

Communications Futures

Every sector of the economy and all aspects of society now depend on communications. Conversely, our communications systems designs impact every dimension of our lives. The Communications Futures Program explores the intersection of technology, industry organization, societal interactions, and the global economic environment to understand key drivers and opportunities across industries.

The Communications Futures Program at MIT

Introduction

The Communications Futures Program is an MIT-wide effort that capitalizes on collaborative research across the Sloan School of Management, the Computer Science and Artificial Intelligence Lab (CSAIL), and the Media Lab, to provide perspective, analysis, tools, and insight into the social, technical and regulatory dimensions of communications and media, broadly conceived.

We began the program with the observation that communications was no longer a discrete discipline or a vertical industry. It is instead defined by interactions and intersections: between people and systems, between technology and regulation, and among diverse businesses. Every development emerges in a context that depends on externalities that are neither simple to predict or anticipate. While underlying technologies may seem to progress monotonically (e.g., Moore's Law), the integration of them into society and business is not straightforward. MIT, with its breadth and depth of researchers and industry interactions provides an unequalled forum in which these challenges can be suitably explored.

The program is unique in both its breadth and its organization. In addition to a diverse faculty, we include an expanding coterie of member companies that cross industry boundaries. We strive to include voices from diverse regions and industries. This includes channel providers, content providers, service developers, and device manufacturers from around the world. We are open to any member who understands that the future of economic activity and society in general is intimately linked to the state of communications worldwide.

We operate primarily on the basis of "working groups" comprised of member companies, MIT faculty, students, and research staff. The program is thus inherently participatory with groups led by a CFP staff member and an industry representative. Groups develop frameworks through which to understand complex multi-dimensional issues. These groups meet as needed, physically and virtually, to guide and explore the process. Each year, we hold plenary and executive meetings at which the broader agenda is defined and the latest findings are discussed.

The Evolving Agenda

When CFP began in 2003, ubiquitous mobility was on the horizon, multimedia broadband was just beginning, music file sharing was threatening to destroy the business models of content providers, and social computing was in its infancy. We considered the impact of these emerging phenomena through lenses that included "personal broadband," privacy issues, value chain disruption, the broadband provisioning dilemma, and business models for "social" services.

As the socio-technical environment, user behavior, and the dominant business models evolve, the CFP agenda will as well. CFP will continue its global approach to these issues, with a focus on the drivers that have the most leverage for change. Today, the omnipresence of digital media and the Internet are assumed; but key drivers of change lie in three general areas:

- The Communications Industry
 - Regulatory struggles: spectrum, privacy, security
 - Operational structures: potential wireline monopoly, value chain disruptions
- Beyond Stakeholders
 - Integration with physical design, energy, cities, mobility, enterprises
 - Migration to proprietary apps; viral apps
- International
 - Role of emerging nations
 - Big Data: in scope and in realtime

Roadmapping as Metaphor

We think of roadmapping as a process to characterize opportunities and risks in the value chain, to identify the barriers to and boundaries of progress, and to find signposts that may suggest future directions and paths. Our models and frameworks help comprehend how changes in our members' and adjacent industries affect them, and how to assess their options. These comprise four related components:

Models of value chain dynamics

- We provide frameworks and methods to comprehend the forces that drive changes in the value chain – technical, social, corporate, user, governmental – to help evaluate the shifting position and structure of a firm and the potential for industry disruptions and business model innovation for both incumbents and entrants.
- The Double-Helix Model describes in detail how value chain structures oscillate between vertically integrated and modular, and how to anticipate phase changes.
- The Incumbent's Dilemma Model characterizes the challenges that incumbent firms face with potential entrant disruptors and how to anticipate and react to these challenges.
- The Gear Model provides an integrated perspective on multiple forces colliding simultaneously in the value chain.

