Charan Padmaraju and Sudhakar Pasupunuri, started it in Aug 2006. From a personal experience of trying to find a bus with an available seat, one of the founders saw a need for a central database of bus operators and an aggregator service, which would have information on seat availability online. With the help of TiE mentorship redBus today has transformed a fragmented market with thousands of bus operators and has become the leading player in the bus ticket aggregation service. It is India's largest bus ticketing company, reaching out to consumers through multiple channels – web, mobile, phone booking, retail outlets etc.

It manages over 19,000 bus services every day from over 800+ bus operators in 22 states with its 23 regional offices in the country and 480 employees, backed with call centers in 7 states. It sells seats directly to passengers via its website, call centers, mobile phones, network of travel agents, post offices, mom-and-pop stores etc. redBus has about 30,000 point-of-sale outlets across the country, some are managed directly while others are managed through partners. redBus gets a commission for each transaction. It also offers the home delivery of tickets and accepts cash on delivery.

It also has 2 other allied businesses – First is Software Solution Business (BOSS™), which is an ERP for bus operators. BOSS™ (www.boss.travel) is a market leader in its space with 700+ operators using it across the country. Second a GDS business (SeatSeller™), which provides bus inventory access to over 40,000 agents. This powers majority of organized bus ticketing agencies, OTAs, organized retail stores in India.

**Challenges**

The bus industry is highly fragmented and unorganized. There are more than 2,000 private bus operators operating 20,000 buses on long distance point-to-point routes. Tickets for these are to be bought in advance. Very few operators have a large fleet of buses, most operators are small and have 5-10 buses each and some are as small as 1-2 buses. They operate through a network of booking agents, whom they allotte seat quotas, with no visibility amongst them on seats sold or available, making it an inefficient system.

Use of computer and information technology was non-existent and probably did not even make sense for small operators to invest into. Bus tickets booking happened the traditional way i.e. through agents. All transactions were cash based throughout the industry.
The business model has a huge network effect. redBus is in the centre of the ecosystem. On one side, there are bus operators and on the other there are agents. Being in the centre of these 2 important entities of the bus industry; they are fuelling business for both bus operators and agents.

Solution

redBus had to integrate the two ends of its business – Bus Operators and Customers (Passengers). Bus operators had no clue of what the information technology can do for them and redBus had to educate them and tell them the importance of getting a computer. For the customers who were expected to be tech savvy, they had to create a feature rich yet simple solution to be able to book a ticket from the comfort of their computer screens. They introduced options in buses and bus operators, choice of seats and payment options. Rather than convincing and integrating bus operators, redBus created a front end website for customers and urged people to use the site. People now got a quality customer experience which in turn motivated bus operators to join the redBus inventory.

Model

redBus has a very low cost model of operation. Nature of business is such that they generate adequate cash flow from the operations. Compared to other e-commerce businesses their cost of acquisition is very low and no capital is blocked in inventory acquisition. They have developed operational capability to manage ~30K individual customer cash transactions in a day with zero reconciliation issues. It becomes accentuated by the fact that each cash transaction generates multiple legs to handle. They are amongst the very few startups, that have been able to reach a financial maturity within 5 years of inception.

Government has invested in road infrastructure about a decade back and thanks to that initiative, today there are some very good highways in the country. redBus expects the industry to grow over 25% per annum as the roads get better and as the need for road transportation increases.

Software Products: The company has a portfolio of 3 products that address the needs of all stakeholders and provide a complete solution for the bus ticketing space

- Portal redBus.in – a front end that allows passengers to search and book tickets online from anywhere to anywhere with an ability to choose their seats and boarding point

![Diagram of Highly Fragmented Industry]

HIGHLY FRAGMENTED INDUSTRY

- Market Size @ ~2.5 B USD; ~220M tickets/year
- Growing at 25% per annum

Call Centre & COD
- redBus.in
- Franchisee
- Seat Seller
  - GDS used by offline travel agents, OTAs etc
Key Innovative Features

- Single portal to access information for hundreds of bus operators online.
- Booking return tickets. Before the online system, a passenger had to be in the city of departure to book tickets, but with online bookings, ticket inventories are available from any point to any point and you can easily book your return or multi-point journeys.
- Choose your Seats: Redbus portal allows customers to choose their seats while booking. They launched this feature even before airlines did it.
- Inventory Management for Operators: Through its enterprise software called BOSS, it allows operators real-time monitoring of the seat inventory. The software ‘seat seller’ enables travel agents to look up seat inventories with different operators.

Impact

The business model has a huge network effect. RedBus is in the centre of the ecosystem. On one side, there are bus operators and on the other there are agents. Being in the centre of these two important entities of the bus industry; they are fueling business for both bus operators and agents. With growing bus business, operators will ply more buses on the roads, which in turn will give agents a bigger pie to share. RedBus influences the businesses in the bus industry with a huge network effect, which is different from any other retail portal. Their research helps bus operators operate new routes which in turn helps increase market size.

The RedBus model brings transparency into the industry by providing accurate, trustworthy and useful information for consumers that enhances their confidence to travel via buses. At the same time, it empowers the smallest operator by providing them the same reach as big ones.

It has brought convenience to consumers who earlier had to go from one agent to another to get a ticket. Now all the buses are available on a single webpage.

