

Ashok Jhunjunwala

Institute Professor, Department of Electrical Engineering

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Personal

Date of Birth June 22, 1953

Research Areas Tele communications, Computer Networks and Fiber Optics, Solar PV systems, ICT based Education & Health Care, Solar DC and Electric Vehicles

Positions Held

Employer	Period	Designation
Department of Electrical Engg. IIT Madras 600 036	1990 – Present	Professor
Department of Electrical Engg. IIT Madras 600 036	August 1998-July 2001	Head
Electrical Engg. Department IIT Madras 600 036	1981 – 1990	Asst. Professor
Electrical Engg. Department Washington State Univ. USA	1979 – 1981	Asst. Professor

Qualifications:

S.No.	Degree	University	Year
1.	B.Tech	IIT Kanpur, India	1975
2.	M.S.	University of Maine, USA	1977
3.	Ph.D.	University of Maine, USA	1979

Contributions

a. Academic Contributions

Prof Ashok Jhunjunwala has made enormous contribution in academic area. His research areas are optical communication, computer network, wireless communication, decentralized solar and Electric Vehicles, where he has significantly contributed in various dimensions. Over the last few decades he has looked at cost and affordability of various components of the Telecommunications and internet network, especially in Indian context. In recent times, he has made some significant contributions on solar-DC and battery systems for Electric Vehicles. He has published plethora of original research articles in peer-reviewed journals and authored several books and monographs. Till date he guided more than 70 MS & Ph.D. students. (*Details are given in Appendix 1*)

- (i) Prof.Jhunjunwala began his career working in the area of surface acoustic waves (SAW). Analyzing a piezoelectric half space, he discovered the “spectrum of waves that can be launched in a surface acoustic wave device using an inter-digital transducer”. He applied his theory on a large number of materials and identified the different materials in different configuration which would be useful for a variety of SAW devices. He continued his work on SAW devices with two of his PhD students. He did a similar analysis on planar bulk waves emitted through inter-digital transducers and then enhanced the analysis to scattering through as rectangular groove. Today his work is making a difference in the LTE-Advanced and other wireless communication systems.

- (ii) Recognizing that India would require utilizing his expertise in a variety of areas, rather than a single field, Dr. Jhunjunwala academic career kept evolving continuously, as he plunged into one area after another. He started working in optical networks, especially in fiber optic networks. While he participated in a number of development projects involving building fiber optic networks for railways, for internal communications within a tank, for high speed back bone telecom network and building fiber couples of different varieties, he at the same time worked on techniques involved in Fibre Optic Ethernet networks.
- (iii) High speed optical networks would carry a variety of traffic. Prof. Jhunjunwala therefore started examining issues involved in packetizing voice and carrying such real-time traffic on different networks. He also examined the issues of switching mixed voice and data traffic and worked on switching architectures, which would provide priority to real time traffic. Prof. Jhunjunwala continued the work on processor architectures and signal processing architectures suitable for different applications.
- (iv) Prof. Jhunjunwala had been examining various computational algorithms, especially for carrying out basic computations. His interest in optical signal processing architecture and the algorithms which would best utilize such architectures lead him to look at a variety of basic arithmetic techniques. He started taking an in depth look at some simple arithmetic techniques that was taught to him at his home in his earlier years. Revising these techniques, he put them together in the form of a book on "Indian Mathematics: An Introduction" [ISBN 81-224-0573-8, 1993]. He then started extending these algorithms for optical implementations. He continued the work on optical symbolic substitution as a strong candidate for implementing optical computing.
- (v) One of the unique work pursued by Dr. Jhunjunwala with his students was to take an in depth look at the Indian Railway Networks and coming up with electronics and communication techniques to significantly enhance the traffic throughput on the network. The Indian Railways is characterized by a large variety of Trains of different lengths and speeds. The differentials contribute to poor utilization of the network. The work involved enhancing the throughput by 5 to 8 times without adding new railway trades or changing the train speeds.
- (vi) Over the last several years, Dr. Jhunjunwala and his student have worked on wave length division multiplexed optical networks without wavelength converters. The through put performance of such networks would be far below than that involving wave length converters. As wave length converters in optical domain are not commercially available, the operators build the network without wave length converters or with much more expensive wavelength converters. The work figured out techniques to enhance the throughput of the network without wavelength converters almost to that of the networks with wavelength converters
- (vii) The most significant part of the academic work of Dr. Jhunjunwala is in the area of telecom networks, especially focused do bring down the costs of Indian telecom network to make it widely affordable to India. He has also worked on techniques which would enable the communication networks to reach rural India.
- (viii) In last three years, his major focus has been in the area of decentralized solar systems. He has pioneered a technology referred to as solar-DC system, which significantly enhances the overall efficiency of roof-top solar deployments, especially in small homes. Further, he has worked on innovative battery-system designs for Electric vehicles.

b. Innovations in Technology for Development

Going beyond conventional academic works, Dr. Jhunjunwala has used his thorough grasp of wide scientific and technological expertise towards transforming India. He has been involved on a variety of Technological and Business innovations in this direction.

- a) As the Indian **Telecom network expand to all parts of India**, Dr.Jhunjunwala has attempted to lead India in the following directions:
- One of his key areas of work has been the **development of corDECT Wireless Local Loop (WiLL)** in mid-90s, which paved the way for wireless communication system to replace wired communication systems at much lower costs. It was not only the lowest cost wireless system in the late nineties, its exchange and base station could work at 55° C and required less than 10% of power as compared to other technologies prevalent at the time. corDECT provides complete wireless access solution for new and expanding telecommunication networks with seamless integration of both voice and Internet services. His focus was on affordable telecom system design and taking the communication to rural areas. He was awarded Padmashree in 2002, for his work on wireless communication systems.
 - **Driving telecom to Rural Areas:** He had pioneered Rural Internet kiosks starting in 2000 and had helped set-up such kiosks in 15000 villages. These kiosks not only provided telecom services, but would use Internet to also take education, health services and financial services to rural areas. It was his work, which lead Government of India to set up rural Internet kiosk program throughout the country.
 - **Make India amongst a leader in Wireless Technology:** Towards this, he helped set up Center for Excellence in Wireless Technology (CEWiT), a public-private institution, focused on creation of Intellectual Property for the next generation wireless network. CEWiT has acquired numerous patents, many of which have been incorporated in 4G Wireless Technologies like 802.16m and LTE-A. He was also instrumental in setting up Telecom Standards Development Society of India (TSDSI), to take Indian patent to the world's standardization body, with ultimate aim of India becoming an exporter of IPR in telecom, as opposed to be an importer.
 - At the same time, he has contribute din creating industry which develops, manufactures and owns **Indian telecom product**. Tejas Networks in one such company and is at the fore-front of Indian product companies. It has 400,000 optical boxes deployed in Indian telecom network driving broad band.
 - He contributed to shaping an **electronic and telecom manufacturing policy** for Department of Telecommunications (DOT) and Department of Electronics and Information Technology (DEITY), which would strengthen Indian products and Make in India program. He recently chaired DEITY committee on usage of TV white-space for communications, especially to strengthen communication in rural areas and for IoT in smart cities.
 - He has helped push India's Broadband Telecom to urban and rural India over the last several years. He recently started helping DOT to extend fibre to every village at the earliest.
- b) **Digital Telecom Network** is a platform for a wide range of services besides data and voice communications. Dr. Jhunjunwala has been relentlessly driving Electronic payments over the last five years, not only for convenience and efficiency reason, but also because it brings transparency in society, as all electronic transactions are traceable. Besides contributing to banks adopting core-banking (as a member of BOG of SBI and IDRBT from 2005-11), he has been the founder and chairman of *Mobile Payment Forum of India (MPFI)*, a forum involving telecom and banking industry, technology industry, academia and Reserve Bank of India. He is also the chairman of Business Correspondent Network Manager's Forum (BCNM), which drives financial inclusion in the nation and chairman and members of numerous committees set up by Finance Ministry over the last few years. Much of this is being used today in Jan-Dhan Yojna.
- c) Dr.Jhunjunwala, has been focused on using **technology for Rural India** in a major way over the last decade and half. Dr.Jhunjunwala's work in promoting rural wealth generation through technology is founded on the belief that innovations alone cannot drive development. It is his view that technology innovations must be coupled by an active support of entrepreneurship and capacity building in rural areas. It is to further this objective that Dr. Jhunjunwala initiated the setting up of IITM's Rural Technology and Business Incubator (RTBI) under the behest of the Dept.of Science and Technology(DST).It is an incubator to design, pilot and incubate scalable rural inclusive business ventures. RTBI's mission is to facilitate the generation of wealth in rural India, by leveraging Information and Communication Technologies (ICT's) for social

Development. It aim stood this by encouraging young entrepreneurs to build companies with a rural focus and to mediate between urban enterprise and rural potential. The Incubation Sectors of RTBI include Education, Livelihood, Agriculture, Health, Financial Inclusion, Vocational Training and Energy. One of the first company it incubated, DesiCrew Solutions focuses on getting urban India to outsource its BPO-related work to rural areas, such that a BPO can be set-up in each village. This Dr.Jhunjhunwala believes will mitigate the wide spread rural-urban migration in the country and offer entrepreneurship opportunities in rural areas.

Product development: Dr.Jhunjhunwala and his incubated companies have been developing a series of products over the last twenty-five years, especially focused on low-income families. He helped Neuro-Synaptics develop India's first Telemedicine kit, to connect village folks to a city doctor, and enabled doctor to measure temperature, blood-pressure and ECG of the patient remotely. He helped Vortex developed a ATM machine, which would be three times less expensive than the existing ATM's and operated using three times less power. With his help, Intelizon developed low-cost efficient lighting systems. NM Works developed a network Management system, which competes with the best in the world. With Uniphore system, he developed an Indian language speech-recognition system, which is used for a wide variety of applications including financial inclusion. Its founder, Umesh Sachdeva, was named in 2016 by Time Magazine, USA amongst the top-ten Next Generation Leaders in the world (the only technology person to belong to this list).

Power and Energy: About three years back, Dr. Jhunjhunwala turned his attention to chronic power-problems of India; huge power-cuts and large percentage of homes unconnected from the power-grid and significant section of people's inability to pay for even-below-cost tariff.

- He pioneered solar roof-tops and DC power-line at home along with use of DC-powered appliances as an answer to these problems. This involves path-breaking use of low-voltage DC power-line (instead of AC power-line) at homes and offices and use of DC-powered appliances (instead of AC appliances). This unconventional approach significantly improves energy-efficiencies. A DC-powered BLDC fan and DC-powered LED light consume 40% of power that its AC counterpart consumes. All electronics (TV, laptops, computers, tablets, cell-phones, sound systems, speaker-phones), use only DC power. Overall, a home can save 50% of power used in these appliances with DC powering and these new appliances. Even the refrigerators / air-conditioners / washing machines will use BLDC motors in near future and will benefit from DC power. Further solar-PV produces only DC power. Batteries store only DC power. Keeping everything to DC saves huge conversion losses. The solar-DC system installs solar and replaces an inverter at home. The UDC system is a unique technology to provide a DC power-line from the power-grid at each home, in addition to the AC line. This can be made uninterrupted, so that even when power-cuts take place, only AC power goes and DC continues.
- He developed the solar-DC technologies along with multiple DC-powered appliances and commercialized them, He created ac on sortium of 7 companies (three established companies and four incubated companies) to develop different pieces of the solution. He then carried out scaled pilot deployments. The system enabled powering of off-grid homes using solar-panel of 40% size of conventional systems. Battery size got reduced to half and total cost of the system went down to about 40% of that of conventional system. The success of these deployments have lead to the Ministry of Power(GoI) to implement a scaled-pilot program to convert every home (100,000 homes) to have a DC line in four towns of the country and power all the off-grid homes (about 4000) in a district with solar-DC using technologies developed at IITM. These towns will have the first ones in the world to have DC line at every home and he thinks all homes in the world will follow this in the coming decades. His work on "Decentralized Solar Photovoltaic Power Generation and Distribution" has potential of transforming India's Power Generation and Usage in years to come.
- He has now extended the work from Green Homes to Green Building, where henot-only introduces solar-DC systems, but also bring in significant energy savings in air-conditioning in commercial buildings using a similar approach. The Variable Frequency Drive (VFD) based Air-handling unit (AHU) is already saving 30% of power. The Variable Air-flow Volume (VAV) that they have designed will further save more energy. A building automation system is being designed to optimize all these parameters

- He believes that India can get 50% of its power from solar by 2030, with the help of decentralized solar systems.
- d) In last couple of years, he has started to focus on **Electric Vehicles**. He believes innovations in electric motor and drive technologies, in battery systems and in cooling systems would enable India become a leader in this segment, especially with respect to smaller and affordable vehicles. He believes that in five years, EVs will cost as much as a petrol vehicle and would have much less operation costs. By 2030, India can replace all its vehicles by electric vehicles.

c. Industry-Academia Intervention and Incubation

When Dr. Jhunjhunwala returned to India in 1981, he found that there was no academia-industry interaction and entrepreneurs coming out of an educational institute were unheard of. Industry had very little R&D of its own and preferred to manufacture for a protected market by importing technology and know-how. Most goods were affordable only to a small section of the society.

