

## Stuart J. Lipoff

Mr. Lipoff is a consultant with a practice in TIME (telecommunications, information technology, media, electronics, and ebusiness). He draws upon his 40+ 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. His clients include component suppliers, equipment manufacturers, service providers, and those who make equity and debt investments in technology ventures. Typical assignments involve product development assistance, technology assessments, M&A corporate development, visioning the future, strategic planning, strategic business development support, competitive product positioning, change management, and overall business decision support.

He has assisted clients evaluate product development plans and apply technologies in activities ranging from conceptual studies to detailed development and implementation of products, services, and strategies. Mr Lipoff has industry expertise in several high volume manufacturing operations in electronics, electromechanical, and related industries. He has assisted clients in strategic planning, managing their technology, improving the product development process, managing complex external procurements, and resolving problems in design, procurement, and manufacturing.

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. Under his leadership this CIE practice was the fastest growing and most profitable operation in the company growing at 30%/year and accounting for 25% of the net profit of the firm with less than 1% of the staff headcount. At both Bell & Howell and Motorola, he had project design responsibility for portable 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 an elected member of the IEEE Consumer Electronics Society National Administration Committee, and was the Boston Chapter Chairman of the IEEE Vehicular Technology Society. He served as 1996-7 President of the IEEE Consumer Electronics Society and is now Chairman of the Consumer Electronics Society Technical Activities and Standards Committee. 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).

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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 is was 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 also served as a board member 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 broadcasting, cable TV, computer products, consumer electronics, media, telecommunications, and wireless communications sectors include:

- For Next Generation Network Architecture llc (NGNA llc) consortium of Comcast, Cox, and Time-Warner; he managed the project that produced a five year planning horizon vision for the services and technology the cable industry will seek to deploy. The services and vision were then mapped to overall architectures impacting network elements in the back office, head-end, outside plant, and customer premises and documented in next generation network recommendations. The project involved coordination with over fifty senior technical staff in the three cable MSO sponsors as well as interactions with over 100 suppliers of systems, software, and products to the cable industry. The recommendations and findings were wide ranging including, for example: software defined downloadable conditional access (CA) systems, migration of the outside plant from low to mid split, bridging from network CA to in-home network digital rights management systems (DRM), and migration from 1way to 2way digital TV.
- For a cable operator I am supporting exploration of alternative means to provide competitive public network wireless services to existing cable and new customers. The project involves exploring 3rd and 4th generation wireless air-interface technologies and developing models that integrate capital expenditures forecasts with operating profits to develop financial performance perspectives of alternatives. A unique aspect of this project includes developing technology forecasts and estimates of subscriber equipment capable of supporting video and multimedia content delivery to handsets.

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- For the venture capital arm of The UN's World Bank (IFC), we supported the evaluation of an investment opportunity in a China based cellphone contract engineering and design firm. As a part of this project, he met with leading cellphone original design manufacturers (ODMs) and contract manufacturers in China to develop technology, feature, and volume forecasts for next generation cellphones.
- 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, and strategies were developed and recommended to the industry.
- 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.
- For Tele2 (a pan European cellular and wireline telephone company), he supported their efforts to procure an advanced cordless telephone from contract manufacturers in China (PRC). This involved development of detailed technical specifications, coordination of a request for information, (RFI), and evaluation of the responses.
- For Millicom International (a cellular provider in several developing nations), he studied capital spending and developed best practice benchmarks. The work products were then employed in forward planning and to develop strategies for improvement of their financial performance. 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 the banks providing financing to The Iridium Mobile Satellite Service, he served as a technical advisor and assisted in developing the contracts between the banks and Motorola in which Motorola secured the loan. As a technical advisor, he had extensive day-to-day interactions with Motorola's manufacturing and product design organization. The interactions included examination of the manufacturing cost, methods, and processes of Motorola's Subscriber Products Group cellphones, pagers, and related portable wireless data communications devices.
- For Sony USA, he supported a feasibility analysis of a planned investment by Sony into a wireless PCS carrier in the USA. This involved the development of alternative business models, financial analysis, and technical analysis in order to determine financial attractiveness and risk of proceeding with the venture.
- For Samsung Electronics Global Marketing, he developed a strategic framework for a line of portable and personal multimedia products to be introduced in The USA. The project

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included developing a common theme for a set of products that ranged from cellphones, MP3 music players, electronic books, PDAs, to hand-held games. One the common theme was developed, product features and capabilities were detailed and market adoption models were developed to forecast demand.