Awards

- Ranked No.1 amongst India’s fastest growing companies; ~4,823% growth rate
- Amongst the Forbes™ list of top 5 startups to watch out for in 2010
- Amongst the Business world top 3 most promising entrepreneurs in India
- Startup of the year award by IAMAI in 2010
- Ranked 48 in the world’s 50 most innovative companies (RedBus is ranked 48 in the world’s 50 most innovative companies by Fast Company)

Key Data

- 800+ bus operators
- 19,000+ bus services every day, across 22 states including 2 Govt. RTCs
- 30,000 point of sale outlets – 10,000 direct, ~200 partners
- Among the top portals in terms of number of customers served/day in India
- 50% of RedBus bookings over the Internet, 30% through call centers and 20% through SeatSeller. Mobile phone bookings account for less than 1% of the overall total.
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Since many years, there has been a concern about industry’s low (compared to many countries) investment in Research & Development and technology deployments in the country. Due to limited resources and inherent constraints, many nations today, leverage global innovations for industrial development and for providing technology solutions to challenges they face. Global partnerships and industry-involvement in technology development, refinement to suit local conditions and finally deployment for business and social development have been a missing link in India for many years. While India has many policy incentives and measures to attract industry investment in this space, it is far behind than many countries. Interestingly, many such countries have established arm’s length organizations to professionally manage and implement programs those involve industry and global linkages.

The Department of Science & Technology experimented a Public-Private-Partnership (PPP) delivery model during last few years and found worth expanding and institutionalizing the same. Subsequently, the sub-committee of the Prime Minister’s Council on Trade & Industry recommended institutionalizing the model.

Finally, on 29 November, 2011, a PPP, not-for-profit (Section 25) Company named “Global Innovation & Technology Alliance” (GITA) has been incorporated jointly by the Technology Development Board (TDB) of the Department of Science & Technology (DST), Government of India and the Confederation of Indian Industry (CII). GITA is

• A unique institution for providing demand-driven technology solutions through global alliances on a competitive process
• An one-stop-shop for forging frontline global technological alliances for Indian companies for achieving leadership in world and domestic markets
• An Innovative mechanism between government of India and Indian industry for attracting Indian industry’s investment in technology by Mapping technology gaps, Evaluating technology offers across the globe on appropriateness from techno-economic perspective for India, Connecting among technology developers, providers, commercializers, Funding last phase of technology development that connects the market and Deployment of technology solutions.

GITA is governed by the board where senior officers from Government and CII’s key industry CEOs are the directors. CII and TDB have put 51% and 49% respectively in GITA’s equity. DST has transferred country-specific funds to GITA for implementing India’s bilateral and multilateral Industrial R&D and technology deployment programs (currently with Canada, Israel and ASEAN block) involving industry and academia. Many countries are showing interest to launch with India such industrial R&D programs and Indian industry, especially MSMEs are partnering with global partners and developing new technologies for global markets.
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Innovations and technology development are the prime movers of national economies. North-centric technology hunters are about to change in the twenty-first century. India and the other developing world is taking lead in the global economy of manufacturing and services. They are continuing edge shall largely depend upon their technological lead. Government of India recognizes the importance of technology development for the economy besides addressing the national issues of education, health, poverty, water, infrastructure development and environment preservation.

The National Science and Technology Policy acknowledge the importance of technology development and follow a comprehensive approach to harness the human potential and knowledge power in India. The gap in commercialization of the newly developed technologies, because of inherent high risk and newness of the new technologies was filled in by creating Technology Development Board through an Act of the Parliament in 1996.

TDB when created was a unique organization not only in India but also elsewhere having mandate to encourage innovator entrepreneurs and commercial enterprises to take up technology oriented projects attempting commercial application of indigenous technology or adapting imported technology for wider domestic applications. Since its inception in 1996, TDB has played a pro-active role in promoting new ideas from small enterprises over at the risk of failure, encouraging production of competitive consumer products, motivated industries and R&D institutions for product innovation, developed socially relevant and profitable technologies, identified and acted in areas requiring strategic interventions and also invested in core technological strengths to enable the Indian industry to stand up to the competitive pressure and help them become a global player.

Over the years TDB has supported more than 400 innovations which also includes projects funded by 13 technology oriented Venture Capital Funds in which investments were made by TDB and also the projects supported by 36 Science & Technology Entrepreneurs Parks (STEPs) and Technology Business Incubators (TBIs) who have been provided Seed Support fund by TDB. For this TDB has made available funds of about Rs. 1232 crores (US$ 246.40 million) so far. Profiles of entrepreneurs range from small scale companies to large national companies. Technology coverage was predominantly in drugs & medicines, bio-technology, medical engineering, software & IT, telecommunication, automobile & engineering and organic chemicals.

TDB also promotes technology development and commercialization amongst entrepreneurs through mechanism of National Awards. These Awards are often given away by President of India to SMEs and also to the large sector every year on 11th May the Technology Day in a high profile event. TDB has also taken steps in international collabora- tion in furthering the cause of technology commercialization. For this TDB has developed institutional relations with France, Spain, UAE.

TDB has also partnered with industry associations such as CI and FICCI to achieve excellence in technology development through public-private partnership. With this objective, TDB has launched two new programs, one in collaboration with Confederation of Indian Industries (CII) named “GITA” (Global Innovation & Technology Alliance) and the other in collaboration with USAID and Federation of Indian Chambers of Commerce and Industry (FICCI) named “Millennium Alliance”. GITA will scout for innovations around the world and leverage such innovations for enhancing technology competitiveness of Indian industry & institutions. GITA will support joint technology development, technology transfer and joint ventures between Indian entities and companies overseas.

Whereas “Millennium Alliance”, an India – U.S. Innovation Partnership for Global Development, is designed to promote cost-effective and rigorously tested solutions for critical development challenges that have the potential for sustained global impact.