

Neurosynaptic Communications

ReMeDiTM

Comprehensive Telemedicine Solutions

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Acknowledgment

This case study on **Neurosynaptic Communications - ReMeDi™** has been compiled after thorough primary and secondary research on the organization. Information has been assimilated from several individuals who have made significant contribution in the development of this case study.

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The Neurosynaptic Communications product, called ReMeDi™-MDAU (Remote Medical Diagnostics) is sophisticated, can be installed anywhere with Internet connectivity and has been designed to work in the most rugged of Indian conditions. . The company's bold aim is to transform, through technology, the cost and delivery of health care to India's villages. Priced quite affordably, the kit performs six key tests, including blood pressure, temperature, oxygen saturation, heart and pulse rate and an electrocardiogram. Its electronic stethoscope captures chest sounds and a central database stores patient records and relays the information from rural settings to top city hospital doctors at the other end, who logging in through a video link, can access the vital parameters and make a clinical decision/ diagnosis and prescribe the appropriate treatment . The cost per consultation and the exam is anywhere from INR 30 to 100 (63¢ to USD 2.5), compared with USD 5 for an electrocardiogram alone from a doctor in the city/town.

Introduction

Many people in poorer societies suffer because of non-availability of simple and standard technologies to the people at the grassroots level. Delivery of healthcare to the rural population is an area of concern. There is a marked difference in the healthcare scenario between the rural/remote areas and urban areas. It is observed that compared to urban areas, in rural areas, doctor to population ratio is lower by six times, hospital beds to population ratio is lower by 15 times and per capita public expenditure on health is seven times lower. A large number of health facilities have been set up by the government but still, the numbers are not sufficient to serve the entire rural population. Many existing facilities lack resources and/or trained medical professionals, which results in non-availability of quality healthcare to the rural population. Villagers end up travelling large distances to towns or cities to get medical services.

In a study done by Indian Space Research Organisation (ISRO) on the utilisation of the Primary Health Centers (PHCs), 47 percent of the population depends on the government PHC for their healthcare needs. Also, the same study points out that 14 percent of the patients travel 9-15 Km, 31 percent travel 35-45 Km and a huge 55 percent travel more than 55 Km for accessing secondary or tertiary services.¹ it results in extra expenditure on travel and loss of pay for the patient as well the person accompanying the patient. Further, most of the increase in the healthcare costs is most likely the result of delay in

treatment, and hence the ailment becoming an emergency, most often resulting in heavy losses for the individuals, driving them below the poverty line in the long run.

World Health Organization (WHO) defines telemedicine as “The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities”. The concept has been in existence for quite some time and many solutions have been deployed all over the world. Even in India, many corporate and government hospitals, non-government organisations and individual clinicians/settings use telemedicine to provide consultation to their patients.

Most of the existing telemedicine sessions are hospital-to-hospital, super specialist consultations. Medical diagnostic devices and equipments as well as the software that are used for the telemedicine sessions were extremely expensive earlier. Connectivity or bandwidth infrastructure is exclusively setup for telemedicine in most cases. In recent years, with the entry of multiple product/device development agencies, the costs have been reduced but still there exists a large need for affordable solutions.

Expansion of telemedicine infrastructure to serve the entire rural population presents its own set of problems. First and foremost is connectivity. Even basic telephony is yet to reach the entire population and in cases where it is available, quality of connection is poor. Another issue is the availability of power in most places. There is either no power or there are outages for long hours as well as large fluctuations. Availability of trained health professionals in these areas is also a big issue. For a solution to be effectively utilized in a rural setup, it has to be extremely simple and foolproof to be operated by an operator who is not necessarily a qualified healthcare provider. Also, availability of right equipment for telemedicine in rural areas is a major issue. The ones that are available are very expensive, and would not be affordable and sustainable for large-scale deployment unless there are equipment and devices available that are cost effective. It would not be possible to provide these services at an affordable price point.

CO-FOUNDERS : Sameer Sawarkar and Rajeev Kumar

INNOVATION : Move beyond just offering affordable tele-medicine solutions to offering a platform for various services and create an ecosystem for delivery of healthcare in rural and remote locations.

MODEL : Working on various models with partners ranging from revenue-sharing, technology fees & leasing arrangements.

SCALE : Has supplied / installed 400ReMeDi (Remote Medical Diagnostic Devices / Solutions) since 2007.