- For Korea Mobile Telephone, he supported the project that developed a strategic plan to position KMT relative to Korea Telecom.
- For Symbol Technology, a manufacturer of hand-held industrial computing products, he co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Latter he 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 for CableLabs that studied the technology and economics of wireless personal communications technology. This project is highlighted in the history of CableLabs in their website as one of the significant accomplishments of The Labs. 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.
- Co-inventor of the Commercial Free™ technology widely licensed to major consumer electronics manufacturers and incorporated in nearly all high end video tape recorders (VCRs), personal digital video recorders (PVRs), and new released DVD video recorders. The technology employs artificial intelligence techniques to automatically recognize commercial segments and remove them upon the playback of time shifted recorded video program material.
- For Rockwell Semiconductor, he supported a major project to identify and explore diversification opportunities beyond their current line of fax modems and compression chips. The project identified opportunities in wireless communications, broadband enterprise networks, and video signal processing. After identification of the opportunities, market forecasts were developed, competitors identified, and an analysis of the attractiveness versus fit with Rockwell was performed to support a request for board approval of diversification plans.
- For Cambridge Silicon Radio (UK), he worked with the client to develop a prioritized list of applications for their Bluetooth component offerings. The project mapped applications into specific target customers and based upon an analysis that considered the market needs with CSR's capabilities, a prioritized roadmap of products was developed to steer the R&D portfolio.
- TCE markets cordless telephones in the USA under the GE Brand Name. The introduction of cost and size reduced imported products had an unexpected and immediate negative impact on market share. he was retained to develop modifications to the existing product to size reduce the existing product by reworking the existing inventory as well as develop a next generation product for new production. The project involved a combination of industrial design, antenna design, modification of the impedance matching electronics for the new

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communications device. The large telescoping antenna was replaced with a center loaded size reduced flexible antenna. An additional printed circuit board was designed and fabricated to tune and match the new antenna to the existing cordphone transceiver. Additional modifications to the transmitter involving component changes were developed to increase the transmitter power to overcome the additional loss in the loaded antenna. Manufacturing process sheets were designed and implemented in the factory to support the rework of the existing inventory. Engineering change orders were prepared for a new product design that included the changes on a single unified printed circuit board.

- For the flash memory global marketing group of Samsung, he led a project that explored the opportunities for flash member in the emerging group of personal multimedia devices. These PMM devices ranged from PDAs, MP3 players, electronic books, to enhanced cellphones. The project developed visions and roadmaps for the rollout of these products and then translated this to the specific flash memory needs. A key aspect of the project was to determine the digital rights management and intelligence needs of the flash memory as content storage media. The analysis drove the Samsung developments and led to their participation in the SD flash consortium.
- For TRW, he participated in an assignment which reviewed all their non-classified military and defense technology to identify commercial applications. A number of systems applications in security for wireless communications and antifraud were developed which became the basis for successful spin-off operations. In addition, this project examined their GaAs design and production capabilities. The project resulted in foundry business for the GaAs fab in large volume consumer applications for direct to home satellite TV receivers.
- For a corporate cross sector event organized by Motorola Corporate for all their divisions, he prepared presentations on the visions of the future in each of the major sectors in which Motorola has an interest. The presentations included: consumer electronics, medical, automotive, industrial electronics, and communications. The presentations provided a basis for the cross sector teams to engage in long term planning for each division.
- For a manufacturer of hand-held industrial computing products, he co-developed the protocol for a wireless local area network that was the basis for the current IEEE 802.11 wireless LAN standard. Latter he 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.
- For a large multinational cellular service provider he 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.

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