

# 15 YEARS OF INTERNET IN INDIA

<Retrospectives and Roadmaps>



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## Telemedicine and the Internet

**Editor's Note** The USP of Teleradiology Solutions lies in creating a hub of excellence from where one can provide the report of a scan performed anywhere in the world, such as in the US, within 30 minutes, and in some cases as low as 15 minutes, as in cases with acute stroke. TRS leverages Internet-driven technologies to optimise the efficiency and reporting accuracy of its radiologists, wherever they may be, namely Delhi, Hyderabad, Mumbai, Phoenix, Boca Raton or Jerusalem. They have created an environment of quality, which allows the highest level of diagnostic accuracy to be delivered to a patient, wherever they may be, whether in Indiana or in Itanagar.



The medical speciality of radiology deals with the performance and interpretation of diagnostic medical scans, namely X-rays, ultrasounds, CT, MRI scans, mammograms and PET scans. As medical science has advanced, imaging technologies have evolved rapidly – scanners have become significantly faster and achieve much higher resolution. Simultaneously, many more applications for imaging have become validated by research, for example, twenty years ago a patient coming to the hospital with pain in the right lower abdomen would typically go straight to surgery to have their appendix removed. Today, a CT scan would typically be first requested to confirm the diagnosis (this has resulted in a 20 per cent decrease in the number of normal appendixes being needlessly removed in Western populations). This has also resulted in a major increase in utilisation of radiology in the emergency setting, impacting most significantly on the night shift. The number of scans being performed has also increased due to the rise in prevalence of the big three killers – heart disease, stroke and cancer.

The practice of radiology in India is advancing in leaps and bounds in keeping with these trends (although mostly in urban areas). With the proliferation in private hospitals, and the entry of investors who see healthcare as the next big thing, even the most expensive imaging technologies are finding ready buyers. Institutions such as the government and the military are also making huge investments in radiology. As a result, the latest imaging technologies are being introduced in India almost simultaneously with the West, a dramatic change from the situation in the 1980s, when I was training at the All India Institute of Medical Sciences (AIIMS), New Delhi, at which time the imaging technology gap between the East and the West was in the range of a decade. During my post graduation, the radiology department at AIIMS did not have an MRI scanner, although the technology had been available for over a decade in the West.

In rural India, the situation is dismal. In many situations, a patient has to travel hundreds of kilometres, simply to get a diagnosis. And without an accurate diagnosis there can be no effective therapy. While in many smaller towns and district level hospitals, there is imaging equipment in the form of ultrasound and CT scanners, there is frequently no radiologist to interpret these scans, given that most radiologists are congregated in the metros. This skewed distribution of radiologists results in delayed diagnosis for literally, millions.

To further worsen the situation, radiology training programmes have not grown in proportion to the increasing demands for radiologists, and of late a shortage of radiologists has become frighteningly apparent. In studies performed in the US at the turn of the millennium, this shortage was estimated to be as high as 20 per cent. And the US has about 25,000 radiologists for a population of 200 million. Contrast this with the situation in India where we have only 10,000 radiologists for our population of a billion and it becomes evident what a crisis faces us in the impending future.

Although most radiology departments in the West are today digital and filmless (and more efficient to run, as a corollary), the practice of radiology in India is largely a film-based practice, divided between hospital-based radiology departments and outpatient imaging centres. Both have traditionally functioned in a relatively inefficient manner. A radiologist is required to be physically present at each hospital and at each imaging centre in order for reporting to be carried out (While in actual fact a radiologist's physical presence is necessary for performing procedures such as biopsies, the process of reporting of radiology scans in the digital age does not require the radiologist to be in the hospital for reporting of the scans, as the images can be electronically

transmitted to the exact location of the radiologist over a broadband network). X-rays and scans even when digitally acquired, are still printed on expensive hardcopy film based on the preference of both patients (who are not satisfied with a CD) and physicians who are still used to putting a film on a viewbox.

Although teleradiology was reportedly first pioneered in Boston in the 1960s, it was only in the 1990s when it really took off in the US. This was a result of three trends: the rapid deployment of broadband telecommunications; the establishment of the DICOM standard, which allows all medical imaging; and the development of web-based PACS systems, the technology that enables the digital storage and electronic transmission of medical images. Essentially, this meant that radiology scans performed anywhere in the world could be interpreted from anywhere else in the world where there was broadband connectivity.

