Stuart J. Lipoff

Mr. Lipoff is president of IP Action Partners Inc, a small business consultancy with a practice in TIME (telecommunications, information technology, media, electronics, and ebusiness) industries and technologies. He draws upon his 30+ years of experience in a wide variety of technologies and industries to assist clients with knowledge based consulting services involving complex business decisions. Clients turn to him for his unique ability to combine a deep understanding of industry dynamics with his equal depth in the underlying technologies. Because he is at home in either the board room or the laboratory, the services he provides range from top line revenue enhancement to operations and capital efficiency improvement working across all levels of the client organization.

Mr. Lipoff was employed 25 years by Arthur D Little, Inc (ADL) as VP and Director of Communications, Information Technology, and Electronics (CIE); 4 years by Bell & Howell Communications Company as a Section Manager, and 3 years by Motorola's Communications Division as a Project Engineer. At ADL he was responsible for the firm's global CIE practice. At both Bell & Howell and Motorola, he had project design responsibility for wireless communications and paging products.

Stuart Lipoff has Bachelor's Degrees in Electrical Engineering and in Engineering Physics, both from Lehigh University. He also has received a Masters Degree in Electrical Engineering from Northeastern University, and a MBA degree from Suffolk University.

Mr. Lipoff is a fellow of the IEEE Consumer Electronics, Communications, Computer, Circuits, and Vehicular Technology groups. He is a member of the IEEE Consumer Electronics Society National Board of Governors, and was the Boston Chapter Chairman of the IEEE Vehicular Technology Society. He served as 1996-7 President of the IEEE Consumer Electronics Society (CESoc), as Chairman of the Consumer Electronics Society Standards Committee, and presently as Vice President of Publications for the CESoc.. He has also chaired the search committee for Sony supported Mazura Ibuka Award in consumer electronics. As Vice President and Standards Group Chairman of the Association of Computer Users, he served as the ACU representative to The ANSI X3 Standards group. For the Federal Communications Commission's Citizens advisory committee on CB radio (PURAC), he served as Chairman of the task group on user rule compliance. He has been elected to membership in the Society of Cable Television Engineers (SCTE), The Association of Computing Machinery (ACM) , and The Society of Motion Picture and Television Engineers (SMPTE).

Stuart Lipoff holds a FCC General Radiotelephone License and a Certificate in Data Processing (CDP) from the ACM supported Institute for the Certification of Computing Professionals (ICCP). He is a registered professional engineer (by examination) in The Commonwealth of Massachusetts.

Mr. Lipoff holds seven USA patents and has published articles in Electronics Design, Microwaves, EDN, The Proceedings of the Frequency Control Symposium, Optical Spectra, and numerous IEEE publications. He has presented papers at many IEEE and other meetings. In the fall of 2000, he served as general program chair for The IEEE Vehicular Technology Conference on advanced wireless communications technology. He has organized sessions at The International Conference on Consumer Electronics and was the 1984 program chairman. He conducted an eight week IEEE sponsored short course on Fiber Optics Systems Design. In 1984, he was awarded IEEE's Centennial Medal and in 2000 IEEE's Millennium Metal.

He has served as member of the USA advisory board to the National Science Museum of Israel and has presented a short course on international product development strategies as a faculty member of Technion Institute of Management in Israel. He is also served as a member of the board of directors of The Massachusetts Future Problem Solving Program.

Mr Lipoff is internationally recognized as an authority and opinion leader in new economy related businesses and technology. Citations supporting his recognition can be found on his web site at http://www.lipoff.org .

Some examples of projects he has performed in the telecommunications and wireless communications sectors include:

- For Rogers Communications of Canada, he benchmarked their high speed cablemodem and video services as compared to the VDSL "FIBE25" offered by Bell Canada. This required a combination of field testing and analysis of the Bell fiber to the neighborhood architecture.

- For the National Cable Telecommunications Association (NCTA) he prepared a paper to deliver at an FCC workshop on high speed broadband services. In this paper, he provided a technical analysis of the limits of the cable industry DOCSIS architecture as compared to the wireless telephone industry DSL based systems.

- For a technical paper presented at the NCTA Cableshow, he prepared an engineering simulation and analysis of the impact of over the top voice over IP telephony services as a function of traffic load on the system.

- Leadership of the project which developed the series of DOCSIS specifications for high speed residential cable modems. The scope of work included developing a roadmap and strategic framework for evolving the business from simple high speed internet services to multimedia broadband services combining voice, data, and secure electronic content delivery. This project was performed under contract to the MCNS consortium of cable TV operators representing 85% of the subscriber base in North America and has since been adopted by the United Nations as a global telecommunications standard.

