Summary of 21 May Ivey Telecom Workshop on Innovation and Telecommunications Policy: Shaping Tech, Markets and Networks

by Erik Bohlin, Romel Mostafa, Raymond Wang, Ivey Business School, and Workshop Presenters.[1]

The workshop on the theme "Innovation and Telecommunications Policy: Shaping Tech, Markets and Networks" was convened on 21 May 2025, at the Ivey Donald K. Johnson Centre in Toronto. It attracted more than 70 in-person registrations and 15 webinar participants. It was the fourth Ivey Workshop on Telecommunications Policy, convened by the Ivey Chair in Telecommunications Economics, Policy and Regulation, *Erik Bohlin*, and the Director of Lawrence National Centre for Policy and Management, *Romel Mostafa*, Ivey Business School at Western University.

This workshop focused on the role of innovation for telecommunications policy – both as a outcome and input. Traditionally, telecommunications policy has focused on competition, affordability, digital divide and access, both for wireline and wireless networks. Little attention has been spent on how to use policy to develop innovation and new technologies for economic growth. Developing policies and strategies that support digital infrastructures, innovation and economic progress is crucial for Canada and other countries, in the wake of globalization, disruption and geopolitical challenges.

International experts, industry and government officials, both past and present, spoke during the day. Here follows a summary of each presentation, with implications toward the end. Complete presentation slides are available at the Ivey Business School website, together with the agenda of the day, also in the Annex of this report.[2]

Professor Romel Mostafa introduced the workshop with an impassioned speech on the role of innovations for Canda's future, and the importance of telecommunications to drive and facilitate innovation. Given the urgent geopolitical context and Canada's strength in telecommunications research and related network applications, such as AI, there is an important opportunity to rethink and reformulate policy, as well as corporate strategies. *Professor Erik Bohlin* developed further this introduction and theme by emphasizing that there is an urgent need to deepen understanding of innovation and telecommunications policy, and to develop new perspectives. The speakers are well positioned to provide this enlightening, being well grounded in both research fields.

[1] This summary contains two Annexes: Agenda and a detailed summary of the presentations, including Q&A sessions of the day.

[2] See https://www.ivey.uwo.ca/news/events/2025/05/innovation-and-telecommunications-policy-shaping-tech-markets-networks/

Professor Johannes Bauer, Michigan State University, elaborated on how regulation influences the rate and direction of innovation in the telecommunications ecosystem, but noted that theories and practices that consider the repercussions of regulatory choices on innovation in advanced digital services and applications were underdeveloped. The presentation generalized insights from innovation research and frames digital innovation as an evolutionary, combinatorial search process. Starting from work on emergent technologies, it examined the drivers of the multiple, coexisting types of innovation in the digital ecosystem, and revealed the contingencies and ambiguities that shape the interactions between regulation and innovation. Depending on the conditions and the design of policy, regulation may be precondition and facilitator of or it may be an impediment or roadblock to innovation. To avoid the potential downsides, policy and regulation should be aligned with the conditions of innovation in advanced digital ecosystems. The presentation concluded with recommendations on how these insights can be translated to policy practice.

Professor Marja Matinmikko-Blue, Oulu University, introduced global research activities on 6G, and emphasized in particular how values are driving 6G R&D in Europe. She summarized Finnish 6G Flagship's multi-disciplinary research roadmap including technology, business, regulation and sustainability perspectives, where multi-stakeholder collaboration involves academia, industry, and public sector interplay. She focused on sustainability as the principle of ensuring that our actions today do not limit the range of economic, social, and environmental options open to future generations, which is a global driver for 6G. She distinguished between ICT sector's enablement role to help different sectors of society towards sustainable operations and ICT solutions' own sustainability burden, which keeps increasing in the AI era. She also outlined global 6G policy discussions and pointed out the emergence of local networks and increasingly difficult spectrum debates. She emphasized the need for close collaboration between academia, industry and governments, and multi-disciplinary multi-stakeholder mindset and actions.