Around the turn of the millennium, when we returned to India and set up our company, broadband Internet was still an expensive and scarce luxury. BSNL was the only provider, and the backbone of a commercial broadband Internet was the so-called leased line, a copper wire connection over which broadband was sold in multiples of 128 kbps, and required a great deal of paperwork, with a long waiting period of 3-6 weeks for installation. Reliability was abysmal, with decrepit infrastructure at the local exchanges and dependence on telephone linesmen to address critical outages. And of course, few if any hospitals had any kind of Internet connectivity or IT infrastructure. Those that did typically had a very low bandwidth connection (64 kbps) that was meant for research or as a library resource.

Another challenge was related to the persistence of legacy non-digital radiology systems, which required a digitiser or some type of frame grabber to capture the images. This added another level of complexity to what was already a clunky system to begin with.

In summary, the pre-Internet era of radiology in India, was a time of relative inefficiency where the reporting of diagnostic scans proceeded at a sedate pace dictated more by constraints of infrastructure and process, rather than true attention to the exigencies of patient care. With the relatively slow adoption of IT and ITES by hospitals in India, the situation is to a large extent still crying for change.

At the time when we started TRS (Teleradiology Solutions) in 2002, teleradiology was a totally unheard-of concept in India. In fact, "Terrorradiology" was what one linguistically-challenged vendor called it!

### Offshoring teleradiology: First steps in India

In the United States, where I was training in the 1990s, teleradiology first began to make an impact towards the end of the millennium when more and more hospitals started to realise its benefits, especially in emergency night support. At Yale New Haven hospital, where I did my residency and fellowship (and then worked in the faculty), I had the opportunity to observe the process first hand. At night, we reported CT scans for the veteran's hospital across town, which were electronically transferred to us. On trips to India, I had seen the burgeoning software/out-sourcing industry and realised how the night shift for any US operation could be effectively performed from high tech locations such as Bangalore. It is when reporting scans at 2 am in the Yale emergency room that the idea struck me that the same could just as easily be done for emergency radiology reporting in the era of broadband Internet. While at Yale, I conducted some research into the use of compression to speed up image transmission over the Internet.

I returned to India in the summer of 1999, my wife Dr Sunita Maheshwari, and I having made a trip a year before and decided that Bangalore was to be our new home. We settled down in an



apartment in Richmond Town and my wife, a pediatric cardiologist, immediately found a position at a well-known cardiac hospital in the city. As a US board certified radiologist with two fellowships, I thought it would be easy for me to find a good opportunity as well. I was wrong. The hospitals at which I applied showed little or no interest, and in some cases seemed downright suspicious of my motives in leaving the US and returning to India. "Visa problem?" was a common response. Both teaching as well as corporate hospitals showed similar disinterest.

The chairman of the department at Yale University School of Medicine had tried to convince me to stay on and not return to India. I had kept my faculty appointment and since things were not working out in Bangalore, I continued to travel to New Haven, CT and work/teach there for periods of 1-2 months, interspersed with long periods of professional inactivity in Bangalore. During one such visit to Yale, I mentioned during a conversation with the chairman the possibility of my reading scans for Yale for India. He was intrigued and interested, though cautious. We decided to first undertake a feasibility project and see if it would work. Back in Bangalore, I rented an office space and bandwidth at a medical transcription company on Richmond Road and conducted a month long study during which I reported scans in parallel with the radiologist at the hospital in Yale. Interestingly, the results showed commensurate accuracy between my reads and the onsite radiologists. The study was published in the literature and presented at an international meeting in San Francisco. At the end of the presentation, the session moderator asked "How much do you intend to charge for your services?" I knew then that we had arrived.

Another article published with the department at Yale had to do with a clinical project wherein I was reading scans that remained unreported at the end of the workday at Yale. This project went off to a successful start but then fell apart because of internal criticism at Yale against the thought of their outsourcing their scans "to India". Being still on faculty there I failed to understand what the fuss was about, but when the chairman called to tell me he was ending the project due to the sustained opposition I realised how serious the matter was. The end of the project came as a shock but we girded our loins and having now seen the true potential of what lay ahead, registered TRS as a company in Feb 2002 sinking our life savings into the venture. My wife, the true entrepreneurial co-founder of the venture worked shoulder to shoulder with me at every stage and provided a critical non-radiologic complement to my own radiologic skills, allowing me to focus on the quality of the reporting.