Case studies

- Since 2003, we have published multiple case studies that have captured breaking issues affecting communications futures including: the digital distribution of music, television and film, location based services, RFID, E911 and CALEA (wiretap) challenges faced by the FCC, Sports over IP, White Space business models, End of the Triple Play, and Social TV.
- Case studies analyze issues and business challenges for communications firms, as well as for industries that use the Internet as a core component of their value proposition including media (music, film and television, books, newspapers, social media, etc.)
- In addition to industry case studies, we dig deeply into cross cutting issues that concern the future of all communications industries like privacy and security, Internet architecture, etc.

Spotting the unexpected

- Tiny ripples can produce big changes, as we know from Moore's law and chaos theory. We observe the ripples and use systems thinking and systems dynamics models to construct scenarios about these potential surprises, while observing our own students as they build the future.

Addressing barriers

- To construct roadmaps and scenarios, one must understand barriers as well as growth paths. Barriers can be fundamental (e.g. the speed of light), but often arise from social or political reasons and require coordinated action to overcome. Spam, privacy, security, and a range of standards issues have this character. We have created working groups with representation from a range of interests to examine these issues and make recommendations.

These four components of CFP reinforce each other, enabling a holistic, dynamic capability to support deep thinking about the communications and media landscape.

Operations

Each of the participating groups at MIT—the Sloan School of Management, the Media Lab, and CSAIL—collaborate on topics within this framework. We engage our members through a number of vehicles:

Working groups:

- We invite our industry partners to be active participants in the research. Working groups provide a forum for ongoing interaction and collaboration in the writing of research papers and dissemination of understanding between MIT and participating companies. Working groups engage in conversations and research that leverage the best information we can find, from every source available.

Plenary meetings:

- Held annually in the fall, plenary meetings (at MIT and hosted by sponsor companies) provide an opportunity for members to interact with CFP staff, invited guests, and each other. Our meetings include presentations and discussion groups that help us collectively explore the knowledge landscape and engage in lively debates about the shape of the future. Outside speakers are often invited to enrich the discussions.
- Participation in plenary meetings is restricted to CFP member companies, select outside participants, speakers and academic guests. Videos of plenary meetings are posted to our public web site after 3 months.

Executive workshops:

- When a member hosts a plenary, they receive a half-day workshop with their senior executives. This smaller meeting focuses on the key issues of the plenary agenda in a more intimate and interactive format.

Industry white papers

- Industry white papers are normally the product of a working group. They are released on the CFP public web site along with academic publications that relate directly to the CFP research. These papers are a means to convey our results to the broader industry.
- CFP membership allows early access to these results.

Research briefs

- Research briefs are a way to provide our members more immediate access to results of our research. They include summaries of talks, executive summaries of academic papers submitted for publication, and the like. They are normally distributed exclusively to our members.

The PI Blogs

- Once a month, the CFP Principal Investigators share their opinions regarding important events in the digital space. Members are invited to respond. Some of our most dynamic discussions occur within the blog forum.

Visits to MIT and member sites

- Members of CFP are welcome to arrange an occasional visit to MIT to discuss issues of mutual interest with CFP faculty and students on an informal basis. This interaction may lead to a directed research engagement if it goes beyond the scope of CFP or demands supplementary attention, as determined by CFP.
- CFP arranges occasional visits to CFP member sites, often in connection with a CFP plenary meeting.

Executive committee

- Active CFP member companies are asked to identify a key point of contact to sit on our executive committee and help set the direction of our research.

Program Benefits

Insight and analysis

- Leading thinkers at MIT develop ideas in collaboration with industry partners, who apply the insights and analysis generated through presentations and discussions inside their organizations. The ideas developed through CFP activities are captured in papers that our member participants can distribute internally.

Validation

- Our members have the opportunity to workshop specific issues they are grappling with inside their organizations with the larger group. This makes CFP an ideal forum to test and validate new ideas.

Social networking

- Through our various meetings, our members have the opportunity to connect with academics, policy makers, and industry peers.