Professor Gerard Pogorel, Institut Polytechnique de Paris, emphasized virtualization as the result of the fast softwarisation and cloudification of almost all aspects of telecom infrastructures processes management. The virtualization of network functions, representing a structural shift in network management towards "virtual networks", brings in major changes in the telecoms industry. This makes possible a more distinct separation between infrastructure and service operations, notable in both fixed and mobile components of networks. It also fundamentally changes the infrastructure financial funding and capital structure equation, enabling more agile business strategies. It creates a fast-evolving and disruptive backdrop, opening opportunities to set up "virtually consolidated" digital networks based on the establishment of an open and competitive wholesale market for local access connectivity. It makes possible the decoupling between services and physical infrastructures and applications, opening the market, facilitating funding by infrastructure investors, creating new opportunities for both faster innovation and increased economies of scale, and allowing more agility for service providers. These changes in the telco business model can be described as "From Telco to TechCo", with several new categories of market players are already emerging.

Professor Peter Cramton, University of Maryland and Max Planck Institute for Collective Goods, gave an overview of his framework and vision to address competition, investment and innovation in critical infrastructures that are subject to congestion. Applications include electricity, communications, and transportation. The approach accommodates any commodity or financial asset, and it is especially powerful for network commodities where products are defined by time and location. The approach can address competition challenges in critical infrastructure industries by removing wholesale market entry barriers. Retail consumers can enjoy innovative and competitive service despite weak competition in physical infrastructure. An open-access market design is used to manage network congestion and optimize network use and value, eliminating the walled-garden approach; instead, it commoditizes network capacity while decentralizing access to a transparent wholesale market. It ensures that scarce capacity is put to its best use by providing a platform for efficient trade. The market operates without friction using flow trading. It allows participants to bid persistent piecewise-linear downward-sloping demand curves for portfolios of products, gradually adjusting positions toward targeted needs. Flow trading allows fine granularity of products in time and location, creating complete markets. Liquidity and computational feasibility are maintained despite trading millions of interrelated forward and real-time products. Participants manage risk and adverse price impact through trade-to-target strategies. A market operator clears the market every hour, finding unique prices and quantities that maximize as-bid social welfare. Prices, aggregate quantities, and the slope of the aggregate net demand are public. The market operator observes positions, enabling it to optimize collateral requirements to minimize default risk. Priority pricing is used to manage real-time imbalances.

Professor Alessandra Rossi, University of Chieti-Pescara and European University Institute, suggested that industrial policy has forcefully returned to the EU telecommunications policy discourse, after being more or less banned since the start of deregulating telecommunications markets in the late 1980s and early 1990s. She elaborated on the reasons for this return, including the changed geopolitical landscape; weak productivity growth in the EU; a wider set of goals being pursued, such as climate and innovation; supply chain shocks due to the pandemic; and finally the fundamental digital transformation taking place in the economy. She emphasized three main features of the evolving industrial policy landscape, and corresponding lessons to the new situation. These lessons are described well in the workshop slides, and also in the detailed summary report, provided in the Annex. Here the main features of the emerging industrial policy are noted. Firstly, a technology-specific and whole-value-chain industrial policy is emerging, and leading towards both a more focused approach in terms of resources and areas, but also aiming for broader impact by picking more general-purpose technologies. Secondly, open strategic autonomy and the geopolitical dimension plays a larger role for the formulation of industrial policy, with important implications for which areas to be supported. Professor Rossi warned however against distributional consequences of a more focused approach. Finally, and thirdly, industrial policy is reaching beyond its traditional boundaries, with a view to influence greater flexibility for mergers, consolidation and competitiveness support.