### The Journey

The company was launched from our home office, with two computers, two employees and a broadband connection. We also registered with the Software Technology Parks of India (STPI) which helped us greatly in navigating through the unknown waters. A website was launched with the princely investment of Rs 1,000 and immediately started to receive hits. This prompted us to take the next plunge and invest in a robust insurance policy that covered us in the US, something critical for our growth.

The USP of our organisation lies in creating a hub of excellence from where we can report a scan performed anywhere in the world, such as in the US, within 30 minutes, and in some cases as low as 15 minutes, as in cases with acute stroke. Our organisation leverages Internet-driven technologies to optimise the efficiency and reporting accuracy of our radiologists, wherever they may be, namely Delhi, Hyderabad, Mumbai, Phoenix, Las Vegas, Boca Raton and Jerusalem. We have created an environment of quality, which allows the highest level of diagnostic accuracy to be delivered to a patient wherever they may be, whether in Indiana or in Itanagar.

In the early years, work poured in from the US and the organisation grew, with several other radiologists moving back from the US to join our team, and some outstanding locally trained radiologists also joining us. Strategic alliances with growing teleradiology groups based in the US

proved beneficial and soon we were able to recruit additional staff and move to a larger rented office. An interesting development came early on in our evolution, in the form of an acquisition offer by a large Indian software company making a foray into healthcare. The offer was simple, join with us or we will crush you. We opted to take our chances, which to this date, is our wisest decision. The offer seemed tempting and risk-free at the time (but in retrospect was paltry and would have put paid to all entrepreneurial aspirations). Regardless, we remained resolute in our belief that the technology could be rented or acquired and that the understanding of the domain was the true determining factor for leadership. Another similar situation arose when one of our US based partners offered to buy us out and were incredulous when we declined (today they are the largest teleradiology provider in the world, having just acquired the second-largest).

Also during this time, a delegation from Singapore visited us to explore outsourcing of their X-rays and were greatly impressed by what they saw, resulting in another delegation visit and yet another until finally in December 2005, we signed an agreement with the National Healthcare group to report for three of their polyclinics. This relationship has grown year on year and today we report for 11 of their clinics and hospitals. In a speech in Parliament in 2006, none other a personality that Mr Lee Kuan Yew, first PM of Singapore mentioned our contribution in glowing terms, an event that greatly excited our partners in Singapore.

In November 2006, we moved to our own campus. Mr Nandan Nilekani cut the ribbon on the occasion and was kind enough to observe in his speech that our growth in our brief life of 4 years far exceeded that of Infosys over the corresponding period of their evolution. Having our own space opened up new opportunities and our impressive infrastructure brought us a host of luminary visitors from the Netherlands, Norway, the US, Singapore and many other parts of the world. Media attention also came with articles in virtually all the international press as well as a supportive editorial in the New England Journal of Medicine.

Over a period of time, our desire to give back to our own community grew. We used the Robin Hood model. Our mission was to use our profits engendered overseas to provide low-cost, high quality diagnostics to our own countrymen who needed it most. And so in 2006, we created the Telerad Foundation, a not-for-profit NGO that leverages our core competence and expertise gained in teleradiology to serve the underserved. Our first success story has been with the Ramakrishna Mission Hospital (RKMH) in Itanagar, Arunachal Pradesh. This hospital had the only CT scanner in the entire state of Arunachal Pradesh, and served a largely tribal population of 1 million people. They did not have a fulltime radiologist, as the only radiologists in the area were too busy performing ultrasound exams. In desperation, the Swami who ran the hospital located us on the Internet and contacted us on e-mail. We responded swiftly and in a short period of time, our IT team was able to establish a link between the hospital and our centre, using remote access tools over the Internet, without anyone having to physically travel to Itanagar. The experiment proved hugely successful and we were soon reporting 15-20 scans a day for RKMH, which prompted the Swami to send us warm letters of thanks, which made all the effort put in more than worthwhile. And even more happily, the PM's office authorised the installation of an MRI scanner at RKMH, which also now sends us MRI scans to report.