REVENUES : (not disclosed) increased five-fold last year (2009-10) and the company hopes to double it this year (2010-2011)

Neurosynaptic Communications Pvt Ltd (NSCPL) is a Bangalore based privately held for-profit Company, incorporated in 2002. The company was co-founded by two Bangalore, India based enterprising promoters - Mr. Sameer Sawarkar and Mr. Rajeev Kumar, former signal processing and embedded systems experts in a major telecommunication technology company. NSCPL was started with a mission to develop ICT based products and technologies, which can create a positive impact on the global rural population. NSCPL believes that technology can enable access to essential resources at affordable prices to the masses and in the healthcare context, essentially bridge the healthcare gap that exists between the urban and rural areas. This offered them a reason to

engage in the development of low-cost indigenous technology for application in rural areas. While there are numerous challenges which people in the rural areas have, Neurosynaptic has decided to focus primarily on the challenges of healthcare delivery.

Since its inception, NSCPL is engaged in the area of Research and Development. Its solutions for remote healthcare delivery are now being used in India and various developing countries of the world, particularly in continents of Africa, Asia, South America and Central America. The products and solutions developed at Neurosynaptic Research Labs are tried and tested with advanced processes for achieving quality and reliable operations in maturity, while they are utilized by considerable population that lives in rural and remote destinations.

The company also believes that developing solutions that are appropriate to rural population and suitable for local markets can in turn create a huge business opportunity, with global scalability; currently their focus is to expand their product line for remote healthcare devices and improvise their existing solutions. The product portfolio of the company includes devices for both telemedicine and standalone medical devices, soft ware and enterprise solutions for Telemedicine Centers.

At first, Sawarkar and Kumar experimented with ambitious ideas such as creating new virtual limbs for the disabled and bringing sight to the blind with vision sensors. In 2003, they received seed funding from a venture capital fund Ventureast and support from the Telecommunications and Computing Networking Group (TeNeT), Indian Institute of Technology (IIT) Chennai. The duo were guided by the TeNet group, headed by Dr. Ashok Jhunjhunwala and Dr. K. Vijayaraghavan, Director, National Centre for Biological Sciences, Bangalore and advised to develop technology that was more down-to-earth, sustainable, and mass-produced.

This led to the idea of developing a portable diagnostic kit—Remote Medical Diagnostics (ReMeDi)™ MDAU (**Remote Medical Diagnostics - Medical Data Acquisition Unit**) as part of their remote healthcare delivery solutions. The innovative device prototype was put through vigorous testing on field and the technology has been clinically validated at reputed medical institutions for accuracy and quality of medical data before the final product was introduced in the market. The Company received a further round of funding from the Biotech arm of the Ventureast. The Company has also received development and commercialization assistance for the product from the Technology Development Board, Government of India.

Remote Medical Diagnostics (ReMeDi)™-MDAU

The Remote Medical Diagnostics (ReMeDi)™ Medical Data Acquisition Unit (MDAU) offered by Neurosynaptic Communications is an indigenous technology, developed jointly with the TeNeT group of the Indian Institute of Technology, Chennai which facilitates remote diagnosis by allowing transmission



Fig 1: ReMeDi- Medical Data Acquisition Unit

of various vital parameters about the patient to a doctor that are needed to make a decision on the preliminary diagnosis. The device was designed to measure six vital parameters such as Electro cardio graph (ECG), Blood pressure, Body Temperature, Heart Sounds, Oxygen Saturation (SPO₂), Heart and Pulse rate. As a first step, the group

worked closely with the medical community, to identify the requirements that meet the basic needs of

the population. Also, inputs from various partners with vast experience in rural areas - on the kind of problems that could crop up while deploying a new technology were sought during the development phase. E.g. in telemedicine the doctor does not see the patient in person, so it was very important to introduce a simulation experience by using video conferencing for communication. At the same time they had to keep in mind that the bandwidth available for the solution is very limited, implying that the video conferencing had to be customized heavily to make it work on limited bandwidth. This collaborative effort and understanding of the local situations resulted in the development of a solution that can operate and overcome the barriers for technology deployment in rural areas.