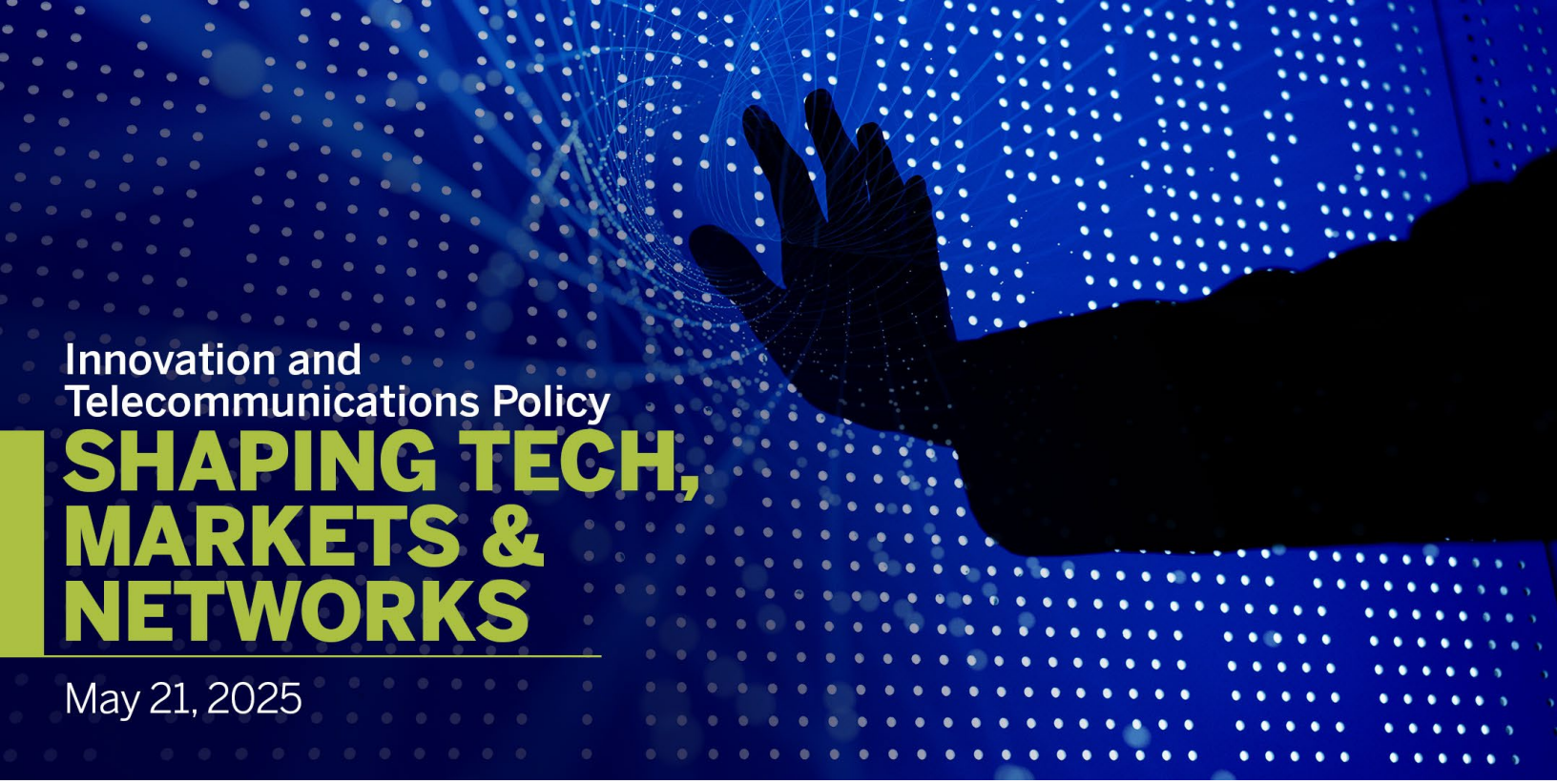
Georg Serentschy, Managing Partner at Serentschy Advisory Services GmbH, note that the latest geopolitical disruptions present both Canada and Europe with a new kind of dilemma: the long-standing boundary between "like-minded" and "non-likeminded countries" appears to be blurring, and confidence in a constellation known as the "Western Alliance" has been eroded. This situation gives rise to the imperative of strategic sovereignty in Canada and Europe. Technology and geopolitics have never been closer because of their many links. Against the backdrop of present geopolitical and geo-economic circumstances, global risks, and enhanced technological competition, the security aspects of quantum, which play an increasing role in the entire technology stack, come into focus. This concerns the security and resilience of critical systems for the economy, society, and defense. Communications systems and Quantum Information Networks are areas in which policy makers should prioritize the efforts in view of the threats and challenges. Two areas stand out: (1) Enhanced Cybersecurity: For critical infrastructure like banking, energy, defense, and healthcare, where data breaches can have catastrophic consequences, quantum communication provides unbreakable encryption. (2) Securing National Infrastructures: Governments and corporations can use quantum communication to protect sensitive information transmitted across national grids and networks, safeguarding against espionage and cyber-attacks. Quantum technologies represent a disruptive force that can transform critical infrastructures, enhance security, and drive efficiency across industries. While AI chips provide powerful tools for many current applications, quantum computing addresses fundamentally different challenges. Together, they represent the future of technological advancement. For companies operating in sectors vital to societal functioning, embracing these innovations is not just an opportunity but a necessity to remain competitive and resilient in an increasingly complex world.