We also realised that being fundamentally academic radiologists, our other passion lay in teaching. We remained academic as an organisation, partly motivated by the need to always be on the cutting edge of quality (in order to compete against the "3rd world" perception of us) – however there was also a desire to extend our reach to a wider audience. The Radgurukul training centre was born in March 2008 and inaugurated by Ms. Kiran Mazumdar Shaw, with its state-of-the-art auditorium infrastructure that permits lectures from a speaker anywhere in the world to be delivered in real time to our audience. Also, around the same time, was born the teaching website Radguru.net, which allows us to share our own learning with radiologists across the globe. We



realise that while teleradiology may improve reporting efficiencies in the short term the only viable long term strategy to alleviate radiologist shortages is to train radiologists in large numbers. The use of e-learning tools, such as videoconferencing and the teaching website are in sync with our use of the Internet as a means/medium for efficient information dissemination. The International PACS and Teleradiology Symposium that we organise each year is an effort to bring about greater awareness on these subjects to both healthcare providers and industry vendors.

Teleradtech is our newest project/venture. The roots of this technology company lay in our early realisation that although PACS systems abounded in industry, there was no effective RIS-workflow solution for an organisation such as ours, which had radiologists and client hospitals distributed unevenly all across the world. So we had to develop our own. We did this by recruiting a software team and providing them with a detailed description of what we were looking for. The product that emerged gave us our own workflow platform, which served us well and could also be rapidly customised to meet our evolving needs. Eventually the realisation dawned that our product, having been developed 'by and for radiologists' was truly a highly marketable commodity, one that many other evolving teleradiology groups would find greatly beneficial to their operations. The only questions were 'who would iron out its bugs, and who would market it?' The answer arrived in the form of a former chip design senior software executive, keen to switch to a more 'happening' sector of industry. In a very short period of time, Ricky Bedi and his team were able to take our homegrown RIS and turn it into a sleek and versatile platform called RadSPA, and several sales have ensued.

Other sectors and segments continue to present themselves as new business opportunities, for example, the process of interpreting scans for clinical pharmacologic trials, the opening up of the reading market in Europe, and research partnerships with blue chip technology companies such as GE and Siemens that provide us with the opportunity to contribute to new imaging technology development.

We are proud to say that we have 3.2 million scans reported in total to date. We are the first and the largest teleradiology company in India, the first Indian healthcare organisation to provide US hospitals with nighthawk services, the first Indian healthcare organisation to be accredited by the Joint Commission and the Ministry of Health, Singapore, and the first healthcare company in India to which Singapore outsourced any of its healthcare requirements. We are rated among the top three teleradiology organisations in the US by the 2010 KLAS survey, which sets the industry standards and benchmarks. We were also selected by the US Consul General as an innovative Indian company to be presented to US President Barack Obama on his 2010 visit to India.

### Contributions and Challenges

Primarily, I feel that our organisation has contributed to India's image in the media as a high-end telemedicine-teleradiology hub, providing cutting edge radiology reporting services to US and Singapore hospitals. Secondly, by creating the Telerad Foundation that provides reporting services free of cost to hospitals in remote parts of the country, we have provided access to the highest quality of healthcare to patients in remote locations, hitherto deprived of quality diagnosis. Essentially there can be no treatment without correct diagnosis, and the Telerad Foundation aims to ensure that every patient receives an accurate diagnosis for an imaging study performed. Finally, by creating a training facility that disseminates training in radiology, radiologic technology, and teleradiology to medical graduates, postgraduates and technologists we have provided an infrastructure for increasing manpower capacity within our country in areas of demonstrated shortages.

The first major Internet-related challenge we face is the high cost of broadband Internet in India. The profusion of Internet Service Providers (ISPs) has, in recent years, decreased the pricing but

it still remains high relative to the West. For us to remain competitive to Western organisations, these costs must come down.

Second, low Internet penetration in remote hinterlands, where teleradiology services are most needed, and can make the greatest impact – last mile connectivity is where the challenge is greatest, and in this regard, WiMax and 3G wireless broadband services can act as a game-changer.

A third significant issue is that of unreliable infrastructure and town planning, for example, cutting of underground cables due to unauthorised digging, or construction of a high-rise building that obstructs line of sight from a radiofrequency tower. Frequent power outages resulting in the need for backup generator and UPS, increase the cost of doing business. Improved urban infrastructure, better town planning and reliable power supply will all go towards improving our service delivery greatly.

### Internet Growth in India

There are five key developmental stages of Internet growth in India. The first key development in my opinion was the end of the BSNL monopoly, and the entry of competition. This had immediate impact in terms of reducing costs and improving customer service, both of which are critical in an environment where we are directly competing with western-based organisations.