- a) His first learning came from usage of lab-equipment for teaching at IIT. When he taught at Washington State University, a class of 50 students will have 25 (if not 50) lab kits, and the students will work on their own to carry out the experiments and learn. At IIT, these lab kits were imported and quite expensive. Thus even at IIT, only one or two experimental set-ups were available and the students worked in turn or they would just watch a demonstration. He recognized that this would severely constrain learning. He wondered, why these experimental set-ups and kits could not be redesigned to have much lower cost, so that 25 sets could be purchased by IIT. He took up this challenge and the first of the several kits that he designed (Fiber Optic Educator) has reached most of the 4000 engineering colleges across India and millions of students and faculty were educated using these. He continues to get royalty for this fiber-optic educator, some 28 years after it was first launched.
- b) He recognized that this problem was not confined to education alone. Most of the products were manufactured using licensed technologies from developed nations, and were affordable to only a small section of Indian society. Industry could therefore never scale. Services provided were limited to a few and the nation lived with shortages. Recognizing that the products and services have to be redeveloped at price-point affordable to a larger section of Indian public. This process required transformation in products and technology. He also recognized that this could not be done by Industry alone and a strong academia-industry collaboration was required. He did pioneering work in bridging this gap, culminating in the setting up of **IITM Research Park, adjacent to IITM**. This 1.2 million sqft space today houses about 60 R&D centers of Industries, working closely with IITM, thus creating an eco-system where faculty, students and industry professionals interact in a formal and informal manner. He believes that such interaction is the key to technological innovations and entrepreneurship. Over the next two years, this number is likely to touch 200.
- c) As Dr. Jhunjhunwala took up **development of lower-cost products**, Indian industry had very little internal R&D and was somewhat risk-averse. To introduce new products to the market, a different approach was needed. Start-ups and entrepreneurship were “discovered” in the Indian context to bridge this gap. Dr. Jhunjhunwala started incubating companies somewhat informally in the beginning, as Indian Academia did not encourage start-ups in 80’s and 90’s. He pushed Academia to recognize that start-ups play an important role in technical institutions and formulated the first set of processes for incubators in an institute. Till date, he has personally **incubated almost 100 companies**. A large number of technologies and products have been developed as a result. He heads IITM Incubation Cell and Rural Technology and Business Incubator (RTBI) today.

d. Technology and education Policy Initiatives

Dr. Jhunjhunwala currently is Chairman of Technology committee of *Security Exchange Board of India (SEBI)*, Bureau of Indian Standards *LVDC committee*, IEEE’s *LVDC forum for standardization*, *TV-White Space Committee* of Department of Information Technology (Government of India), *Technology Advisory Group for Electric Mobility* and whole set of many other Government committees. He is on the board of several public and private companies as well as educational institutes.

Dr. Jhunjhunwala is a Fellow of World Wireless Research forum, IEEE and fellow of all the four Science & Engineering Academies in India called INAE, IAS, INSA and NAS. He has received numerous S&T awards in India including the prestigious *Bhatnagar Award*. He was a member of Prime Minister's Scientific Advisory Committee from 2004 to 2014.

- a) As a member of various committees set up by MHRD (for example *Kakodkar committee on IIT and Kakodkar Committee on NIT and AICTE Review Committee*), Dr. Jhunjhunwala has been contributing to transforming and strengthening Technical education in India. Each of these reports are path-breaking and is in process of impacting education. He was also chairman of MHRD committee for *Quality Enhancement in Engineering Education (QEEE)*, and today drives a Direct to Students (D2S) program which delivers live course modules to about 125 engineering colleges spread over the country. About 30 course modules are delivered every semester. QEEE program is aimed at enhancing quality in engineering education all over the country. He is Chairman of Governing Council of College of Engineering, Trivandrum and is / was a member of Governing Councils of IIIT Hyderabad, IIIT Sricity, LNMIT Jaipur, DAICT, Gandhi Nagar, NIT Trichy and IITDM Jabalpur. He is also chairman of Electronics and ICT Academies DEITY. He is also member of IIT Council and IIIT Council today.
- b) Chairman of SAC-DC committee on Water: SAC-PM Report (2014) recognizes water as one of the most precious resource in India, which could lead tomorrow to water-wars. It deals with Technology interventions in the Water Sector. Starting with Large River Basins, it looks at water-bodies and Ground Water Recharge, Water in Agriculture, Reuse and Recycle of Waste Water and then look at water-distribution as well as drinking water.
- c) Till recently, he was Chairman of TAG-EM Committee. It looked into the ever rising pricing of fuel and its growing consumption, Department of Heavy Industry has set up a Technology Advisory Group (TAG for Electric Mobility) to drive, promote and scale the Electric Vehicles under the chairmanship of Prof. Ashok Jhunjhunwala. Work is going on developing electric 2-wheelers, three wheelers, four-wheelers, motors, Motor-controllers, Batteries and Battery Chargers.
- d) Chairman of TV White Space Committee: With digitization, we have got some spectrum chunk available as digital dividend. Hence this gives us a good opportunity to redefine the scope of using this spectrum in best interest of the nation. In order to do so, Department of Electronics and Information Technology (Deity) has set-up a committee under the abled Chairmanship of Prof. Ashok Jhunjhunwala. The committee explores the best use of this spectrum and has recommend different technologies feasible to utilize this spectrum dividend.
- e) Chairman Technology Committee, SEBI: As a Chairman of Technology Committee of Security Exchange Bureau of India (SEBI), he looks at technologies for insider-trading and technologies that give unfair advantage to one over the other. It looks at Technology issues involved in Business Continuity and Risks associated with any unwarranted event /attack.

Administrative Experience

- Chairman, Technology Advisory Group, SEBI, 2014 -present
- Chairman, TVwhitespacesPolicyAdvisoryCommittee, DIETY, Govt. of India, 2015-Present
- Chairman, Technology Advisory Group – Electric Mobility. DST and DHI, from 2014 -2016
- Chairman, MHRD Committee for Reforms in Technical Education in Institutes other than IITs and NITs, 2013 –present
- Co-chairman and Faculty In-charge, IITM Incubation Cell, 2013 -present
- Chairman, HTIC, 2012-present
- Chairman, TIFAC's vision 2035 for Electronics and IT, 2011-present
- Faculty In-charge and Board Member, RITCOE-Telecom Centre of Excellence (TCOE) from September 2009 –present

- Chairman and Faculty In-charge, Rural technology and Business Incubator (RTBI), 2007 - present
- Faculty In-charge and Board Member, IITM Research park, 2000 –present
- Head, Telecommunications and Computer Network group at IITM: 1993 –present
- Indian coordinator of 15 institute Indo-UK project on Communications, 2009 -2015
- Chairman, Committee to formulate rules and strategy for Telecom Manufacturing promotion Fund, Telecom Research Promotion Fund and Telecom Entrepreneurship Development fund,2012-2013
- Chairman, Technology Advisory Committee of SEBI,2012-2013
- Chairman, Committee to draft 12th Plan for Telecom Research, Development and Innovation2011-2012
- Chairman,DITcommitteetodraft12thPlanforElectronicsR&Dandmanufacturing,2011-2012
- Chairman, Technology committee of Board of SBI,2005-2011
- In-charge of Telecom facility on IIM Campus for several years,1993-2003.
- Head, Department of Electrical Engineering, IITM,1999-2002
- In-charge of Computerization work at IITM including Library Computerization, Academic Record Computerization and Telephone Bill Computerization,1992-1997.
- Head and Faculty In-charge, Guidance and Counselling unit, IITM,1983-85

Awards and Fellowships

- Foreign Member / Fellowship of the National Academy of Engineering from 23rd Feb 2018
- "Copper Excellence Award for Technology Innovation" from India Copper Forum on 8th Nov 2017
- The Guru” award from CEO India magazine, 28th July 2017.
- IEEE Spectrum Technology in the Service of Society Award to the solar DC technology, May 2017.
- “Leader in Energy Storage & Microgrids, by IESA, 12th January 2017.
- Eminent Engineer Award 2016 from Engineering Council of India (ECI), 4th April 2016
- Honorary Doctorate from Rajasthan Technical University, Kota(28thFebruary 2015)
- Life time Achievement Research and Development Award of IITMadras (17thApril 2014).
- AB.Rama Rao Technology Award by Indian Institute of Chemical Technology, Hyderabad in May2013
- Top Innovator of Top 11 Innovators Challenge Rockefeller Foundation &mHealth Alliance in December2011
- Dronacharya award by The IndUS Entrepreneurs(TIE),Chennai, November2011.
- J.C. Bose fellowship award by DST, July2010.
- Honorary Doctorate by ‘The University of Maine’, USA in May2010.
- ‘Bernard Lown Humanitarian Award’ for the year 2009, awarded by University of Maine Alumni Association,USA.
- IETE-M N Saha Memorial Award for the best application oriented paper (Titled “Analytical Performance Computation for all Optical Networks with Wavelength Conversion”) for2009.
- “Excellence in Science and Technology Award for 2008-2009” on January 2009 from Indian Science Congress
- “CII CONNECT 2008 Entrepreneurs Award” in the category ICT Ecosystem for the year2008
- “HonoraryDoctorate”fromtheBlekingeInstituteofTechnology,heldonSweden on October2008

- Fellow of IEEE, from November 2008
- Fellow of Indian Academy of Sciences, Bangalore from January 2007
- Fellow of the Wireless World Research Forum (WWRF) from November 2007
- IBM Innovation and Leadership Forum Award by IBM for the 2006
- Jawaharlal Nehru Birth Centenary Lecture Award by Indian National Science Academy for the year 2006.
- “For the Sake of Honour Award” by Rotary Club of Chennai for Working towards Taking Technology to Rural Areas for the year 2006.
- Skoch Challenger Award for the year of 2005 by Business India
- 27th IETE Ram Lal Wadhwa Gold Medal for outstanding contribution in the field of Electronics and Communication Engineering in during the last ten years by the Institution of Electronics and Telecommunication Engineers on 26th September 2004 at Ahmedabad.
- Shri Om Prakash Bhasin Foundation Award by Shri Om Prakash Bhasin Foundation for Science & Technology for the year 2004
- UGC Hari Om Ashram Trust Award – Outstanding Social Scientists: Science & Society for the year 2003 by University Grants Commission on September 1, 2004, New Delhi.
- “Outstanding Contribution to Knowledge Based Industries” by FICCI for the year 2002-03, New Delhi on 7th January 2004.
- Dataquest IT Path-breaker Award for the year 2003 on 19th December 2003 at New Delhi
- Outstanding Academician Award 2003 Instituted by Sarsawathi Ammal Educational Trust at Arunai Engineering College, Thiruvannamalai on 26th December 2003.
- Padma Shri 2002 for distinguished service in science, engineering, telecommunications
- H.K. Firodia Award for excellence in Science & Technology for the year 2002
- Dr. P. Sheel Memorial Lecture Award for the year 2001 by The National Academy of Sciences.
- “Rajasthan Shree” Award by Rajasthani Association, August 2001
- Silicon India Leadership Award 2001 for Excellence and Promise in Business & Technology Academics
- Millennium Medal by CSIR during Indian Science Congress held in January 2000 at Pune
- Fellow of Indian National Science Academy (INSA), New Delhi since 1999
- Fellow of The National Academy of Science, Allahabad since 1999
- Distinguished Alumnus by IIT Kanpur, September 1999
- For the Sake of Honour Award by Rotary Club of Madras Central for the year 1998- 99 towards the achievements in the field of Electronics, Telecommunications
- Shanti Swarup Bhatnagar Award for outstanding contributions in the field of Engineering Sciences for the year 1998.
- Dr. Vikram Sarabhai Research Award for the year 1997 towards the contributions and achievements in the field of Electronics, Informatics, Telematics & Automation
- Best Product – Fibre Optics Educator Kit at Elecrama 1996, Bombay
- 1st Prof. S.N. Mitra Memorial Award, IETE, 1995
- Fellow of the Indian National Academy of Engineering, India since 1994
- Best of the Show for Nova Switch 2400 Ex, InterOp + Networld’96, Las Vegas, USA
- “Bharat Asmita Vigyaan – Tantragaan Shresththa Award” for the best use of Science & Technology through Innovation by MIT Group of Institutions
- Copper Excellence Award for Technology Innovation