The ReMeDi Solution is designed to work on multiple protocols – “the store and forward” which means it can capture all the parameters and then, whenever there is connectivity, a digital transfer is possible. In the other live mode, if the real time bandwidth is available, then it can connect and transfer all the parameters in real time on a very low bandwidth (upward of 32Kb/sec). To overcome the low power-constrained situations, the device was designed to work on only two watts of power, which it can draw from the computer USB port. To address the lack of availability of trained medical professionals in the villages, the solution has been developed such that after a minimal amount of training, even a high-school graduate can operate the Solution. The solution provides complete Electronic Medical Records, images, various health parameters like ECG and heart sounds, as well as audio-video conferencing at very low bandwidth, thereby making it an excellent platform for rural and remote healthcare delivery in villages starved for infrastructure and medical expertise.

Some salient features of the product are:

- **Remote Medical Diagnostics (ReMeDi)™ kit can currently measure 12 channel ECG, Non-invasive Blood Pressure, Heart and Lung Sounds, Temperature , Oxygen Saturation levels, Heart rate and Pulse Rate**
- **Equipment taking rural conditions into account: low power consumption, re-engineering of probes, USB connectivity with the PC and complete isolation of the patient from AC mains**
- **Minimal amount of training required to operate the solution even for a non-medical professional**
- **Includes complete Video Conferencing which works on low bandwidth networks as well**

Remote Medical Diagnostics (ReMeDi)TM-Professional

The Remote Medical Diagnostics (ReMeDi) Professional is a basic telemedicine solution package offered by Neurosynaptic Communications for conducting remote consultations which enables patient handling in an effective manner by the physician through a multimedia laptop / or a desktop computer from anywhere in the world with internet connectivity. The solution consists of

- The Remote Medical Diagnostics(ReMeDi)TMMDAU and Patient application software
- The physicians application software

Major Features:

- Complete video conferencing
- Works even on bandwidth as low as 32 Kbps
- Patient medical records – storage, transmission and management
- Capability to capture and include images in the records
- Capability to store stethoscope sounds and ECG images in standard format