The second trend was in the form of the replacement of copper with optical fibre cables. I see this as being another major step forward, in that the speed of data transfer was increased and at the same time, the reliability of uptime was increased several fold.

The third trend was related to the availability of low cost consumer broadband Internet availabil-

### The Lighter Side: Anecdotes and Humour!

A) Reading US scans from India – that's crazy!

This was my wife's initial response when I called her from Chicago to tell her I had potentially found our first client. The deal never actually happened, but we had received sufficient inspiration that were on our way.

B) An interesting incident I recall in the early days was when I was working with Yale and my BSNL Internet line went down. I had to go to the linesman's house and pull him literally out of his house in his lungi with his toothbrush in hand, and shove him to the telephone exchange, where he reluctantly reset my modem!

C) Bangor Maine? Get out of here!! In the first few months after we started, I had this amusing conversation with an ER physician on the other side of the world. He asked where I was. I braced myself and responded Bangor, ME. He asked: "Bangor Maine?" when I repeated no Bangor, ME. India. There was a moment of awkward silence and then he

said, "Get out of here!" I have had similar responses many times but none so evocatively phrased as this one.

D) You said no to Tom Friedman?! When we had recently set up, Tom Friedman came to India to research his book 'The World is Flat' and develop a TV show around the theme of India Shining. Nandan Nilekani called me to tell me that he had suggested to Tom that he speak with me and I readily agreed. However, one day my phone rang and it was a young and persistent female who informed me that Mr Friedman was on his way to meet me with his TV crew in tow. The anti-outsourcing movement was at its peak in the US media and I could not think for a moment that any good could come to us out of such a TV show. So I called the lady back and politely informed her that I couldn't meet Mr Friedman. A couple of weeks later I ran into Nandan and he asked me in stupefaction: "You said no to Tom Friedman?!" I could only smile in embarrassment back at him. Worse repercussions ensued.

when the book came out and I realized how big that interview could have been for us. Well, as they say, c'est la vie!

E) Email from client in Georgia. For now all administrative personnel of the hospital have been evacuated and all of us remaining are tending to the injured. Unfortunately there are a lot, and we are getting even more. We are being overwhelmed because we are just a small rural hospital and we are trying to do the best we can. I'll keep you posted. I just evacuated my wife and children but I will be here for now. The teleradiology project we started is becoming even more necessary now for us. I will keep you posted as much as I can as long as I have some communication channel but even this is wearing thin because a lot of cell towers have been bombed. May God be with us. Regards Konstantin



ity from home. In the year 1999, the only Internet access at home was using a dial up 56 kbps modem, after which the next alternative was a 128K ISDN line followed by the so-called 'leased line' at incrementally higher cost. The availability of a 2 mbps home Internet connection has made a huge impact on the healthcare sector, allowing for decentralisation of its staffing and innovative uses of telemedicine.

From the perspective of our niche industry, the overall success story of BPO/call centres, resulted in an increasing credibility of the offshored model and an understanding of how this could be both effective and cost-effective, which impacted in the form of increased awareness and acceptance of the model.

Finally, the advent of mobile broadband and availability of high speed wireless cards allows for Internet access from anytime anywhere, making instant telemedicine a true reality.

### India's global position in the Internet Age

India's strengths, which give it a unique advantage in the globalised Internet era lie in its large English speaking population, its relatively lower wage base allowing for a significant cost advantage, and in its large number of engineering and computer training (and also medical) colleges. The STPI, an organisation that allows IT-enabled services to grow and flourish by providing assistance at all levels to companies in this space, is an invaluable asset to companies such as ours.

The biggest Achilles' heel of our country is currently our poor infrastructure, manifesting itself as power outages, or crowded streets with poor public transport. Periodic strikes and bandhs are a scourge that destroys our credibility, given that we are a mission critical operation running 24 x 7. When employees fear for their security to come to work, operations are affected and the company loses credibility on the international stage.

I see Telemedicine, specifically Teleradiology as a big opportunity for India in this time of physician shortages and specifically radiologist shortages. Distance education -if effectively implemented, can address the shortage of trained teachers and extend the reach of teaching programmes to a large extent. Here again there lies great opportunity for India, particularly in the healthcare domain, given the critical shortages of sub-specialist teachers in most medical specialties. Healthcare IT development is another growth area with tremendous potential, given both growing domestic as well as international requirements.