The panel discussion on innovation and technology adoption in Canada was moderated by *Professor Romel Mostafa*, and featured notable panelists as *Salim Teja*, Partner, Radical Ventures, *Peter Wilcox*, Director, Enterprise Wireless Products & Services, Bell, and *Carlos Cabrero*, Director, Customer Experience Excellence, TELUS Agriculture and Consumer Goods. The first round of presentations centered on the respective companies of the panelists, and what these firms were offering in relation to the panel topic. Each panelist also explained some of the roles each played in their companies, and how they arrived at their positions. The panel debate then moved into two other main strands of discussion. Firstly, concerns of barriers, policy, and scaling were highlighted, including dimensions relating to rural connectivity, SME resource gaps, fragmented procurement, and technology literacy. Secondly, the theme data and technological sovereignty, security, and IP attracted a set of wide ranging observations and reflections from the panel. Concluding, the speakers centered their key messages on issues such as stability in government relations and policies, the importance of local innovation systems, and finally the urgency with the opportunities that the innovation platforms offer. The Annex includes a detailed exposition of the discussion, together with a summary of the Q&A.

Greg Lang, Senior Strategic Officer, Office of the Vice President, Canadian Radio-television and Telecommunications Commission (CRTC) concluded the day with reflections on what the messages of the day meant for Canada, and especially the mission and role of the CRTC, noting that he was speaking strictly in a personal capacity and not representing CRTC's official position. He asked himself of what the key messages were to bring back to the CRTC after the workshop and centered on three main messages. Firstly, integrating innovation analysis into regulatory practice was an overarching message of the day, calling for a systematic, structured approach to embedding innovation analyses within regulatory decision-making. While the workshop provided concrete steps toward this end, he cautioned that every new policy lens adds complexity to the regulatory process. Secondly, the suggestions regarding innovative pricing mechanisms for wholesale access in telecommunications were interesting, as a contrast to the long-standing emphasis on cost-based analysis. Thirdly, the resurgence of industrial policy within EU telecommunications has parallels with current shifts in Canada, moving away from exclusive reliance on market forces. Within such an industrial policy renewal, there is a need for policy coherence, across government departments and agencies. As a final concluding message, he congratulated the organizers for bringing this palette of international experience coupled with Canadian implications to the audience, enriching discussion in Canada on ways to develop future telecommunications policy.

Annexes:

- Workshop Agenda: Innovation and Telecommunications Policy: Shaping Tech, Markets and Networks, May 21
- Detailed Summary of Innovation and Telecommunications Policy: Shaping Tech, Markets and Networks, May 21,by Ray Wang, Ivey Business School



Wednesday, May 21, 2025
12 – 6 p.m.
Donald K. Johnson Centre, First Canadian Place / Exchange Tower
130 King Street, Toronto, Ontario

Host
Ivey Business School, Western University, Ontario

Organizers
Erik Bohlin, Ivey Chair in Telecommunication Economics, Regulation and Policy, and Romel Mostafa, Director, Lawrence National Centre for Policy and Management, Ivey Business School

Schedule

Time	Location
12:00 – 1:00 p.m.	**Welcome Buffet Lunch**
1:00 – 1:10 p.m.	**Welcome and Introduction** Erik Bohlin, Professor, Ivey Business School and Romel Mostafa, Director, Lawrence National Centre for Policy and Management, Ivey Business School
1:10 – 1:30 p.m.	**Opening Keynote: Aligning Innovation and Telecommunications Policy** Johannes Bauer, Professor and Director, Quello Center, Michigan State University, USA
1:30 – 1:50 p.m.	**How 6G Will Change Innovation and What Policy Should Do** Marja Matinmikko-Blue, Adjunct Professor, Oulu University, and Director, Sustainability and Regulation, 6G Flagship, Finland
1:50 – 2:10 p.m.	**How Network Virtualization is Changing Fundamentals of Telecom Policy** Gérard Pogorel, Professor Emeritus, Télécom Paris, France
2:10 – 2:30 p.m.	**How an Open Market for Wholesale Access can Reshape Innovation in Wireless** Peter Cramton, Professor Emeritus, University of Maryland, USA & International Research Fellow, Max Planck Institute for Collective Goods, Germany
2:30 – 3:00 p.m.	**Coffee Break**
3:00 – 3:20 p.m.	**The Return of Industrial Policy in Telecommunications** Maria Alessandra Rossi, Associate Professor, University G. D'Annunzio of Chieti-Pescara & Scientific Coordinator, Centre for a Digital Society, European University Institute, Italy **Virtual presentation*
3:20 – 3:40 p.m.	**Quantum Communications – Network Security and Resilience – Geopolitics** Georg Serentschy, Managing Partner, Serentschy Advisory Services, Austria