Membership and Chairmanship in Committees, Governing Boards and Advisory Boards

- Member of Academic Advisory committee of the Kendriya Vidyalaya Sangathan, New Delhi
- from 2016 –present
- Member of Council of the Indian Institute of Information Technology, New Delhi from 2015 –present
- Director of the Biotechnology Industry Research Assistance Council (BIRAC) / New Delhi from 2013-present
- Member of the “Risk Management Review Committee (RMRC)” Securities and Exchange Board of India (SEBI), Mumbai from 2013 – present
- Chairman, IIT committee for solar energy installation at IIT, 2013 –present
- Member, IIT Council, 2012 –present
- Member of Kakodkar Implementation Committee (MHRD) for IIT by MHRD, 2012-present
- Member of Kakodkar committee on NIT by MHRD, 2012 –present
- Member on the “Technology Vision 2035: Constitution of Apex Committee”, Chairman, Governing Council, TIFAC, New Delhi from 2012-present
- Member on the committee of “Policy Framework for Technology Based Education,” MHRD Department of Higher Education, New Delhi, 2012 –present
- Member for the “Constitution of Group to finalise Specifications and Standard Operating Procedures (SOPs) for all products of Payment System in India” Ministry of Finance, Department of Financial Services, New Delhi, 2012 -2014
- Member for the “Constitution of Group to work-out roadmap for facilitating Payment through Mobile Phones” Ministry of Finance, Department of Financial Services, New Delhi, 2012 –2014
- Member of the Board of Governors of The Sankara Nethralaya Academy, Chennai, 2012– present
- Chairman, IITM committee to mentor young faculty, 2012-present
- Chairman of SEBI Technology Advisory committee, 2012 –present
- Member of Governing Council of Indian Institute of Information Technology, Design & Manufacturing Jabalpur from August 2011–2014
- Member on the Standing Committee for NIT Council, MHRD, New Delhi, July 2011–2013
- Member, CSIR Society (2005-2008), 2011-2014
- Member on the Governing Council of the Entrepreneurship Development Institute (EDI), Tamil Nadu from October 2011 –present
- Member of Research Council, CEERI, Pilani, 1994 – 2000 and from October 2010-present.
- Member in National e-Governance Advisory Group of Department of Information Technology, New Delhi, 2010 –present
- Member of the Scientific Advisory to the Prime Minister (SAC-PM) from 2003-2009 and 2009 to 2014
- Chairman in the constitution of a committee to strength DBT- Indian Institute of Science Education And Research (IISER), New Delhi, 2009-present
- Member of the Advisory Board of Climate Healer Inc-USA. From October 2008 –2011
- Member of Research Advisory Committee of CEERI Pilani: 2008-present
- Member of an Inter- Ministerial Advisory Committee, Universal Service Fund (USF), Department of Telecommunications, New Delhi, December, 2002 –present
- Governing Council of AU-KBC Centre for Internet & Telecom Technologies, Anna University, Chennai, 2000 –Present
- Member of the Centre for Telecom Policy Studies (CTPS), IIM, Ahmedabad, 1998 -2006
- Co-Chair of National Task Force on Research, Innovation & Entrepreneurship, MHRD-AICTE-CII International Workshop on Industry-Institute Collaboration, March 2013

- Member of Judging Committee for the annual award 'Bharat Ratna Dr. C. Subramaniam Award' instituted by Indian Council of Agricultural Research for 2012,2013
- Chairman on the "Committee on micro-ATMs / PoS devices" to prepare the technology specificationsformicro-ATMs&PosdevicesinvitedbyDirector,MinistryofFinance,Dept. of Financial Services, New Delhi, October2011
- Chairman on the "Committee on ATMs to prepare the technology specifications for rural as well as urban ATMs", invited by Director, Ministry of Finance, Dept. of Financial Services, New Delhi, October2011
- Member on the "Constitution of Advisory Group online payments in India", invited by Director, Ministry of Finance, Dept. of Financial Services, New Delhi, October 2011 – 2012
- Member in the Constitution of Working Group for the formulation of Eleventh Five year Plan forDST,2011-2012
- Member of Advisory Council for the 'Entrepreneurship Development Institute' (EDI) that was established under the State Government of TamilNadu, Chennai,2011-12
- Member SEBI Technology Advisory Committee,2010-2012
- Member of Expert Committee constituted by the Department of Posts, New Delhi, 2010-12
- Member of Technical Advisory Group Member of the "PARADISO High-level expert group", Brussels,2009-2012
- Member of Kakodkar committee on IIT by MHRD on IIT,2009-11
- MemberintheTechnicalAdvisoryCommitteeconstitutedbytheDepartmentofScientific and Industrial Research, New Delhi,2008-2012
- Member on the "Emerging Markets Advisory Board (EMAB) for Microsoft Research India, New Delhi,2008-12
- MemberofExecutiveCommitteeoftheChennaiCentreoftheKrishnamurthyFoundation, India Chennai educational centre, October 2008 –2012
- Board Member of Government of India Department of Atomic Energy Variable Energy Cyclotron Centre, West Bengal . From September 2007 – 2009
- MemberofSwarnajayantifellowshipCommittee(SubjectEngineeringScience)2007-2008
- Member of Executive Council of the Jawaharlal Nehru University (JNU), 2006-2008
- Member in the Governing Council of "National Innovation Foundation", Council of Scientific & Industrial Research, New Delhi , 2005 -2012
- Memberofthe(TAG)forNREGA,MinistryofRuralDevelopment,NewDelhi,2005–2010
- Member of the Army Information Technology Advisory Board, Army Head Quarters, New Delhi, May 2005 -2007.
- Member of the UNESCO Expert Group on Natural Sciences Sub-Commission of INC for CooperationwithUNESCO",InternationalCooperationDivision,DepartmentofScience& Technology, New Delhi, 2005-2007
- Member to study the Australian Model of broadband connectivity and its uses in extending broadband connectivity to far flung areas, MIT, Department of Information Technology (International co-operation Division), New Delhi from December2005-2007
- MemberoftheBoardofStudiesinFacultyofInformation&CommunicationEngineering, Anna University, Chennai,2005-2008
- Advisory Committee Member at Nabard, Mumbai,2005
- Member of IT Task Force, Government of Rajasthan, Jaipur –2004
- Chairman of the Confederation of Indian Industry Tamil Nadu Task Force on Industry-Institute-Interaction,2003-2004
- Member of the Working Group on Flow of Credit to SSI Sector, Reserve Bank of India, Mumbai,2003-04
- Member of DST's Apex committee Science and Engineering Research Council, 2002 – 2007
- MemberoftheWorkingGrouponInformationTechnologySectorfortheTenthFiveYear Plan,2002-2007
- MemberoftheWorkingGrouponTelecomSectorfortheTenthFiveYearPlan,2002-2007
- Advisor on the Information Technology Committee of Directors of Punjab National Bank September, 2002 – 2005

- Member of the ICICI Venture's Advisory Board, Mumbai, 2001-2003
- Member of the Advisory Committee for Technology Information, Forecasts and Assessment Cell of the MIT, New Delhi, 2001 -2005
- Member of the Task Force for Information Technology, Government of Tamil Nadu, Chennai, 2001 –2005
- Chairman of the National Advisory Committee of ISRO, Ahmedabad 2001 – Present
Member in the Research Advisory Committee, Centre for Indian Knowledge Systems, Chennai, 2001 –2006
- Member of Committee constituted to evolve a Mission on Information Security by the Principal Scientific Advisor (PSA), Govt. of India, 2001 -2006
- Member of Development Council for Telecom Sector, Ministry of Communications, New Delhi, 2001 –2006
- Member of the Task Group for Industry-academia level links in Telecommunication between India and UK, 2001 –2006
- Member of the Science & Engineering Research Council (SERC) for the period, 2001-2007
- Member of Advisory Council of Nadathur S. Raghavan Centre for Entrepreneurial learning (NSRCEL), IIM Bangalore, 2001-2007
- Member of Shanti Swarup Bhatnagar (SSB) Prize Advisory Committees for 5 years in Engineering Science, 2001 –2015
- Member of the Working Group on Information Technology for Masses, MIT, New Delhi, 2000
- Member of the Panel of Experts for the Investment of UTI Venture Capital Fund, Bangalore, 2000 –2002
- Member of the Apex Committee of the Incubation Centre at IIT Kanpur, 2000 –2005
- Chairman of the Steering Committee of the Photonics Development Programme of MIT, New Delhi, 2000 -2006
- Member of the Knowledge Network for Augmenting Grassroots Innovation (KnowNet-Grin), IIM Ahmedabad, 2000 –2007
- Member of IT Task Force for Uttaranchal, Dehradun, 1999 –2000
- Member of the Board of Studies, University of Madras, 1999 –2002
- Member of Programme Advisory Committee (PAC) of Electrical, Electronics, and Computer Engineering, DST, New Delhi, 1999–2007
- Member of the Engineering Sciences Research Committee, CSIR, New Delhi, 1998 –2003
- Member on the Sectional Committee on Electronics & Communications of Indian National Academy of Engineering (INAE), New Delhi, 1997-98
- Member of 9th Plan Study Team on Electronics Materials, Department of Electronics, New Delhi, 1996 –1998
- Member of the Working Group on "HRDE", Department of Electronics, New Delhi, December 1996 –1997
- Member of Board of Studies in Electronics & Communication Engineering for Andhra University, Visakhapatnam, 1996 –2007
- Member on TIFAC committee for the panel on Electronics & Communication, New Delhi, 1995-96
- Member of the Task Force on Future Technology Forecast for India for 2020, TIFAC, New Delhi, 1995-96
- Member of the Task Force on Telecommunications, Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi, 1995 –1996
- Member of Research Advisory Committee, K.K. Birla Academy, New Delhi, 1995 –2007
- Member of Expert Committee in the area of Optoelectronics/Photonics, Department of Electronics, New Delhi, 1993 –1996
- Treasurer – PPST Foundation, 1985 –2000

Directorships in Public Companies

Sl.No.	Name of the Company	Tenure
1	Mahindra Rewa Electrical Vehicles Pvt Ltd	20.6.2014 – 20.1.2017
2	Intellect Design Arena Limited	17.9.2014- 3.2.2017
3	Exicom Tele-Systems Ltd	2002-2005and 31.12.2008–9.2.2017
4	Tata Communications Ltd	25.10.2008-27.1.2017
5	Tata Teleservices (Maharashtra) Limited	12.04.2007-10.2.2017
6	Tejas Networks Limited	07.03.2002-21.1.2017
7	Polaris Software Lab Limited	16.06.2001- 4.3.2016
8	Sasken Communications Technologies Ltd	22.11.2000 – Present
9	3i Infotech h Ltd	19.10.2006 – 15.09.2014
10	Bharat Electronics Limited	23.05.2006-22.05.2009
11	State Bank of India	15.09.2005-24.06.2011
12	I-Softtech Private Ltd.	13.03.2002-28.03.2007
13	HTL Ltd.	31.12.2002-10.07.2006
14	Shyam Telecom, New Delhi	01.01.2002-01.04.2006
15	Videsh Sanchar Nigam Ltd	01.08.2002- 01.08.2005
16	Bharat Sanchar Nigam Ltd	01.08.2002- 01.08.2005
17	Jataayu Software Private Ltd	03.03.2001-05.11.2007
18	Midas Communication Technologies Pvt. Ltd	April 2006 – 02.04.2009

Directorship in Non-Profit Organizations / Section 8 Companies/Venture Capital Company

Sl.No.	Name of the Non-Profit Organization / Institutes / Sec 25 Company	Tenure
1	Biotechnology Industry Research Assistance Council (Sec. 25 Co.)	25.06.2013 –Present
2	IITM Incubation Cell (Sec.25 Company now Sec. 8 Company)	03.12.2013 – Present
3	IITM Research Park (Sec. 25 Company)	24.04.2006-Present
4	National Internet Exchange of India (Sec. 25 Company)	19.06.2003-2015
1	Ventureast TeNeT Fund I	24.09.2001 – Present
6	National Research Development Corporation Ltd. (NRDC)	2006– 2009
7	Institute for Development & Research in Banking Technology (IDRBT) (Sec. 25 Company)	2005-2011

8	Vishal Bharath Comnet (Sec. 25 Company)	25.07.2000 – 2013
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Governing Councils of Educational Institutional