Some of the risks to India include potential changes in US federal policies in order to limit outsourcing by US corporations. Rapidly rising wages in India are another source of concern in that they effectively make outsourcing non-competitive, given other infrastructural challenges that increase company overheads. Finally, in terms of healthcare delivery, there is the issue of malpractice risk - which is not insignificant when delivering high-end services to litigious regions such as the US.

### Telemedicine organisations in India

Organisations such as Apollo Hospitals have done good work providing primary care telemedicine services to some of the poor and deprived districts of Andhra Pradesh. Aravind Eye Hospital has a teleophthalmology programme that allows for early detection of retinal disorders in the field. And the Asia Heart foundation conducts telecardiology projects with coronary care units across the country, allowing for the effective treatment of heart attacks even in the periphery. RXDX centre is partnering with Cisco to deliver quality healthcare to people of Raichur district using the highend Cisco teleconferencing platform.

Our experience has been that the business model for telemedicine in India has still not matured and so it is difficult for providers to sustain the costs of infrastructure delivering telemedicine services over time (in contrast the CSR or Robinhood model works perfectly well, as in the case of the Telerad Foundation). The fundamental lack of awareness of the potential of telemedicine among potential users is a significant barrier to its growth. Local politics also plays a role, and the protectionist attitude of some physicians (who believe that telemedicine will result in a loss of revenue) is a barrier to the growth of telemedicine services. Finally, technology and infrastructure issues such as unreliable bandwidth can result in significant loss of credibility to telemedicine programmes, especially those that deal with emergencies or are otherwise mission critical.

### The Road Ahead: The Next 15 Years of the Internet in India

In the next 15 years, the Internet will begin to play an important role in healthcare delivery in India, as well as in enabling our country to provide services globally. Healthcare portals will take on greater role in providing information related to health issues and in connecting users to providers. Telemedicine over the Internet will provide us with the opportunity for virtual consultations without stepping outside our homes. Medical education will be transformed as more and more training will become available online. The government will benefit through public private partnerships with organisations such as ours that maximise the reach of the Internet for both healthcare delivery as well as training.

Organisations such as ours provide physicians trained overseas an opportunity to return home secure in the awareness that they will continue to have the same level of professional practice and remuneration that they have been used to while they were in the West. In the past many radiologists hesitated to return to India from the US because of such concerns. The standard of radiology practice in our country will be benefited by the learning brought back by these returnees.

India stands to contribute in no small measure to the overall healthcare metrics of the world, given our tremendous manpower resources. The key challenges lie in training effectively and efficiently and in overcoming the infrastructural obstacles that we face today.

### Recommendations for the Future

I would recommend to the policymakers that they should give priority to increasing the penetration of bandwidth and reducing its costs, including streamlining of the process by which broadband spectrum is allotted.

Additionally, policy makers should recognise and support the use of technology to teach and train paramedics, healthcare IT personnel etc., instead of remaining fixated on traditional classroom-based learning modules, which are limited in their reach.

Finally, policies should be formulated that allow resources available in India to flourish, i.e., niche companies with domain knowledge, rather than just working with large companies/firms, who already have established market share.

I would recommend that industry focus on technology and infrastructure for power generation, e.g. solar, wind energy and low cost computers so that technology usage in healthcare can be optimised by having power to run the computers.

Industry should also work on developing low cost telemedicine and teleradiology softwares, to bring down the cost of image transmission and make it affordable at the periphery.

Finally, the healthcare industry should work on low cost digitisers to enable digitisation of non

DICOM (analog) images from older legacy systems of which a significant number are still in existence and use. This will facilitate the growth of teleradiology.

Regrettably, the utilisation of the Internet by Indian medical schools is inadequate and sub-optimal to date. Students typically access teaching websites to get information, however, it is not in the form of an organised or structured programme. In this regard, two highly successful initiatives that may be mentioned are the Heartstrings e-learning module in Pediatric Cardiology, and the Radguru teaching website of Teleradiology solutions both of which allow the reach of learning to be extended through the length and breadth of the country and beyond.

My recommendation to educational organisations would be to seize the opportunity afforded by the Internet and to make education more accessible and of higher quality across the board. This must be in the form of acquiring e-teaching infrastructure, implementing formal distance learning modules, developing online content and engaging the students in the process of online study by educating and sensitising them.

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