CFP Leadership

The Communications Futures Program draws on the expertise of researchers throughout MIT. An interdisciplinary team heads this program:

David Clark is a Senior Research Scientist at the MIT Computer Science and Artificial Intelligence Laboratory, where he has worked since receiving his Ph.D. there in 1973. Since the mid 70s, Dr. Clark has been leading the development of the Internet; from 1981-1989 he acted as Chief Protocol Architect in this development, and chaired the Internet Activities Board. His current research looks at re-definition of the architectural underpinnings of the Internet, and the relation of technology and architecture to economic, societal and policy considerations. He is helping the U.S. National Science foundation organize their Future Internet Design program. He is past chairman of the Computer Science and Telecommunications Board of the National Academies, and has contributed to a number of studies on the societal and policy impact of computer communications. He is a member of the National Academy of Engineering and a Fellow of the ACM and the IEEE.

Charlie Fine, the Chrysler LGO Professor of Management and Engineering Systems, teaches operations strategy and supply chain management at MIT's Sloan School of Management. His research focuses on supply chain strategy and value chain roadmapping, with a particular focus on fast-clockspeed industries. His work has supported design and improvement of supply chain relationships for companies in electronics, automotive, aerospace, communications, and consumer products. His current research examines dynamic models for assessing the leverage among the various components in complex industrial value chains and principles for value chain design, based on strategic and logistical assessments. Professor Fine holds an AB in mathematics and management science from Duke University, an MS in operations research from Stanford University, and a PhD in business administration (decision sciences) from Stanford University. He is the author of *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*, Perseus Books, 1998. His work, on quality management, flexible manufacturing, supply chain management, and operations strategy, has also appeared in *Management Science*, *Operations Research*, *Journal of Manufacturing and Operations Management*, *Production and Operations Management*, *Annals of Operations Research*, *Games and Economic Behavior*, *Sloan Management Review*, *Supply Chain Management Review*, and *Interfaces*.

Andrew Lippman is Senior Research Scientist at the MIT Media Laboratory. Andrew received both his B.S. (1971) and M.S. (1978) degrees in electrical engineering from MIT. In 1995 he completed his Ph.D. studies at the EPFL, Lausanne, Switzerland. He directs a \$5.5 Million research consortium at the MIT Media Laboratory entitled "Digital Life" that addresses bits, people and community in a wired world. He has been a member of the editorial board of "Image Communications" and the ACM Multimedia Journal. He has also been one of the first members of the ISO Motion Picture Experts Group that developed the first standards for low-rate and high quality video compression. He holds eleven patents in television, digital image processing and interface technologies. His current research interests are in the domain of "viral systems" both as a new approach to wireless communications and as a basis for innovation.

Membership

Members contribute \$100K a year. Member privileges include:

- Unlimited participation at all CFP events
- Unlimited participation in CFP working groups
- One-on-one interaction with CFP faculty members
- Full access to CFP intellectual property

For small companies (e.g., recent startups) we are prepared to discuss a reduced membership fee for restricted participation.

Current Members

Cisco
Comcast
ESPN
NBCU
Nokia Siemens Networks
Samsung
Telecom Italia
United States Postal Service OIG

Member testimonials

"The CFP has created a valuable and unique forum for the exchange of ideas, developments, visions and research between industry representatives and recognized academic masterminds. A series of regular working group meetings, workshops, and plenaries has led to deep research and a rich set of tools to help bring CFP ideas inside corporations. The ongoing dialogue of the CFP is of high value to its sponsors."

— Dirk Trossen, Cambridge University

"The CFP provides us, for the first time, with an examination of technology innovation that intersects with business innovation. The combined participation of industry and academia directly benefits the analysis of the complex scenarios faced by the telecommunications industry today. The ideas and results of the CFP provide valuable input to our internal discussions on our firm's strategic direction."

— Roberto Saracco, Telecom Italia

"In some programs, you listen to and meet influential people — or you get business analysis and discussion of communications industry problems — or you get technical analysis and discussion — or you work with other industry people to identify and fix problems — or you work with academics to identify and fix problems. At CFP you do all of these. And because the standard is consistently high, it's worth it for the best people from a broad spectrum of industry and academia to participate."

— Bob Briscoe, BT Research

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Map of MIT <http://whereis.mit.edu/map-jpg>

Getting to MIT <http://cfp.mit.edu/contact/directions.html>