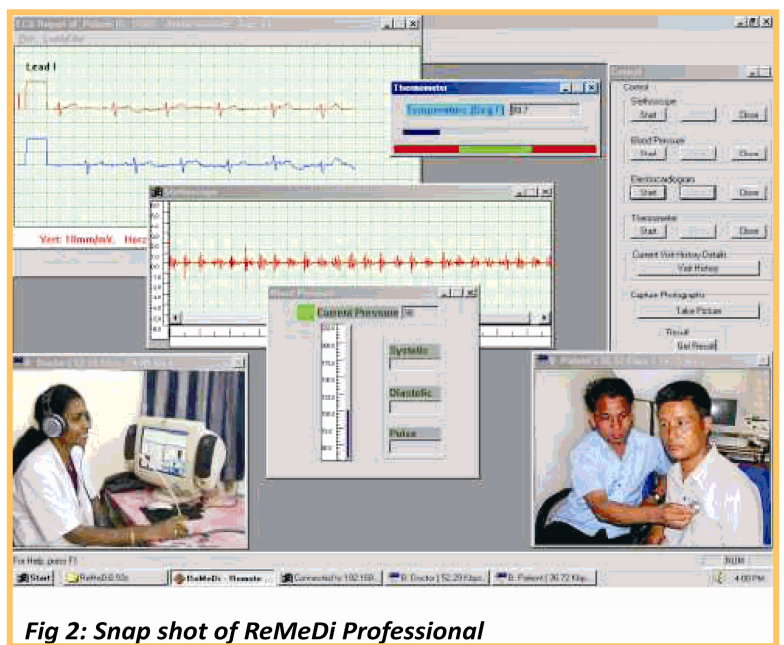


Fig 2: Snap shot of ReMeDi Professional

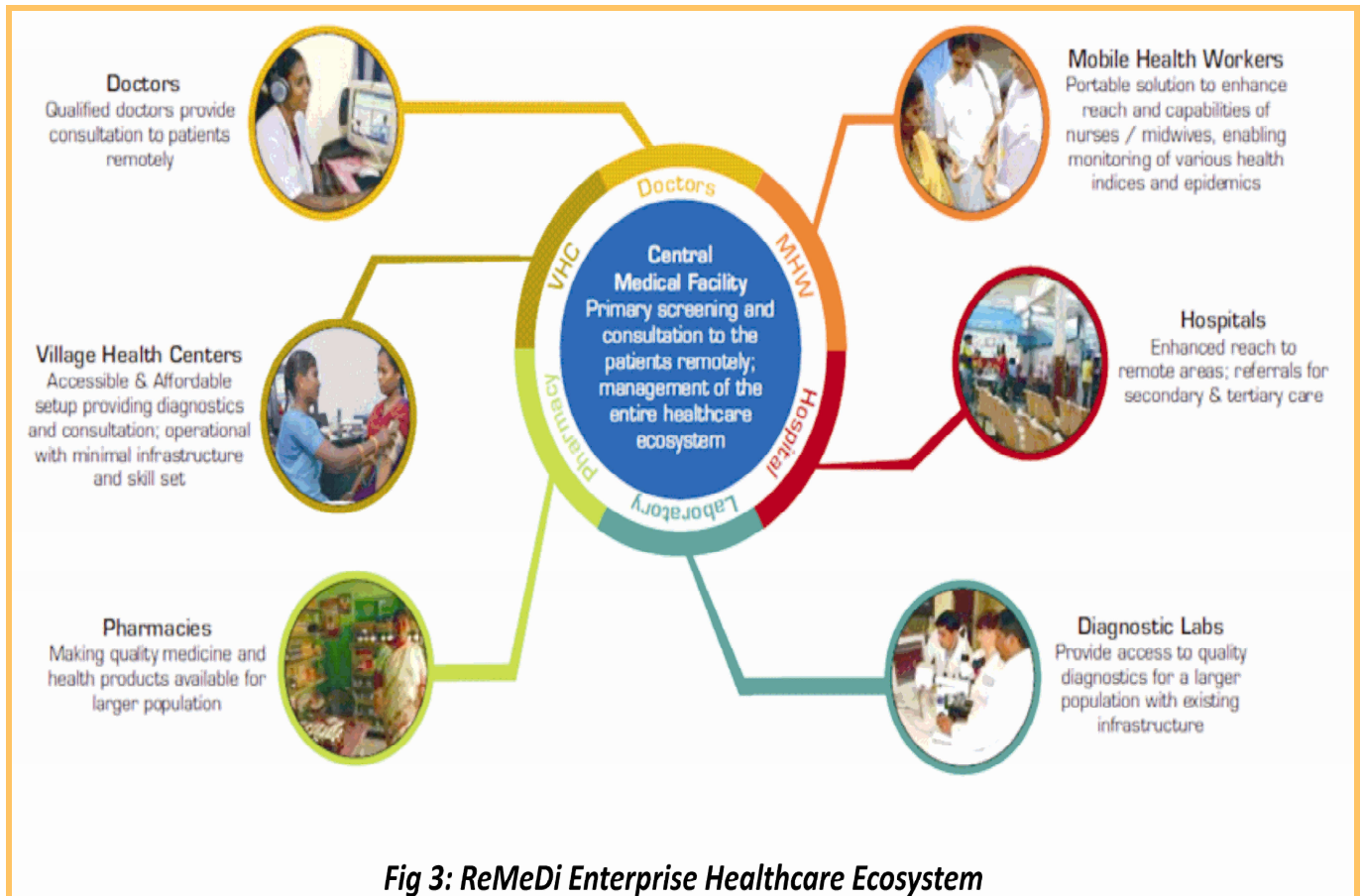
- Ability to print the complete medical record, prescription, lab reports and measurements with a standard PC printer
- Available for standalone as well as for remote consultation
- Supports both real-time and store-and-forward modes of Operation
- Easy to use interface and requires minimal training

Remote Medical Diagnostics (ReMeDi)TM – Enterprise

The "Enterprise Healthcare Ecosystem", is a unique and comprehensive solution developed by Neurosynaptic communications. It provides linkages to various partners and clients in the healthcare delivery network and is also suitable for organizations providing telemedicine services through a Hub-and-Spoke network model with the spokes, located in remote and distributed areas, in turn connected to a central medical facility for remote consultation. The bundled product consists of Remote Medical Diagnostics (ReMeDi)TM Server Application , Remote Medical Diagnostics (ReMeDi)TMMDAU & Patient Client Application, Doctor Client Application Assistant/Associate Client Application , Other Client Applications [Diagnostic Labs, Pharmacies, Clinics (Pvt. & Public – PHCs, CSC), Midwives, etc.]