Sl.No.	Name of the Educational Institutes	Position
1	IIIT Sricity	Member (present)
2	Pandit Dwarka Prasad Mishra Indian Institute of Information Technology, Design & Manufacturing (PDPM-IIITDM) Jabalpur.	Member, Board of Governors (2010-2013)
3	Indian Institute of Information Technology, Design & Manufacturing, (IIIT D&M), Kancheepuram.	Member, Board of Governors (2010-2013)
4	International Institute of Information Technology (IIIT, Hyderabad)	Member, Governing Council (2010 – present)
5	Dhirubhai Ambani Institute of Information and Communication Technology (DAIICT)	Member, Board of Governors (2008 – 2014)
6	Information Technology Institute for the Tribes of India (ITITI)	Chairman, Board of Trustee (2000-present)
7	LNMI Institute of Information Technology (LNMIIT)	Member (2000 – 2014)
8	Research Council for Central Electronics Engineering Research Institute, Pilani (CEERI)	Expert Member

Member of Other Science, Technology and Innovation Organizations

Sl. No.	Name of the Trust / Societies	Position
1	Institute of Financial Management and Research (IFMR)	Member, Board of Governors
2	Centre of Excellence in Wireless Technology (CEWiT)	Member
3	Rural Technology and Business Incubator (RTBI)	Chairman & Member
4	Reliance –ITM Telecom Centre of Excellence (RI-TCoE)	Member
5	Mobile Payment Forum of India (MPFI)	Chairman & Member
6	Centre for Indian Knowledge Systems (CIKS)	Trustee
7	Foundation for Revitalisation of Local Health Traditions (FRLHT)	Member, Governing Council
8	Ventureast TeNeT Fund II	Member, Investment Committee
9	Translational Health Science and Technology Institute (under Societies Registration Act, 1860) (Society).	Member
10	Healthcare Technology Innovation Centre (HTIC) (Society)	Chairman

Patents

- Direct-In-Dialers for Decadic-Pulsing Telephone System, Patent Nos.173914 and173916
- A Long Range DECT System, PatentNo.198261
- A device for simultaneously providing permanent internet access and normal voice telephony to subscribers, Patent noNo.205227
- LAN Trainer Lab Apparatus, Patent No.No.216206
- A Direct Internet Access System, Patent No.208017
- Broadband Internet Connectivity, Patent No203512
- Filed for "NewMonics" an intelligent e-mail client, along with Raymie Stata of Analog Devices Inc, USA, 2003
- Filed for "A system for providing online transactions and customized information access" have been re-titled "A voice based system for providing online transaction and information access and retrieval", Application No: 1018/CHE/2007 dated 14/05/2007.
- Filed for "Use of Wi-Fi for Last Mile Broadband Access", Application No: 1980/CHE/2008 dated 14/08/2008.
- Filed for "Voice Authenticated Lock Mechanism", Application No: 2813/CHE/2009 dated 16/11/2009
- Filed for "Systems and methods for relating events to a date or date range selection" , Application No: 10/424,073, USA, 2009
- Filed for "Wallet Banking System" Application No: 10788146.8-2221 dated 01/09/2010
- Filed for "Synchronized TV viewing for Social Networks", Application No: 3747/CHE/2010 dated 08/12/2010.
- Filed for "Partial access to electronic documents and aggregation for secure document distribution", Application No: 481/CHE/2011 dated 18/02/2011.
- Filed for "Predictive texting for communication over Social Television", Application No: 1295/CHE/2011 dated 14/04/2011
- Filed for "Synchronized media in Social Networks", Application No: 1350/CHE/2011 dated 14/04/2011.
- Filed for "Digital Receipts Depository System", Application NO.61/CHE/2011 dated ***
- Filed for "Transport Control Protocol SMS", Application No: 312/CHE/2012 dated 27/01/2012
- Filed for "Method and System for Secure and Selective Access for Editing and Aggregation of Electronic Documents in a Distributed Environment", Application No.: 13/364,745, dated Feb. 2, 2012
- Filed for "Method and system for enhancing authentication performance by updating voice print", Application No: 5202/CHE/2012 dated 13/12/2012
- Filed for "A handheld device based television meter (LCTV)", Application No: 1149/CHE/2013 dated 15/03/2013
- Filed for "Providing uninterrupted DC supply to consumers", Application No: 1246/CHE/2013 dated 21/3/2013
- Filed for "Splicing Infrastructure-based and Ad hoc approaches for Efficient, Reliable and Secure Routing in Wireless Mesh Networks" Application No.: 4222/CHE/2011 date 21.6.2013
- Filed for "Providing uninterrupted power supply to consumers", Application No: 334/CHE/2014 dated 27/01/2014
- Filed for "A single remote control unit for controlling various devices", Application No: 663/CHE/2014 dated 21/02/2014
- Filed for "User perception-based prediction of graphical user interface", Application No: 2023/CHE/2014 dated 21/04/2014
- Filed for "Minimizing Losses in decentralized Solar-Dc deployments" A dated not yet published Application No: 5596/CHE/2014
- Filed for "Prediction of modality of interaction with an electronic device based on user

- impairment”, Application No: 2024/CHE/2014 dated 21/04/2014
- Filed for “Load management in off-grid power supply system based on load segregation”, 2015
- Filed for “Method and system for providing broadband connectivity using WI-FY Technology”, 05/Jul/2016
- Complementary Engagement of Battery Banks to Augment Life, Performance and Capacity of Overall Energy Storage System
Application No: 17154473.7 – 1804 / dated 9/05/2016
- Integrated Solar Heating and Cooling System for multi-storied Building using VFD driven AHUs and VAVs Application no 2016 41043899 dated 22/12/2016
- DC/AC converter to drive loads including inductive loads from Battery /limited power DC source Application no 2016 41043900 dated 22/12/2016
- Swapping of Chillers for Air-conditioning of Electric Vehicles Application no 2017 41009829 dated 21/03/2017

Technologies Developed and Commercialised

- CORDECT Wireless in Local Loop: Midas
- Lite-GSM: Midas
- Rural ATM: Vortex
- Digital Internet Access System (DIAS): Banyan Networks
- V-Connect - Ethernet to DSL convertor: Banyan Networks
- Remote Medical Diagnostics kit (ReMeDi): Neurosynaptics
- Weather Monitoring System: Neurosynaptics
- Blue-Bill – Telecom Billing for Internet & Voice based on Radius Server : Nilgiri Networks
- Minnow – Redundancy Server for small ISP’s: Nilgiri Networks
- Spars Area Communication System (SACS)
- Multilingual Office Package: CK Technologies
- Low-bit rate Video Conferencing (iSee): OOPS
- IP Soft-switch: Nextge
- CygNet Network Management System: NMSWorks
- Power-Connect: Amdale
- Mobile Banking Solution: Uniphore
- Managed Access Client: Novatium
- Mobile Interface to Enterprise Database (MINED): TCOE
- Voice-Lock: TCOE
- Auto-CAF: TCOE
- Welding Simulator: Skillveri
- Zonlight: Intelizon
- UDC: Uninterrupted DC Meter designed for homes to provide a minimum assured supply of uninterrupted DC power
- UDPM: Uninterrupted DC Power Management designed to assure a minimum power supply which is uninterrupted and to also aid in converting existing AC power within homes to DC power in order to increase and promote energy efficiency.
- GOA: Green Offices and Apartments: A powering solution which promotes the concept of Green Power at work places and residential complexes by the combined usage of solar power in the DC form.
- E-Book: Interactive e-book for different courses
- PRS: Pear Review System
- ExamApp
- Student Analytics
- QEEE: Quality Enhancement in Engineering Education
- Inverterless Solar Controller: Designed to leverage the efficiency of DC to power off-grid homes through solar energy; can also act as power back-up for grid-connected homes

Research Guidance

Ph.D's Guided		
Name of the student	Title of Thesis	Year of Award
Elizabeth Elias	Theoretical Analysis of Planar Bulk Acoustic Wave Devices	1989
R. Krishna Thilakam	Design, Flow Control, and Simulation for a High Speed Broad band Integrated Network	1989
K.V. Krishnamurthy	Some Issues in Processing Short Segments of Speech Signals	1991
R.K. Sanghi	Integrated Voice-Data Communication on Some High Speed Fibre Optic Networks	1995
Ranjani Parthasarathy	Some Arithmetic Algorithm and Implementation Considerations for Electronic and Optical Computing	1996
P.R.Goundan	Enhancing Throughput of Railway Network using information & communication technology	2002
P.Rajalakshmi	Techniques to enhance the performance of circuit –switched optical backbone networks	2008
M.S. Guided		
D. Manjunath	An Ethernet Interface for Tiered Networks	1989
Alok Raj	A User-Micro programmable Bit-Slice Processor to Emulate 16-Bit Processors	1989
Raghu Raghu	An Optical Slotted Ring Network for Point to Point and Packet Switched Communications	1989
R. Narayanaswamy	Computer Software Security Products	1990
K. Vidyashankar	A Fibre Optic-Token Bus Networks for Factory Automation Environments	1990
Mathew Thomas	A Packet-Switched Wireless Data Network	1991
Aradhana Mehta	ISDN in Indian Context	1992

Sanjay Gupta	Design of a Remote Station Unit for a TDM-TDMA Wireless Communication System	1993
Archana Rao	A Fault Tolerant Fibre-Optic Counter-Rotating Ring Network for Process Control	1993
Mahabir Prasad	Micro controller based Instruments for Manufacturing Industries	1994
RavindraBhilave	Fail-safe Multiplexer System for Railways	1994
K. Vijayalakshmi	DSP Based System For Implementation of JPEG Still Image Coding	1996
R. Lakshminarasimhan	Drop & Insert Multiplexer	1996
J. Magdalene Ratna	DSP Based Design of R.111 Multiplexer and Sixty Channel ADPCM Transcoder	1996
J. Sowdhamini	Interconnecting Ethernet LANs using Bridges	1996
G. Kalimani Venkatesh	ISDN Signaling Protocols Implementation and Application to LAN Interconnection	1997
Correya Oswald	Architecture for DECT Wallset and Base Station	1997
VasudevNambakkam	Statistical Multiplexer for Variable Bit-rate Voice Signals	1997
Abhay A. Joshi	Non-Coherent Receivers for DECT Air Interface Standard	1997
N. Ramesh	Distributed Control Network Using LON works	1997
R. Thirumurthy	Design And Analysis of FDDI-Ethernet Bridges	1998
N.P. Manoj	Design of the 8-port Ethernet MAC ASIC and the FDDI Uplink for Novaswitch, An Ethernet Switch	1998
E. Elwin Stelzer	Design of RMON for Large LAN Switches	1998
P.Dheenadayalan	Design & Performance of HDLC based Ring Network	1999
S.MaruthaNayagam	Analysis, Design & Development of a Base Station Distributor (BSD) for DECT WLL	2000
R.Ravi Kumar	Internet Communications in cordECT Wireless Local Loop System	2000
S.Durgesh	Design of a Wireless PBX as a Seamless Adjunct to a Wired PBX	2000
D.Sanjeev	Implementation on Validation of Link Layer Protocols in Access Devices	2000
S.Shankar	A Low cost, Compact Bedside ECG Monitor	2000

R.Sivan	Analysis and Design of Relay Base Station for DECT WLL	2000
R.Kumar	Mobility Management in the corDECT Voice/Data Network	2000
S. Mohamed Rabeek	Internet Access in CorDECT MultiWallset	2001
S. Koteeswaran	Design and Implementation of a low cost flexible remote access switch with modem	2001
S. Roopini	Design and implementation of Second Generation Fibre Access Network System	2003
R. Radakrishnan	Development of a Simulator tool for Data Communication on a Cable TV Network	2004
Josephine S	Design and implementation of VOIP-PSTN gateway.	2006
Vanchynathan A G K	Managed distributed architecture for affordable communication	2006
Ponnmozhi S	Design of hardware coprocessor for optical time domain reflectometer (OTDR)	2007
K Amutha	Design and Development of 48 port ADSL line card and loop diagnostics using DELT	2008
Karthikeyan P	Design and development of interactive digital cable access system.	2008
UmendarKoosam	A low bit rate design for handling video applications in thin-client systems.	2008
Sabari Girivasan S	FPGA based video display system for multimedia network computers.	2008
Benix Samuel	A process for optimal porting of embedded software on DSP	2009
Anup Kularni	Design and Implementation of Remote Lab on a DSP Cloud	2014
Saranya R	Energy Meters Interfacing Module for Building Management System	2015