- Working with Cambridge Consultants UK Limited (a subsidiary of Arthur D Little, Inc), he contributed to the business plan that resulted in the spin out of Cambridge Silicon Radio (CSR), one of the leading semiconductor suppliers of Bluetooth technology. He continued to assist CSR with applications identification and planning while employed at ADL.

- For an advanced R&D group at Texas Instruments, he provided marketing and applications assistance that lead to TI's current TIRUS RF tag product line. The project involved a competitive review of RF tag technologies and development and evaluation of the market potential for current success models such as the Mobil Speedpass and Ford Motor AntiTheft high security key.

- Leadership of a project jointly funded by The National Association of Broadcasters and Maximum Service TV Association to analyze options to accelerate the adoption of digital TV technology by consumers. His recommendations were provided to the FCC and were the basis for the August 2002 report and order the FCC issued to mandate a roll-out schedule for digital TV receivers.

- For a manufacturer of hand-held industrial computing products, I co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Latter I worked with this same client to selected voice over internet protocol (VoIP)

codecs and algorithms that support the client's current product offering cordless industrial voice telephony over a quality of service (QoS) managed wireless IP network.

- Leadership of the project that studied the technology and economics of wireless personal communications technology. The project included the selection of CDMA technologies and the development of strategies to compete with incumbent cellular carriers. This effort led to the formation of a consortium between Sprint and the cable MSOs that has evolved into the present Sprint PCS business.

- Analysis and recommendations in a study funded by CableLabs which led to today's hybrid-fiber coax architecture widely deployed worldwide for delivering broadband multimedia services to the home. The project involved developing forecasts of technology trends in parallel with projecting the business applications. Detailed proforma financial models were developed to make the cost/benefit of deploying this technology visible to the cable industry.

- For Bell South I contributed to a major operations improvement project involving developing forecasts of the future competitive environment, customer needs, a strategy to compete, and new business models. These forecasts were then applied to develop business redesign recommendations and a list of new services offerings.

- For a large multinational cellular service provider I performed a review of their capital efficiency. The project involved the collection of data from over 25 systems in 12 countries and developing capital efficiency metrics that were normalized to the specific geographic and demographic specifics of each system. The project not only provided a measure of present and historical capital efficiency but also provided a management system to be employed for the future.

- For an OEM supplier of subscriber premise telephony equipment sold in multiple countries he engaged in an operations improvement project looking at all aspects of the design, manufacturing, distribution, and support of this high volume consumer product. By means of including unique capabilities in the design of the next generation product that allowed for automatic configuration, he was able to improve the firms performance in multiple dimensions. The new product allowed for a single universal product that reduced inventory costs, simplified distribution, and reduced order fulfillment time. A cost benefit analysis was performed to demonstrate the value of the significant investment required and showed paybacks of under 6 months.

- For a large multiclient project I led the technology analysis efforts exploring the applications fit and cost benefit analysis of electro optics technologies across a wide range of industries and applications from telecommunications to sensors. The client group included NEC, Sumitomo, CBS, Corning, Siemens, and several other firms. The work was performed in the mid 1970's just as fiber optics technology was emerging from the laboratory. During this project I developed automated system design and cost models of fiber optics telecommunications systems that allowed war-gaming the applications based on expected technology improvements and new applications demands. A byproduct of this multiclient project was the Corning/Siemens joint venture Siecor. I assisted both companies develop their joint venture agreement and strategies.

- For a second multiclient group, I studied the state-of-the-art of available LED and semiconductor laser sources in the near infrared 820 nM band. By measuring these devices and determining their contribution to distortion products, I was able to develop applications used today in the cable TV industry involving linear modulation of sources for analog cable TV in hybrid fiber coax (HFC) systems. This work was also performed in the late 1970's time frame and contributed to the first commercial HFC systems deployed in the early 1990's.

- For Magnavox Cable TV (a division of N.A. Philips) I performed comparative cost and technical analysis of fiber optics versus conventional coax systems. This analysis was followed by the development of strategies and sales support materials to pitch the new HFC systems to cable TV operators.

- For Fujikura Electric of Japan, I explored the intellectual property situation in optical communications cables, waveguides, and associated electro-optics components. During this project I met with representatives of the US Department of Commerce, Corning, and other organizations with major patent positions. I identified opportunities for licensing and joint venture.

- For AMP Electric, I evaluated an opportunity to develop and supply fiber optics connectors to the telecommunications industry. The results of this project was the launch of a variety of products targeted to short distance information technology and enterprise network connectors.

- In 1989, as the first project for the newly formed Cable Television Laboratories, I performed a major project for the cable industry to study the role for fiber optics in cable TV. The project developed alternative designs for fiber architectures and developed cost models to explore cost differences. The recommended Hybrid Fiber-Coax (HFC) systems are now being built into today's cable systems worldwide, and the future roadmaps developed in 1989 are still the blueprints being followed today.