Major Features:

- Linkages to various Partners in the Healthcare Delivery Network
- Multiple Simultaneous Consultations with multi-party video conferencing
- Maintenance of Patient Medical Records & Authentication at the Server with On-Demand Access
- Support for Health Level 7 (HL7)
- Network Upgrade of the Software
- Comprehensive Billing Module
- Mechanism to Capture Feedback for System Audit and Quality Control
- Administrative Rights and Privileges
- Medicine Formulary
- Fingerprint Identification & Integration with Health Card Systems
- Integration with other software applications (CDSS, HMS having CRM, SCM and ERP)
- Many other features



Experiment on Shared Platform

A telemedicine solution, as a healthcare delivery vehicle, faces three challenges. On one front, it has to be scalable to reach the masses, on the other; it has to be affordable for being utilized. Further, it has to be appropriate for the needs. Scalability heavily depends on the self-sustainability of the solution. Hence, setting up communication and other infrastructure just for telemedicine is a non-viable proposition since it pushes up the overall cost of the system. According to Mr. Sameer Sawarkar, “Our initial thought was that technology alone cannot bridge the gap. What we need is the right kind of reach into villages and at this point of time there is no sense in establishing a new proprietary infrastructure”

Neurosynaptic Communications, in the initial years had chosen a shared platform to deploy and test the impact of their product ReMeDi™-MDAU (Remote medical diagnostic – Medical data acquisition Unit) through **n-Logue Communications** - an internet kiosk operator, offering rural people access to doctors from its internet kiosks using video-conferencing. The service that was being provided through the n-

n-Logue kiosks was limited because vital medical information of patients was not available. However, with the deployment of the low-cost medical kit that works in conjunction with a rural kiosk, n-Logue overcame the barrier of transmitting the vital parameters of the patients to the consulting doctor thus resulting in accurate diagnosis and treatment for their clients.

To make the partnership operational, Neurosynaptic Communications had selected the n-Logue internet kiosks, trained the kiosk operator to use the Remote Medical Diagnostics (ReMeDi) Kit and identified a partnering doctor to provide virtual consultation. They promoted the new services and diagnostics available through the n-Logue kiosks by conducting a health camp where all visitors were given free blood pressure and ECG test. Immediately after the launch of the service, a spike in visitors to the kiosk was observed. Subsequently, the number dropped to a few regular, repeat visitors. Neurosynaptic Communication along with n-Logue has analyzed the reasons for the drop in the consultations through a survey and discovered few factors that may have affected the trend:

- kiosk operator's inability to administer the service properly
- poor identification of the kiosk as a place where medical care is dispensed
- lack of awareness of the service, distance of the kiosk from the village
- lack of availability of the prescribed drugs in the local pharmacy

The field study that lasted 18 months, in Tamil Nadu and Maharashtra, threw up interesting facts on the issues faced at ground level. According to Sameer Sawarkar, "We developed a telemedicine product technologically superior to anything else available in the market considering that it would be enough to make our business venture a success, only to realize that technology is important enabler and many more things are needed to make it work". The whole eco-system required for meaningful healthcare delivery was missing.

However, based on the lessons learnt, they have come up with a new strategy to involve partners who are providing comprehensive care at the primary level and have a better understanding of the local healthcare needs. Mr. Rajeev Kumar says, "Our new strategy was to partner with health care organizations who have in-depth understanding of the health care issues in rural India much better than [we do], and we understand the technology issues much better—that's the kind of synergy that will work."

In 2008, Neurosynaptics partnered with World Health Partners (WHP) to conduct another pilot project in 4 Centers run by World health partners to test the effectiveness of the multi parameter device and the suitability of developing a sustainable and comprehensive model for health care service delivery using technology. The pilot lasted till March 2009 and the outcomes have been positive. After the completion of the pilot, both the partners (WHP and Neurosynaptic) were convinced that a comprehensively planned health care model combined with technology can bridge the gap of providing quality health services at affordable costs to the rural population through Telemedicine.

The attributing factors that have made the pilot with WHP successful are:

- Appropriateness of the solution - the Remote Medical Diagnostics (ReMeDi) MDAU can be installed on any personal computer working on a Windows system and doesn't require more advanced infrastructure than the one that is currently available with WHP to function.
- Accessibility of the solution - the parts, knowledge and skills to operate and use the innovation are readily available as Neurosynaptic Communications had designed the product without any complicated but superior technology and offered training to the operator.
- Affordability of the solution - Neurosynaptic communication has priced its device at price-points far less (40 percent) than their counterparts available in the market, which benefits the provider by drastically decreasing the capital costs on the technology.



In addition, the solution does not require any drastic behavior shifts from villagers. Rajeev says, "One of the fears expressed during the design phase was the possibility of a patient getting a shock while using the device. So we isolated the device and other probes from the power unit".