Appendix II: List of Research Publications

JOURNALS

Full Name of All Authors	Title	Name of Journal, Volume, Year and Page
V.B. Jipson, J.F. Vetelino, Ashok Jhunjunwala and J.C. Field	Lithium Iodate – A New Material for Surface Acoustic Wave Applications	Proc. IEEE 64, April, 1976, pp 568-569
Ashok Jhunjunwala, J.F. Vetelino, and J.C. Field	Temperature Compensated Cuts with Zero Power Flow in $Tl_3 VS_4$ and $Tl_3 TaSe_4$	Electronics Letters 12, No.25, December, 1976, pp 683-684
W. Soluch, A. Duracz, R. Lec, Ashok Jhunjunwala, J.F. Vetelino and J.C. Field	On the Temperature Coefficient of Delay for Surface Acoustic Waves in LiO_3	Proc. IEEE 65, 1093 (1977)
Ashok Jhunjunwala, J.F. Vetelino, and J.C. Field	Berlinite a temperature – compensated material for surface acoustic wave applications	Journal of Applied Physics 48, 887 (1977)
J. Melngailis, Ashok Jhunjunwala, J.F. Vetelino, T.B. Road, R.E. Fahey, and E. Stern	Surface Acoustic Wave Properties of Fresnoite, $Ba_2Si_2TiO_8$	Applied Physics Letters 32, 203 (1978)
Ashok Jhunjunwala, M. Mukunda Rao, V. Rajendran, S. Kalyanaraman and Varun Jeoti	Effect of Ocean Surface on Optical Communication from Satellite to Submarine	Special Issue on Optical Communication, Journal of IETE, Vol.32, No.4, July/August, 1986, pp 331-337
B.B.Jha, V.Rajendran, Ashok Jhunjunwala and M.Mukunda Rao	Development of an Underwater Laser Communication Receiver	Journal of Optics, Vol.15, No.3, April, 1986, pp 79-87
Varun Jeoti, Elizabeth Elias and Ashok Jhunjunwala	Techniques for the Search of Optimum Planar Bulk Acoustic Wave Devices	IETE Journal, Vol.35, No.5, September, 1989, pp 298-304
Elizabeth Elias and Ashok Jhunjunwala	Analysis of Planar Bulk Acoustic Wave Devices	Electronic Letters, Vol.24, No.4, February, 1988, pp 240-242
G. Uma Maheswari, R.C. Sekar, Ashok Jhunjunwala and C. Eswaran	A Signal Processing Workstation on the VME Bus	IETE Journal, Vol.34, No.6, 1988, pp 435-440
G. Uma Maheswari, C. Eswaran and Ashok Jhunjunwala	Signal Processing Implementation with a Dual-Bank Memory	Microprocessor and Micro Systems, Vol.12, No.4, May, 1988, pp 206-210
R.K. Sanghi and Ashok Jhunjunwala	Implementation Consideration in Fibre Optic Bus Network	IETE Technical Review, Vol.6, No.2, March-April, 1989, pp 97-110
R. Krishna Thilakam and Ashok Jhunjunwala	Proposed High Speed Packet Switch for Broad band Integrated Networks	Computer Communications, Vol.12, No.6, December, 1989
Elizabeth Elias and Ashok Jhunjunwala	Theoretical analysis of planar bulk acoustic wave response	IEEE, Trans. UFFC, Vol.37, No.1, January, 1990, pp 2-12

Elizabeth Elias and Ashok Jhunjunwala	New Orientation for Bulk Acoustic Wave Devices	IEEE Trans, UFFC, Vol.37, No.3, May, 1990, pp 230-32
R. Krishna Thilakam and Ashok Jhunjunwala	Simulation Studies on proposed design of a broad band integrated network	IETE Journal, Vol.36, Nos.5&6, 1990, pp 446-445
Varun Jeoti and Ashok Jhunjunwala	A Volume Perturbation Approach to the Problem of Rayleigh Wave Scattering at a rectangular groove	IEEE Trans, UFFC, Vol.39, No.1, January, 1992, pp 127-137
R. Krishna Thilakam and Ashok Jhunjunwala	The Design and Flow Control of a High Speed Integrated Packet Switched Network	Computer Networks and ISDN systems, Vol.25, 1992, pp 241-257
Aradhana Mehta and Ashok Jhunjunwala	ISDN in Indian Context	Journal of IETE, Vol.39, No.2, March-April, 1993, pp 69-75
Mathew Thomas, Bhaskar Ramamurthi and Ashok Jhunjunwala	Design & Performance Evaluation of a Low Bit-Rate Packet Radio Networks	Journal of IETE, Vol.39, No.5, September-October, 1993, pp 281-290
Sanjay Gupta and Ashok Jhunjunwala	Fibre Optic Local Loop	Journal of Optics, Vol.22, No.2, 1993, pp 43-50
M. Archana Rao, B. Murugesh, Timothy A. Gonsalves, Bhaskar Ramamurthi and Ashok Jhunjunwala	A Reliable Fibre-Optic Ring Network for Process Control	International Journal of Optoelectronics, Vol.8, No.4, 1993, pp 477-491
Ashok Jhunjunwala and Ranjani Parthasarathy, Jegannathan	Computer Implementation of the Straight Division Algorithm	Journal of IETE, Vol.39, No.5, September-October, 1993, pp 317-322
C.D. Malleswar and Ashok Jhunjunwala	Exploiting Inter-Processor Communication for Fault Diagnosis in Multiprocessor Systems	Defense Science Journal, Vol.44, No.2, April, 1994, pp 99-104
Ranjani Parthasarathy and Ashok Jhunjunwala	Implementation Considerations of Symbolic Substitution in Digital Optical Computing	Journal of Scientific and Industrial research, Vol.54, January, 1995, pp 75-90
R.K. Sanghi and Ashok Jhunjunwala	Fibre Optics Ethernet Network for Voice & Data Communication	Journal of IETE, Vol.41 (2), March-April. 1995, pp 119-128
Ranjani Parthasarathi and Ashok Jhunjunwala	Symbolic Substitution by means of one-of many coding	Optical Engineering, Vol.34(5), May, 1995, pp 1456-1463
Ranjani Parthasarathi and Ashok Jhunjunwala	Modified Straight Division: A Computer Implementation of Multiple Precision Division	Euromicro Journal of Micro processing, Vol.41(3), June, 1995, pp 193-209
Bhaskar Ramamurthi and Ashok Jhunjunwala	Wireless in Local Loop : Some Key Issues	Journal of IETE, Vol.12, Nos. 5&6, September-December, 1995, pp 309-314
Ranjani Parthasarathi and Ashok Jhunjunwala	Techniques for Efficient Implementations of Symbolic Substitution using one of may Coding	Optical Engineering, Vol.35, No.10, October, 1996, pp 2830-2837

Ranjani Parthasarathi and Ashok Jhunjunwala	Design Tool for Symbolic Substitution	Optical Engineering, Vol.35, No.11, November, 1996, pp 3313-3322
Ranjani Parthasarathi and Ashok Jhunjunwala	Multiple-Precision Square-Root using the Straight Square-Root Algorithm	Journal of Systems Architecture, Vol.44, 1997, pp 143-158
Ashok Jhunjunwala, Bhaskar Ramamurthi	The Role of Technology in Telecom Expansion in India	IEEE Communication Magazine, 0163-6804/98, November 1998
Ashok Jhunjunwala	Can Telecom and IT be for the Disadvantaged?	Journal of Rural Development, Vol.17(2), pp.321-337 (1998), NIRD, Hyderabad
Ashok Jhunjunwala and P.R.Goundan	Evaluation of Relative Merits/Demerits of different Signalling schemes used at a Railway Station for an approaching train in Indian Railways today	IEEE Transactions on Vehicular Technology, 1999
Ashok Jhunjunwala	Looking Beyond NTP '99,	Journal of Bitcom India, Vol.I, No.1, January 2000, New Delhi.
Ashok Jhunjunwala, Devendra Jalihal and K.Giridhar	Wireless in Local Loop – Some Fundamentals	Journal of IETE, Vol 46, No 6, November-December 2000.
Ashok Jhunjunwala	Challenges in Rural Connectivity for India	ASCI Journal of Management, Vol 31(1&2); March 2002
Ashok Jhunjunwala	Drivers of Telecom in India	IETE Technical Review, Vol.20, No.4, July-August 2003, pp 279-287
Ashok Jhunjunwala	Fibre Access Network for India as India Poises for Growth	Special Issues of the IEEE Proceedings on Circuits, Devices and Systems, Vol.150, No.6, December 2003.
Ashok Jhunjunwala, Anuradha Ramachandran & Alankar Bandopadhyay	n-logue: The Story of a Rural Service Provider in India	The Journal of Community Informatics, Vol. 1, Issue 1, pp. 30-38, 2004
Ashok Jhunjunwala, Anuradha Ramachandran & Alankar Bandopadhyay	n-logue: The Story of a Rural Service Provider in India	The Journal of Community Informatics, Vol. 1, Issue 1, pp. 30-38, 2004
Ashok Jhunjunwala and Ms. Sangamitra Ramachandran	Rural Connectivity in India	Computer Society of India (CSI) Communications Magazine, September 2005
Ashok Jhunjunwala and Ms. Sangamitra Ramachandran	Role of Wireless Technologies in Connecting Rural India	Indian Journal of Radio and Space Physics. Volume 34. October 2005
Ashok Jhunjunwala and David Koil Pillai	India' s Mobile Revolution	IEEE Vehicular Technology Society News, November 2005
Ashok Jhunjunwala	The potential of ICT in Development: The n-logue experience	Pura journal, 2006. Gandhigram Rural Institute

Ashok Jhunjunwala, Anuradha Ramachandran, Sangamitra Ramachander	Connecting Rural India: Taking a Step Back for Two Forward.	Information Technology in Developing Countries, IIM Ahmedabad, Volume 16, No. 1, February 2006
Ashok Jhunjunwala & Sangamitra Ramachander	Novel Approaches to Rural Finance	ICT for Rural Financial Services, College of Agricultural Banking, (special issue on CAB) RBI. April-June issue 2006.
Ashok Jhunjunwala, H. Ramachandran, K. Giridhar, A. Jhunjunwala and M. Subramanian	Convergence and India – The TeNeT Group Perspective	IETE Technical Review, Vol. 23, No. 4, pp 221 – 230, July – August 2006
Ashok Jhunjunwala & Sangamitra Ramachander	Enabling Rural Development Through Telecom	Kurukshetra, Ministry of Rural Development, Annual Issue, October 2006
Ashok Jhunjunwala	Guest Editorial Rural radio communication – The Indian perspective	Indian Journal of Radio & Space Physics, Vol.36 June 2007. Guest Editorial
Ashok Jhunjunwala	Next generation wireless for rural areas	Indian Journal of Radio & Space Physics, Vol. 36, June 2007, 165-167.
Ashok Jhunjunwala David Koil Pillai & Bhaskar Ramamurthi	Broadband to Empower Rural India	IETE Technical Review, Vol 24, No 4, July-August 2007, pp 195-201
P. Rajalakshmi and Ashok Jhunjunwala	Wavelength reassignment algorithms for all-optical WDM backbone Networks	Optical Switching and Networking, vol. 4, pp. 147 – 156 , November 2007
P. Rajalakshmi and Ashok Jhunjunwala	Routing wavelength and time-slot reassignment algorithms for TDM based optical WDM Networks	Computer Communications, vol. 30, No. 18, pp. 3491-3497, December 2007
P. Rajalakshmi and Ashok Jhunjunwala	Analytical performance computations for optical networks with wavelength conversions	IETE Journal of Research, vol. 54, issue 1, January – February 2008
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Ashok Jhunjunwala	Project UDC: Getting Indian homes to be free of black-outs	INDO – US Project Meeting, National Renewable Energy Laboratory (NREL) / Colorado, Denver & 14.06.2014
Ashok Jhunjunwala, Jayalakshmi Umadikar, U. Sangeetha, M. Kalpana, M. Soundarapandian, Suma Prashant	mASK: A Functioning Personalized ICT-based Agriculture Advisory System Implementation, Impact and New Potential	Proceedings of the IEEE Region 10 Humanitarian Technology Conference 2014 (R10-HTC), Chennai / 6 th -9 th Aug. 2014
Ashok Jhunjunwala, Tamaswati Ghosh and Suma Prashant	Flowering up of Start-up Ecosystem in India and Funding Challenges	2014 IEEE Region 10 Humanitarian Technology Conference (R10-HTC),Chennai /6 th -9 th Aug. 2014
Ashok Jhunjunwala	Technology, Economics and Policy Interface	CPR South 2014 Conference Research ICT Africa/ Maropeng, South Africa & 10.09.2014 – 12.09.2014
Ashok Jhunjunwala, Sara Eriksén, Jenny Lundberg, Suma Prashant	Transforming Healthcare Delivery in Sweden and India	Transforming Healthcare Delivery in Sweden and India Workshop Paper, Participatory Design Conference (PDC), October 2014, Namibia