- In 1994 I performed additional work for The Cable Television Laboratories in which I studied the application of remote and distributed antennas supporting microcellular PCS on hybrid fiber-coax cable TV systems. A key issue explored was the requirement for the fiber optic portion of the plant to carry the PCS carriers in analog form and deal with the wide dynamic range demands for inbound signals.

- For a consortium of the major cable TV operators consisting of Comcast, Time Warner, Cox, and Rogers; I developed models for prediction of reliability of alternative HFC architectures and their suitability to provide local exchange voice services competitive with ILECs. The project required understanding the reliability specifications employed in conventional local exchange carrier telephone plant and the contributions between hardware, power, and workmenship failures. Each of three alternative fiber optic architectures for cable delivered voice telephony were studied and modeled to develop reliability predictions and recommendations were made as to which aspects of the three alternatives were the best choice for cable delivered voice telephony.

- For a consortium called Multimedia Network Cable Network Systems (MCNS) consisting of TCI, Comcast, Cox, Time-Warner, and Rogers I lead a project that developed the DOCSIS series of cable modem interface specifications suitable for use on modern hybrid fiber-coax cable TV plant. This DOCSIS specification has been adopted as an ITU international specification and is used world wide as the basis for today's commercial cable modem service over HFC cable plant.

- For the USA CIA, I performed a project to identify critical electro-optics technologies in the marketplace as well as in late stages of development. This project involved tracking the source and proliferation of these technologies within, and outside of, the United States. Of particular interest was the export of these critical technologies outside the USA and understanding how they were being exported, the planned uses, and the parties involved.

- I suppored a project for the US Office of Technology Assessment by providing analysis for the project team on the capabilities and limitations of technology in supporting the broadband

telecommunications development through analysis of data communications systems and services provided over electro-optical systems.

- For the real estate management group of the Northern Indiana Public Service Company (NIPSCO), I led a project to determine market and technical feasibility of NIPSCO's using its rights-of-way to offer a fiber-based private network transmission service to the highly industrialized area of Northern Indiana. This project involved conceptual layout of the right-of-way of the new network, development of a service model, investigation of the competitive and regulatory situation, identification of likely customers, and interviews with both potential customers and potential partners to validate the market and technical assumptions.

- For Commonwealth Edison of Chicago, I contributed to a project in which a statewide, multimedia fiberoptic communications network was designed to replace the electric company's aging microwave transmission system. The new fiberoptic system was designed to support voice, customer service data terminals, SCADA, protective relaying, teleconferencing, mobile radio backbone, and computer-aided design remote access to engineering drawings. The project resulted in a systems design, an RFP procurement document, a cost justification for CECO management and the state PUC, and a time-staged implementation plan. Following this project, I participated in a follow-on project to evaluate vendor responses to the RFP. The system was built and is in operation in the Chicago Metro Area.

- For COMCAST Cablevision of Philadelphia, he assisted in the development of a family of advanced two-way, residential digital service, including development of system/service concepts and specification/selection of a range of equipment to provide this service. Key to the services was the specification of the HFC outside plant required to support the services.

- For Kansai Electric in Japan, I developed financial and operating models of a range of typical HFC based U.S. cable television operations to be used as planning tools for new systems being considered in that country.

- For the Westinghouse Teleprompter Cable Company, I studied the market for a fiberoptic based institutional data network in Pittsburg and developed the business and financial models to examine the financial attractiveness.

- For GTE Systems I prepared a presentation on developing commercial opportunities for wide-bandwidth ATM switching. The scope of applications included: metro area network LAN interconnect, broadcast studio digital video routing and switching, and distributed switching for digital wireless personal communications networks. The goal of the project was to explore commercial applications for their military systems broadband switching technology.

- I supported an assignment which prepared the specifications for a three-node, two-link communications system for Niagara Mohawk Power Corporation. Our system designs included requirements for lightwave cable, transmitters, receivers, voice channelization equipment, multiplexers, voice terminals and data modems, low-speed and high speed facsimile equipment, video conferencing cameras and monitors, plus a high-speed data interface with IBM 3030 computers. We observed tests on cable and equipment at the manufacturer's plant and approved them prior to shipment to the field site.

- I was a member of a team exploring the airport applications of fiber optics cables under a DOT project in California. The Bakersfield Airport Fiber-Optic Cable Loop is a data acquisition/power control/signal monitoring and communication system for airport control purposes. The system provides a reliable environment to collect data and send control signals to various airport facilities scattered around the perimeter of the airport. The airport facilities included air surveillance radar, radio transmitters and receivers, runway visual ranges, equipment

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