Business Model

Based on the lessons learnt during field testing, Neurosynaptic Communications has not initiated any efforts to directly network with hospitals and run the telemedicine service. Instead, they have taken a path of identifying partners—mostly those who are good at the delivery logistics and have a

comprehensive service model where the patient will have access to the consultants, pharmacy, lab tests etc. The company priced their product at attractive price-points and sells it to telemedicine providers across the country and overseas on outright purchase, revenue sharing basis or lease arrangement. (The company however was not willing to disclose the revenue details). The company initially outsourced the manufacturing of the product as it is a low-value and high volume product. They wanted to undertake in-house manufacturing after they reached a certain sales volume. Currently, Neurosynaptic Communications manufactures certain components of the product and the rest are outsourced. The final assembly & quality procedures are carried out by Neurosynaptic Communications. The company provides after sales services at the client location depending on the annual maintenance contract signed between the two parties and a regular upgrade is done through the web for the Telemedicine software application installed at various locations.

Neurosynaptic provides training for the Medical Data Acquisition Unit (MDAU) and the associated applications to the operators. The training covers operating instructions, hands-on training on maintenance, troubleshooting, dos and don'ts of the kit and is conducted offsite at the Neurosynaptic Communications offices or through a video conference.

Neurosynaptic currently works with various partners and about half a dozen are keen on scaling it up. One of those is World Health Partners (WHP) which has a network of 137 Remote Medical Diagnostics (ReMeDi)-powered Centers set up in Uttar Pradesh, India. It has another 43 Centers set up in Public-Private-Partnership (PPP) modes and 170 Centers as experiments with various entities in India and overseas.

Impact and Growth Plans

Neurosynaptic Communications till date have sold and installed 400 units of their Remote Medical Diagnostics (ReMeDi)-Medical Data Acquisition Unit at various locations and 400 additional installations are in the pipeline. It indirectly caters and serves almost 6 million people around the world.

The company revenues have increased by five folds last year and they aim at doubling that number by the end of 2011. The company hopes to expand in India and achieve a target of 1500 Installation catering to 30 million people by 2011. As Rajeev says, "[It's] not mandated only for villages. We see a huge untapped market for the product in urban areas and elsewhere around the world. The research

team over the next five years wants to add pathology, eye care, cardiovascular disease, and biochemical tests to the kit". "We want to solve the common man's problems—that's the core," says Sameer

Neurosynaptic Communications and another partner are working together for various overseas projects in Africa and South and Central America to develop and implement nationwide Private Telecom Networks (VPN). These networks will act as a base for "Telemedicine Solutions" that would spread across the countries. The company receives many requests from telemedicine service providers around the world and currently telemedicine providers from Bangladesh, Mexico, Tunisia and the Philippines and many more countries have ordered the MDAU kits (Details not disclosed).

Financing

Raising finances has been a challenge for Sameer Sawarkar and the team who began the journey eight years ago with an initial seed funding from a venture capitalist. According to Sameer, "It is very hard getting an investor interested in investing [in] a startup in the development sector, as it involves longest cycles of development to come out with the end product".

The company currently runs with the revenue generated through the sales and service of the Remote Medical Diagnostics (ReMeDi) solution. But to scale and achieve a horizontal growth and accommodate innovation in the segments they deal with, the privately held company is now looking for venture capital and private equity funding. It has set itself an aggressive target of installing its products and services in 10,000 Centers by 2015. "We are already profitable since last three years. We will reach large scale by 2014-2015," said Sameer Sawarkar. The promoters feel they have the advantage now as they have the final solution ready and field tested through the pilots.

The Neurosynaptic team develops its own software and they ensure to bring down the recurring costs for the customer at every level - be it using narrow bandwidth and video applications readily available on PCs instead of high-end cameras or making the unit work under India's frequent voltage variations.

Conclusion

ReMeDi™ uses an existing shared platform and does not require to set-up specific infrastructure for telemedicine. Also, the consultation fee charged from the patient can covers all the costs, making it a self sustainable telemedicine solution. By delivering diagnostic services in villages that don't have doctors, ReMeDi at least potentially saves villagers the costs and lost opportunities of traveling to towns or cities when they need to see doctors for primary healthcare. With about 75 percent of the people who visit ReMeDi powered health centers not having to travel to the next town for their health care needs, the solution offers a great amount of affordability too. The final model that has been developed by Neurosynaptic Communication allows the patients to get access to quality health care for less than a dollar.

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