Ashok Jhunjunwala, Lakshmi Narasamma, Krishna Vasudevan, Bhaskar Ramamurthi, Prabhjot Kaur.	Decentralized solar dc power and smart load management to enable 24 x 7 power for Indian homes	Activities on Smart city Workshop in Asia. Institute of Electrical Engineering of Japan (IEEJ) March 31, 2015. Pg: 39-42.
Ashok Jhunjunwala, Swetha Bharati K	Implementation of Machine Learning Applications on a Fixed-Point DSP	28 th Canadian conference on electrical and computer engineering (CCECE2015). 3-6May 2015, Halifax, Canada
Ashok Jhunjunwala,	Technological and Deployment Challenges and User-Response to Uninterrupted DC (UDC) deployment in Indian homes	IEEE First International Conference On DC Microgrids / 7 th -10 th June 2015 / Atlanta USA
Sudeep Jain, Ashok Jhunjunwala	Solar-DC Deployment Experience in Off-Grid and Near Off-Grid Homes: Economics, Technology and Policy Analysis	IEEE First International Conference On DC Microgrids / 7 th -10 th June 2015 / Atlanta USA
Ashok Jhunjunwala,	Economic Analysis of Deployment of DC Power and Appliances along with Solar in Urban Multi-Storied Buildings	IEEE First International Conference On DC Microgrids / 7 th -10 th June 2015 / Atlanta USA
Prof. Ashok Jhunjunwala, Jacob George	Scalable and Robust Audio Fingerprinting Method Tolerable to Time-stretching	2015 IEEE International Conference on Digital Signal Processing (DSP 2015) Singapore, 21 st -24 th July, 2015
Ashok Jhunjunwala	Disruptive Innovation towards overcoming India's Power problem Making India one of the most Green Nations Looking at Smart-grids in Indian Context	ACM e-energy 2015, Bangalore, 16 th July 2015
Gagandeep Kang, Saron Pandian, Ranjan Srinivasan, DeapicaRavindran, A.Charles, Ashok Jhunjunwala	Antenatal and Infant Monitoring System(AIM)	UGC-UKIERI Workshop on Infrastructural Networks: Implications for Innovation in Rural Development, Chennai, 12 th January 2016
Lakshmy Mohandas, Akhila Vijayakumar, Ashok Jhunjunwala, Prabhjot Kaur	Enabling Quality Enhancement in Engineering Educating through ICT in India	UGC-UKIERI Workshop on Infrastructural Networks: Implications for Innovation in Rural Development, Chennai, 12 th January 2016
Anusha Ramachandaran, Ashok Jhunjunwala, Aditya Lolla, Prabhjot Kaur	Inverterless Solar DC Solution for Rural India, An Innovative Socio – Technological Intervention	UGC-UKIERI Workshop on Infrastructural Networks: Implications for Innovation in Rural Development, Chennai, 12 th January 2016
Niraja Swaminathan, Lakshminarasamma N, Kumaravel M, Ashok Jhunjunwala	A Novel Zonal based MPPT control scheme for a Full Bridge series resonant Converter	43 rd IEEE Photovoltaic specialists Conference, June 5-10,2016, Portland, Oregon

Rajesh Kunnath, Krishna Vasudevan, Ashok Jhunjunwala, Devendra Jalihal, Prabhjot Kaur and M. Kumaravel, IIT Madras and B. G. Fernandes, IIT Bombay	Low Voltage DC Distribution – Are we ready yet?	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Anusha Ramachandran, Sairam Mannar, Ashok Jhunjunwala	Inverterless Solar- DC System Design for Off-Grid and Near Off-Grid Indian Homes	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Ankit Poddar, Prabhjot Kaur, Ashok Jhunjunwala	Green Building Air Conditioning System with Variable Frequency Drive and Variable Air flow Controller	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Ashok Jhunjunwala, Prabhjot Kaur	Energy optimization and Cost Management in multi-storied Green Complexes	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Ashok Jhunjunwala, Krishna Vasudevan, Prabhjot Kaur, Bhaskar Ramamurthi, Kumaravel, IITM Santosh Bitra and Kushant	Energy Efficiency in Lighting: AC vs DC LED Lights	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Sushant Mutagekar John P Kurian Dr. Ashok Jhunjunwala, Dr. Prabhjot Kaur, Shivashankar Gunaki	Designing a high performance battery life cycle tester	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Pooja Rani, Vignesh D, Shivshankar Gunaki , Ashok Jhunjunwala	Design of Converters for leveraging 48V DC Power line at Homes / Offices	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Visakh Sasikumar, Jacob Thekkekara, Ashok Jhunjunwala	Green Transportation using Intelligent Solar Electric Pedal Assist Three Wheeler	1st International conference on sustainable Green Buildings and Communities(SGBC), 18-20 th Dec 2016,Chennai
Sriram Narayanamurthy, Pradheep Ganesan, Ashok Jhunjunwala, Prabhjot Kaur	Efficiency gain using DC micro grid and BLDC machine based refrigerator and air cooler	India Smart Grid Week, ISGW 2017, New Delhi, 7-10 March 2017
Ashok Jhunjunwala, Prabhjot Kaur	Preparing for High-mix of Renewables in India's Power Generation	India Smart Grid Week, ISGW 2017, New Delhi, 7-10 March 2017
Ashok Jhunjunwala, Prabhjot Kaur	India's Renewable Energy Compulsion Solar-DC and Electric Vehicles	IEEE Spectrum Technology in the Service of Society Award, 25 th May 2017,California,USA
Ashok Jhunjunwala	Innovation towards Powering Low-income Rural Homes leveraging ICT	The Munich conference series on Ethics in Innovation, 26 th June 2017,Munich, Germany

Ashok Jhunjunwala	Scaled adoption of DC power-line in India Homes, offices and village micro-grids	2nd IEEE, ICDCM Conference, 27-29 th June 2017, Nurnberg, Germany
Ashok Jhunjunwala, Prabhjot Kaur	Scaled adoption of DC power line in India: homes, offices and village microgrids	2 nd IEEE International conference on Microgrids, ICDCM. 27-29 June 2017, Nuremberg, Germany
Ashok Jhunjunwala, Prabhjot Kaur	Enhancing Affordability of Roof-top Solar using Communications	CPRsouth 2017, 30 Aug-1 Sep 2017, Mayangone, Myanmar

TEXT BOOKS / MONOGRAPHS/BOOK CHAPTERS AUTHORED OR CO-AUTHORED / REPORT

Name of Author	Title of Text Book/ Monograph/Book Chapter	Publishing Company	Year of Publication
A.Jhunjunwala	Fibre Optic Educator User Manual	Comptec Electronics Pvt. Ltd., Madras	1988
A.Jhunjunwala	Indian Mathematics – An Introduction	Wiley Eastern	1993
A.Jhunjunwala	Chapter on “Indian Telecom & Internet Tangle – What is the Way Out?”, in Emerging Communication Technologies And Society, p.nos.29-42,	Narosa Publishing House, New Delhi.	1999
A. Jhunjunwala	Chapter on “Towards Enabling India through Telecom and Internet Connections, New Millennium Lectures: Celebration of Science, CSIR, pp. 81 – 108, 2000	National Institute of Science Communications, New Delhi.	2000
A. Jhunjunwala	Chapter on “Towards Enabling India through Telecom and Internet Connections”.	New Millennium Lectures: Celebration of Science, CSIR, pp. 81 – 108.	2000
A. Jhunjunwala	Chapter on “An update on the current telecom regulation scenario in India” in the book “Bridging the Digital Divide: Lessons from India “Edited by Ken Kenniston and Deepak Kumar.	National Institute of Advanced Studies, Indian Institute of Science, Bangalore, India.	2000
A. Jhunjunwala	Chapter on “Looking beyond NTP 99” in the book “Bridging the Digital Divide Lessons from India “Ken Kenniston and Deepak Kumar.	National Institute of Advanced Studies, Indian Institute of Science, Bangalore, India.	2000

A. Jhunjunwala	Chapter on “Looking Beyond NTP’99”, page No.210, India Infrastructure report 2001 by IDFC, IIM and IIT Kanpur.	IDFC, Chennai	2001
A.Jhunjunwala	Telecommunications Reform in India “Strategies for Rapid Telecommunications and Internet Growth”	Greenwood Publishing Group, Inc. USA	2002
A. Jhunjunwala	Chapter on “ Unleashing Telecommunications and Internet in India” in the book titled “Telecommunications Reform in India	Edited by RaffiqDossani, Greenwood Publishing Group, USA	2002
A.Jhunjunwala	Taking Internet Connections to Rural India	Book titled Technology Enabled Flexible Education & Development	2002
Ashok Jhunjunwala	Connecting Rural India towards Prosperity	UN Department of Economic and Social Affairs ICT Task Force Series 4.	2003
Ashok Jhunjunwala & Sangamitra Ramachander	Sparse and Rural Area Communication Systems	‘Information Technology and Communications Resources for Sustainable Development’, UNESCO Encyclopedia of the Life Support Systems (EOLSS). http://www.eolss.net	2004
A. Jhunjunwala	Report on Case Study on India for the Bridging Digital Divides project	ITU, Geneva	2004
Dr. Ashok Jhunjunwala & Bhaskar Ramamurthi	Experience in India Bridging the Digital Divide Editors: Kenneth Keniston& Deepak Kumar Chapter on “Telecom and Regulation Scenario in India”	Sage Publications Pvt. Ltd.	2004
A. Jhunjunwala	Chapter on Wireless in the Local Loop: Towards Connecting India in the book titled Asia Unplugged: The Wireless and Mobile Media Boom in the Asia Pacific.	Sage Publications India Pvt. Ltd.	2005
A. Jhunjunwala	Interview on Technology, Innovation and Rural Development: Critical Linkages, In Conversation with Mr. G. Venkatesh, Sasken, Bangalore.	For IIMB, Management Review. Reprint 04403	2005
A. Jhunjunwala	Book Review on Asia Unplugged: The Wireless and Mobile Media Boom in the Asia Pacific	For Current Science, Volume 89 Number 4	August 2005

Ashok Jhunjunwala & Sangamitra Ramachander	"Changing Role of Agricultural Extensions in Asian Nations" edited by Dr. R.K Samanta and Dr. Van den Ban, Chapter on "ICT and Agricultural Diversity"	B.R. Publishing Corporation	March 2006
Ashok Jhunjunwala & Sangamitra Ramachander	Empowering Rural India through ICTs, edited by Kamlesh Agarwal, Chapter on "n-Logue Communications Private Limited n-Logue A Business Model for Rural Connectivity"	Vol. 4 IIIT-A Book Series on e-governance	March 2006
A. Jhunjunwala & Anaka (RTBI)	Case Study: Connecting Rural India with Broadband Wireless	ITU case study library web site	July 2007
A. Jhunjunwala	Towards Rural Prosperity Public Private Partnership, Issues and Strategies	A Lucknow Management Association Publication (LMA), Pg. 169-180.	July 2007
Ashok Jhunjunwala and Anuradha Ramachandran	'ICTs and Indian Social Change: Diffusion, Governance, Poverty' Editors: Ashwani Sith, M. Vijayabaskar, V. Gayathri, Chapter on "Sustainable Internet Connectivity in Rural India"	Sage India	April 2008
Dr. Ashok Jhunjunwala	"Reflections by IITians" the Book, authored by Ram Krishnaswamy - IIT Madras Alumnus, Chapter on "My inspirations, My experiences"	Publisher Sydney Australia	December 2008
Ashok Jhunjunwala & Sangamitra Ramachander	"Rural Finance and Development: Issues and Challenges" edited by Arindam Mukherjee, Chapter on "Novel Approaches to Rural Finance"	Published by ICFAI	May 2009
Dr. Ashok Jhunjunwala	India's Security and Cyber Warfare article on "India's National Security Annual Review 2009" Author Satish Kumar	Routledge India (Publisher)	December 2009
Dr. Ashok Jhunjunwala	Poverty Alleviation and Bottom of Pyramid Models, Pyramid model of Prof. CK Prahalad and Prof. Stuart Hart, Chapter on "Enabling Rural India through Innovations in ICT: but can it be Sustainable?"	IndSearch	August 2010

Dr. Ashok Jhunjunwala	Timeless Inspirator – Relieving Gandhi Conceptualized and Edited by, Raghunath Mashelkar, Chapter on “Learning from Gandhi in today's context: India will show the way forward.”	Sakal Papers Ltd.	October 2010
Dr. Ashok Jhunjunwala, Ms. Janani Rangarajan	Information and Communication Technologies (ICT)	Berkshire Encyclopedia of sustainability 7/10 China, India, and East and Southeast Asia: Assessing Sustainability / 2012 First Edition, , Page 206-216	August 2012
Ashok Jhunjunwala, Bhaskar Ramamurthi, Sriram Narayanamurthy, Janani Rangarajan And Sneha Raj	Powering Cellular Base Stations: A Quantitative Analysis of Energy Options, Solar PV, Diesel Generator, Batteries and Electric Grid	Technical Report , IIT M's Telecom Centre of Excellence	October 2012
Dr. Ashok Jhunjunwala, Ms. Janani Rangarajan	The Role of ICT in Empowering Rural Indians	IGI Global's Social and Economic Effects of Community Wireless Networks and Infrastructure, pages 75- 93,	January 2013
Expert Advisory Committee on Solar power and Energy Sector (Dr. Ashok Jhunjunwala- Member)	Technical Feasibility Report of UDC Technology	National S & T Entrepreneurship Development Board, Department of Science and Technology	March 2015
Mr. K. Kaw, Dr. Ashok Jhunjunwala, Dr. U. B. Desai, Prof. A. K. Aggarwal	Technical Education in India A FUTURISTIC SCENARIO	Ministry of Human Resource Development, Govt. of India	April 2015

BOOKS REVIEWED

Book Review by	Title	Edited by
Dr. Ashok Jhunjunwala	Book Review on Asia Unplugged: The Wireless and Mobile Media Boom in the Asia Pacific	For Current Science, Volume 89 Number 4, 25th August 2005
Dr. Ashok Jhunjunwala	R&D towards empowerment of India: a story of the TeNeT group of IIT Madras	Publication of a book based on awards given by the Shri. Om Prakash Bhasin Foundation for Science and Technology Year 2007.
Dr. Ashok Jhunjunwala	ICT Infrastructure in Emerging Asia: Policy and Regulatory Roadblocks	Rohan Samarajiva and Ayesha Zainuddin Current Science, April 2008.
Dr. Ashok Jhunjunwala	"Monograph on Poverty Alleviation and Bottom of the Pyramid Models"	IndSearch Public Awareness Lecture Series in August 2010

SHORT PAPERS AND ARTICLES IN NEWSPAPER/MAGAZINES

Name of the Authors	Title	Name of Newspaper/Magazine
Ashok Jhunjunwala	Net connection for each Indian	Outlook Magazine, 2005 10th anniversary special Scitech issue
Ashok Jhunjunwala Alankar	The Indian Mind	Mindia, February 2005
Ashok Jhunjunwala Sangamitra Ramachander Anuradha	Broad banding India	Financial Express, 8th August 2005
Prof.Ashok Jhunjunwala	Overcoming rural India's lack of communications infrastructure	Id21 website, October 2005 http://www.eldis.org/id21ext/r3aj1g1.html
Ashok Jhunjunwala	Wireless Communications and Development: Rural India Focus	Published on The Communication Initiative Network https://www.comminit.com October 2005
Ashok Jhunjunwala &Ranjana Joshi	Information Technology Institute for the Tribes of India (ITITI) , Mainstreaming Tribal Communities with IT	i4D Magazine, November 2005 issue
Ashok Jhunjunwala, Sangamitra Ramachander, Anuradha	India is nowhere near technology leadership	Financial Express, 21st November 2005
Ashok Jhunjunwala	Empowering Rural India using IT and Communications	Dataquest, December 2006
Ashok Jhunjunwala & Jennifer Bussell	e-Government in India: A Model for Future Success	A special issue on "Strategic e- Business Model for Government" 2006
Ashok Jhunjunwala &Sangamitra	Successful Use of ICT in Rural India	PiTech Magazine, Vol. 1, Issue 3, December 2006.
Ashok Jhunjunwala	Innovation as a way forward for India	The Manathan Book, September 2007
Ashok Jhunjunwala	Telecom as IT Driver: The Unfinished Tasks	PC Quest, December 2007.
Ashok Jhunjunwala &Roshni Menon	IC to empower Rural India	Special Issue Yojana, 2007
Ashok Jhunjunwala & Sriram Raghavan	Telecentres run as small, local businesses make a model to ensure sustainability	Telecentre Magazine, Vol. II, Issue 2, Page 35, June 2008
Ashok Jhunjunwala	3G, though a move forward, shouldn't slow down 4G	The Financial Express, January 2009
Ashok Jhunjunwala & Bhaskar Ramamurthi	Spectrum Auctions and Mobile Technology	The Economic Times, India, February 2009.
Ashok Jhunjunwala	A Tale of Incubation in Academia, The TeNeT Group, IIT Madras	PiTech Magazine, Issue 6, Page 22, October 2009
Dr. Ashok Jhunjunwala, Ms. Suma Prashant, Ms. Neeraja N. Arjun and Ms. Vasumathi Anandan	Path-Breaking Innovations for Rural India	Coffee Table, October 2010
Ashok Jhunjunwala	Enabling micropayments using cell	The Times of India, October 26, 2010

Ashok Jhunjunwala	Have Mobile, Will Travel Introduce traceability in financial transactions to strike a blow against black money	The Times of India Ahmedabad, Section Editorial Page: 16, February 22, 2011
Ashok Jhunjunwala	Back to Back-End Basics!	E-Governance Magazine, January 2011
Ashok Jhunjunwala	The Maturing of Technology Entrepreneurship in India	Inc. Magazine, (Special Anniversary Issue) February 2011
Ashok Jhunjunwala	Next Steps for India's Telecom	Connect World India, pg-7-8, ISSN 369-894X, 2011
Dr. Ashok Jhunjunwala	Think Beyond Telecom as Money-spinner Spectrum auction should be based on multiple parameters, not just the price, as this will help proliferation of broadband facilities, maximizing social welfare	The Economic Times Mumbai; Section: Viewpoint; Page: 15, March 26, 2012
Dr. Ashok Jhunjunwala	Setup a 30 seater BPO in every village	The Financial Express, 18 th January, 2012
Dr.Ashok Jhunjunwala	Don't Kill the golden goose	The Indian Express,4 th May, 2012
Dr. Ashok Jhunjunwala	Have the ability to make the difference	The Hindu, Chennai, Sep 15, 2013
Dr.Ashok Jhunjunwala	Enhancing Quality of Education in Engineering	Express News Service, 7 th Aug. 2014
Dr.Ashok Jhunjunwala	Re-Engineering Rural India	IEEE Spectrum, 30 April 2015
Ashok Jhunjunwala	Creating low-cost solutions for rural India requires surprising sophistication	IEEE Spectrum, Volume: 52, May 2015
Dr.Ashok Jhunjunwala	Education, Research and Development: Linkage to "Make in India" Mission	Special Issue Yojana January 2016,
Dr.Thillai Rajan A., Dr.Ashok Jhunjunwala	One stroke, many colors - Univenture at IIT Madras Programs, stakeholders, and their relationships	Venture Findings #4 (2016) — University Venture
Dr.Ashok Jhunjunwala	The Mind of an Engineer	INAE Publications,Vol II (2017)

CONTINUING EDUCATION AND CONFERENCES ORGANIZED

<ul style="list-style-type: none"> Short Term Course on Microprocessor
<ul style="list-style-type: none"> Fibre Optics for DRDO, January,1985
<ul style="list-style-type: none"> Fibre Optics for BHEL, January,1986
<ul style="list-style-type: none"> International Workshop on Optical Communication, March 1984 Short Term course in Malaysia for Fibre Optics, Organized by COSTED,1986

<ul style="list-style-type: none"> • Short Term Course on Fibre Optic Application in Service Sector, April 1988
<ul style="list-style-type: none"> • Principles of Telematics: Intensive Course on Digital Technology, December, 1988
<ul style="list-style-type: none"> • Short Term Course on Cellular Radio Mobile Communication, January, 1989
<ul style="list-style-type: none"> • Short Term Course on Digital Modulation Technique, December 1991
<ul style="list-style-type: none"> • Short Term Course on Fibre Optics Communication in Malaysia, June, 1994
<ul style="list-style-type: none"> • Short Term Course on Telematics, December 1995
<ul style="list-style-type: none"> • National Conference on Communications, 31 January-2 February, 1997
<ul style="list-style-type: none"> • Short Term Course on System Software and Communications – I, organised by Usha Martin, Calcutta, May, 1999
<ul style="list-style-type: none"> • Short Term Course on System Software and Communications – II, organised by Usha Martin, Calcutta, August, 1999
<ul style="list-style-type: none"> • International Workshop on Equity Diversity and Information Technology (EDIT), NIAS, Bangalore, December 1999
<ul style="list-style-type: none"> • Workshop on Evolution of WCDMA/HSDPA Technology towards Wireless Broadband organized by Centre of Excellence in Wireless Technology (CEWiT) in Department of Electrical Engg., IIT Madras, 2004.
<ul style="list-style-type: none"> • Workshop on Evolution of CDMA 2000/HDR Technology towards Wireless Broadband organized by Centre for Excellence in Wireless Technology (CEWiT) in Department of Electrical Engg., IIT Madras, November 29, 2004
<ul style="list-style-type: none"> • Workshop on “WiMAX” organized by CEWiT at Delhi, 3rd December 2004
<ul style="list-style-type: none"> • Brainstorming Session on “Connecting Rural India” at IIT Madras, January 18, 2005
<ul style="list-style-type: none"> • “Indo-UK Workshop on Next Generation Communication Networks” at IIT Madras, January 31, 2006
<ul style="list-style-type: none"> • “Indo-UK Workshop on Next Generation Communication Networks” at University College London, May 31, 2011
<ul style="list-style-type: none"> • 3rd International Workshop on Infrastructure in Healthcare: Global Health, IT University of Copenhagen, June 22, 2011
<ul style="list-style-type: none"> • UGC-UKIERI Workshop on Infrastructural Networks: Implications for Innovation in Rural Development, IITM, Chennai, January 12, 2016
<ul style="list-style-type: none"> • Workshop on Microgrid Challenges and Opportunities, IIT Madras & ABB Chennai/ 25th February 2016

Appendix III

(A) SPONSORED PROJECTS

No.	Title of the Project	Duration	Sponsoring-Agency	Value of Project	Investigator/Co-ordinator
P1	Feasibility studies on the Application of Blue/Green Laser for Underwater Comm	1984-88	Department of Electronics, New Delhi	Rs. 15.95 lakhs	Co-ordinator
P2	Development of TDMA for Rural Communication Radio Systems	1988-92	TRC/ Centre for Development of Telematics , Bangalore	Rs.41 lakhs	Co-ordinator
P3	Fibre Optic Systems for Service Sector Application	1986-92	Department of Electronics, New Delhi	Rs.90 lakhs	Co-ordinator
P4	Development of some Optical Couplers	1986-91	A.R.D.B.	Rs.46.80 lakhs	Investigator
P5	Development of 8 nos. Engineered version of Fibre Optic Communication System	1986-91	D.R.D.O.	Rs.32.20 lakhs	Investigator
P6	Development of 1553 Compatible Fibre Optic Data Bus	1987-91	A.R.D.B.	Rs.38.66 lakhs	Co-ordinator
P7	Telematics	1986-94	Ministry of HRD	Rs.75.0 lakhs	Co-ordinator
P8	Model for study of Optical Scattering at Air water Interface	1989-90	N.S.T.L. Visakhapatnam	Rs.1.22 lakhs	Co-ordinator
P9	Foundation of Mathematics in Indian Tradition	1991-94	Department of Science and Technology	Rs.5.34 lakhs	Co-ordinator
P10	Fibre Optics Railway Signaling and Communication System	1993-94	Department of Electronics, New Delhi	Rs.17.0 lakhs	Co-ordinator
P11	Mangrove Ecosystem Information Services	1993-94	M.S. Swaminathan Research Foundation, Madras	Rs.1.5 lakhs	Co-ordinator
P12	FDDI Station Management Protocols & Ethernet Bridge	1993-94	Department of Electronics, New Delhi	Rs. 27.0 lakhs	Co-ordinator
P13	A Peer-to-peer 802.11b based Mesh Network for Rural Communities (Phase I)	2002-06	Media Lab Asia	Rs.48.0 lakhs	Co-ordinator
P14	PLDs for Access Devices	2003-05	Media Lab Asia	Rs.114.6 lakhs	Co-ordinator

P15	HP Lab for Technology for Developing Markets	2001-06	HP India Software Operations Ltd.	Rs.48.17 lakhs	Investigator
P16	Intelligent Optical Networks	2001-06	IITM Alumni Association, USA	Rs.48.0 lakhs	Investigator
P17	Design of Satellite Modems and Transcoders for Sparse Area Communication System	2003-09	ISRO, Ahmedabad	Rs.159.85 lakhs	Investigator
P18	Driving Applications on Wireless Internet in Rural India	2003-05	Intel, USA	Rs.45.78 lakhs	Investigator
P19	Communication Technology	Recurring Cost @ 15% of Nonrecurring budget will be provided for each	IIT Madras, Chennai	Rs. 60.00 lakhs	Investigator
P20	Development of Wireless Systems	2004-2008	Midas Communication Technology, Chennai	Rs. 60.00 lakhs	Co-Investigator
P21	ADI-IITM DSP Learning Centre	2001-2010	Analog Devices, USA	Rs.70.0 lakhs	Investigator
P22	TeNeT Development Activities	2004-2010	TT Funds & IIT Madras	Rs. 33,09,800	Investigator
P23	Rural Weather Monitoring System	2006-2009	DST, New Delhi	Rs. 34.3 Lakhs	Investigator
P24	Thin Client Systems	2005-2009	Novatium Solutions, Chennai	Rs. 36 Lakhs	Co-Investigator
P25	Technologies for Rural ATM	2007-2008	Vortex, Chennai	Rs. 15 Lakhs	Investigator
P26	Optical Networking Project	2006-2010	IITM Alumni Association, USA	Rs. 45 Lakhs	Co-Investigator
P27	Participatory , Sustainable , Convergent and high quality public E-services developing	2007- 2010	Swedish International Development corporation academy.	Rs. 18.4 lakhs	Investigator
P30	Vidya Sruthi knowledge through voice	2008-2009	IITM Alumni Association,	Rs 5 lakhs	Investigator
P29	India-UK Advanced Technology Project	2009-2012	DST, New Delhi	Rs 5.6 crores	Principal Investigator
P30	Development of Wireless Systems	2010-2012	Midas Communication	Rs. 5.7 Crores	Investigator
P31	TeNeT Development Activities - Phase II	2010-2012	TeNeT	Rs. 40 lakhs	Investigator
P32	JC Bose Fellowship	2010-2012	DST, New Delhi	Rs. 68 lakhs	Investigator

P33	Estimating Quality of Broadband Internet in India	2010-2012	NIXI, New Delhi	Rs.3.5 lakhs	Investigator
P34	CSTRI Center - IIT Madras	2010-2012	CSTRI	Rs. 12 lakhs	Investigator
P35	ADI-IITM DSP Learning Centre - Phase II	2010-2012	Analog Devices Inc.	Rs. 8.86 lakhs	Investigator
P36	Council of Science and Technology for Rural India Centre at Indian Institute of Technology.	2012- 2014	CSTRI	Rs.83 lakhs	Principal Investigator
P37	Decentralized solar PV Generation and DC usage (Under CSTRI core grant sub project- I)	2012- 2014	DST, New Delhi	Rs.129 lakhs	Principal Investigator
	Rural Engineering College students for Assessment of Technological Gaps in Villages (Under CSTRI core grant - sub project - II)	2012 -2014	DST, New Delhi	Rs.38 lakhs	Principal Investigator
P38	Solar power air conditioners and desert air-cooler	2012-2013	Dept of Science & Technology	Rs.63 lakhs	Principal Investigator
P39	Indo-UK (IUATC Phase II, Co-ordination project)	2012-2015	DST, New Delhi	Rs. 4.3crores	Investigator
P40	Decentralized solar PV power for commercial buildings	2012-2018	SIRIIUS	Rs.1.35 crores	Investigator
P41	Centre of Excellence or Decentralized Power Systems	2013-2018	MHRD	Rs.4 crores	Principal Investigator
P42	Proof of Concept for Project UDC	2013-2014	MHRD	Rs.4 crores	Principal Investigator
P43	QEEE		MHRD	Rs.95 lakhs	Principal Investigator
P44	QEEE Phase II		MHRD	Rs. 1 crores	Principal Investigator
P45	Transforming healthcare delivery - Innovative Healthcare technology for health promotion		DBTX	Rs. 56 lakhs	Principal Investigator
P46	The interaction of ICT networks structure and downstream trade flows: Two case studies from India	2014-2016	UGCX	Rs. 9 lakhs	Principal Investigator
P47	Implementation of full-sized pilots of Uninterrupted Direct Current (UDC) supply to households	2015-2016	MOPO	Rs.80.35 crores	Principal Investigator
P48	Charging Infrastructure Management System	2015-2016	DHI	1.25 Cores	Project Coordinator

(B) RESEARCH BASED INDUSTRIAL CONSULTANCYPROJECTS

S.No.	Title of the Project	Duration	Sponsoring Agency	Value
R1	Development of Fibre Optic replacement of PLCC	1986-90	W.S.Industries, Bangalore	Rs.5.00 lakhs

R2	Development of 32 Channel Fibre Optic Mux-Demux for RS232 Interface	1987-89	Electronics Corporation of India Limited, Hyderabad	Rs.2.50 lakhs
R3	A versatile Fibre Optic Time Division Multiplexed Voice and Data Network	1989-91	Electronics Corporation of India Limited, Hyderabad	Rs.5.00 lakhs
R4	Wireless Multi-access Messaging System	1989-91	Intelligent Commn, Equipment Pvt. Ltd., Hyderabad	Rs.2.60 lakhs
R5	Development of Drop Insert PCM equipment	1989-91	Indian Telephone Industries, Naini	Rs.2.5 lakhs
R6	1553 B Data Bus Network Analysis through Simulation Modelling	1989-90	Aeronomy Development Agency, Bangalore	Rs.1.0 lakhs
R7	Development of EKB with LCD Display	1990	Hindustan Tele printers Ltd., Madras	Rs.1.0 lakhs
R8	Telephone Sharing System	1990-91	Innovation Commn Systems, Hyderabad	Rs.1.4 lakhs +R
R9	Development of Digital Communication Educator Kit	1990-91	Universal Instruments, Bangalore	Rs.0.75 lakhs +R
R10	Development of EKB Concentrator	1990	Hindustan Tele printers Ltd., Madras	Rs.1.0 lakhs
R11	Fibre Optic Based Double Ring Telemetry System	1991-92	Instrumentation Limited, Kota	Rs.5.5 lakhs
R12	Fibre Optic Communicator	1990	Benchmark System, Madras	Rs.5.5 lakhs
R13	Development of an Electronic Totalizer Unit for Conveyor Belt Weighing System	1990-91	Gillanders, Arbuthnot & Co, Ltd., Calcutta	Rs.0.15 lakhs
R14	G732 Compatible Mux with Drop and Insert Capability	1991-91	W.S.Industries (India) P. Ltd.	Rs.3.24 lakhs
R15	Operator Console for EPABX	1991-92	W.S.Industries (India) P. Ltd.	Rs.1.25 lakhs
R16	Failsafe Signal Multiplexer Systems for Railways	1991-92	Crompton Greaves Ltd., New Delhi	Rs.5.5 lakhs
R17	Development of R111 Compatible Multiplexer for Telegraph & Data Transmission	1991-92	Unitel Communications Limited, Bhubaneswar	Rs.2.5 lakhs
R18	Simulation of Study of High Quality Wideband Audio Compression Techniques	1991-92	Indchem Research & Development Laboratory, Madras	Rs.0.80 lakhs
R19	DSP Based PLCC System	1992-93	W.S.Industries (India) P. Ltd.	Rs.4.00 lakhs
R20	Development of a Neuron-based Distributed Control SCADA System – Phase II	1993-94	Alacrity Electronics, Chennai	Rs.15.0 lakhs+ R
R21	Integra-SQL Based Software Development	1992-93	Grasim Industries, Calicut	Rs.1.00 lakhs
R22	Ethernet Driver and Monitor	1992-93	Zenith Technologies, Bombay	Rs.0.40 lakhs
R23	PC-Based Ethernet Bridge	1992-93	Multimedia Inc., Madras	Rs.1.00lakhs

R24	6 Channel ADPCM Mux with D&I for Rlys and 60 Channel ADPCM Transcoder	1993-94	W.S.Telesystems, Bangalore	Rs.7.5 lakhs +R
R25	Development of New DSP Based Products	1993-99	Analog Devices, USA	Rs.7.875 lakhs
R26	Design & Development of Bedside ECG Monitor	1993-94	Siemens, Madras	Rs.6.0 lakhs
R27	Ethernet Twisted Pair Remote Bridge	1993-94	Citi Bank, Madras	Rs.2.5 lakhs
R28	Networked Library Information System	1993-94	International Ocean Institute, Malta	Rs.1.5 lakhs
R29	Digital Telephony Answering Machine	1993-2000	Analog Devices, USA	R
R30	Wireless in Local Loop	1993-2000	ADI,USA Westel Wireless, Bangalore, ECIL, Hyderabad, Shyam Telecom Ltd., New Delhi	Rs.800 lakhs +R
R31	Computer Networking Activity	1995-2000	Acacia Networks, USA	Rs.160 lakhs + R
R32	Two Port Local and Remote Ethernet Bridge	1995-99	Excellent Computers, Madras	R
R33	Development of ISDN Terminals	1996-98	Tata Telecom, Gandhinagar	Rs.4.0 lakhs+ R
R34	ISDN Interface for Paradigm Exchange	1996-97	Tata Telecom, Gandhinagar	Rs.9.0 lakhs+ R
R35	E1 Circuit Multiplier	1996-97	Shyam Telecom Ltd., New Delhi	Rs.1.5 lakhs + 2.5% R
R36	Development of a Neuron-based Distributed Control SCADA System – Phase II	1997-98	Alacrity Electronics, Chennai	Rs.18.0 lakhs + R
R37	Fibre in Local Loop	1997-2002	HFCL &Shyam Telecom New Delhi	Rs.90.0 lakhs + R
R38	Study of Development of Simulation for Multi-carrier Satcom Modem	1997-98	ISRO, Ahmedabad	Rs.2.0 lakhs
R39	Co-channel Signal Recovery	1997-98	Ericsson, USA	Rs.8.0 lakhs
R40	Design of LANfone System	1998-99	BPL Telecom Ltd., Bangalore	Rs.1.3 lakhs
R41	Digital Internet Access System	1998-99	ARM-Hyderabad HFCL, &Shyam Telecom, Delhi.	Rs.100.0 lakhs + R
R42	Cygplan Access Network Planner	2001-2	Nilgiri Networks, Ooty	Rs.1.0 lakhs + R
R43	Minnow	2001-3	Nilgiri Networks, Ooty	Rs.3.5 lakhs + R
R44	Royalty on OFT From Bench mark	2007-2008	BENCHMARK ELECTRONIC SYSTEMS PVT. LTD. PERUNGUDI, CHENNAI	Rs 4. 56 lakhs
R45	TeNeT Development Activities	2004- 2010	TT Funds & IIT Madras	Rs. 27.5 lakhs + R
R46	Consumer Behaviour Measurement	2011-2012	Nielsen Company	Rs. 55 lakhs

R47	E-VyapaarSewa (EVS)	2011-2012	Sasken Communications	Rs. 6 lakhs
R48	Consumer Behaviour Measurement	2011-2017	Nielsen Company	Rs.225 lakhs

(C) CONSULTANCYPROJECTS

Title of the Project	Duration	Sponsoring – Agency	Value
VentureastTeNeT Fund	2000-2001	APIDC Ventureast Advisors, Hyderabad	Rs.2.40 lakhs+ R
Usha Comm.	2001	Usha Comm., Calcutta	Rs.0.96 lakhs
Integrated SoftTech Solutions Pvt. Ltd	2002	IsoftTech, Chennai	Rs.1.20 lakhs
Consultancy service for Sasken	2002-2003	Sasken, Bangalore	Rs 6 lakhs
Development of wireless system (R)	2004	Midas communication technology , Chennai	Rs 576 lakhs
Technical Advice for setting up a solar PV power plant	2011-2013	CCCL Infrastructure Ltd.,	Rs.12 lakhs
Voice Banking Technology	2011-2015	Uniphore software system Pvt Ltd.,	Rs.13 lakhs
IT Advisory	2012-2014	United India Insurance Ltd.	Rs.20Lakhs
Remote Diagnostic Kit and weather monitoring	2012- 2014	M/s. Neurosynaptic	Rs.1.34 lakhs
Transfer of Technology for the ATM Development	2012- 2015	Vortex Engineering Pvt Ltd.,	Rs. 29 lakhs