3:40 – 4:40 p.m.	**Panel Discussion** Moderated by Romel Mostafa, Director, Lawrence National Centre for Policy and Management, Ivey Business School Carlos Cabrero, Director, Customer Experience Excellence, TELUS Agriculture and Consumer Goods Salim Teja, Partner, Radical Ventures, Canada Peter Wilcox, Director, Enterprise Wireless Products & Services, Bell
4:40 – 5:00 p.m.	**What are Some Takeaways for Canada?** Greg Lang, Senior Strategic Officer, Office of the VP, Canada Radio-Television and Telecommunications Commission
5:00 – 6:00 p.m.	**Networking Reception with Cocktails and Hors d'oeuvres**

Speakers

Johannes Bauer is a researcher, writer, teacher, and academic entrepreneur. He is interested in the digital economy next-generation media. His position as Quello Chair for Media and Information Policy facilitates the pursuit of rigorous and actionable research. From September 2023 through December 2024, he was on leave from MSU to serve as the Chief Economist in the Office of Economics and Analytics (OEA) of the U.S. Federal Communications Commission in Washington, DC. Educated as an engineer and social scientist, he obtained advanced degrees in economics from the Vienna University of Economics and Business, Austria. Michigan State University has been his home institution since 1990. He had the privilege to spend extended times affiliated with Delft University of Technology, The Netherlands (2000-2001), the University of Constance, Germany (Summer 2010), and the University of Zurich, Switzerland (2012).

Erik Bohlin is Professor and Chair in Telecommunication Economics, Policy and Regulation at the Ivey Business School. He is an expert in telecommunications policy, an inter-disciplinary topic concerned with the impact of digitalization in the economy and society. He is Editor-in-Chief of *Telecommunications Policy*, a premier journal in the field. He is on leave as Professor at Chalmers University of Technology, Sweden. His graduate degree

is in Business Administration and Economics at the Stockholm School of Economics (1987) and his Ph.D. is from Chalmers University of Technology (1995). He is a Member of the Swedish Royal Academy of Engineering, and Past Chair of the International Telecommunications Society, an inter-disciplinary professional society convening conferences on the evolving digital society and policy needs.

Carlos Cabrero is an established TELUS leader with an impressive track record of delivering quality results. He started with TELUS in 2013, spearheading a variety of programs supporting the Procurement and Finance teams, focused on transforming end-to-end source-to-pay processes, building data insights to drive cost savings and implementing new tooling and technology. Carlos joined the TELUS Agriculture & Consumer Goods team in 2024 with the mission of building a best-in-class customer experience practice. This includes implementing a voice of the customer program, customer health program, customer self-serve capabilities, building a knowledge management repository, establishing a 24/7 global operations model and implementing technology to underpin it all. Carlos completed his undergraduate degree at Western University and his MBA at the DeGroote School of Business at McMaster University, with a double major in finance and the management of innovation and new technology. Carlos has also taught Strategic Procurement at DeGroote as a sessional instructor since 2019.

Peter Cramton is an Emeritus Professor of Economics at the University of Maryland and an International Research Fellow at the Max Planck Institute for Research on Collective Goods. Since 1983, he has researched auctions and market design, designing complex markets to achieve goals. Applications include electricity, financial, and communications markets. He has introduced innovative market designs in many industries. He has advised many governments on market design and dozens of bidders in major auctions. Cramton is a co-inventor of spectrum auction designs used in North America, Europe, and Asia-Pacific. He is an advisor and chief economist to companies implementing markets. From 2015-2021, Cramton was an independent director of the Electric Reliability Council of Texas (ERCOT) board. He received his BS in Engineering from Cornell University and his PhD in Business from Stanford University.

Greg Lang joined the CRTC in 2023 as Senior Strategic Advisor in the Telecommunications Sector. In this role, Greg advises senior decision-makers on key telecom policy areas. He also contributes substantively to the CRTC's work on high-profile issues like Internet and cellphone competition, network resiliency, and 9-1-1 services. Greg joined the public service in 2006 and spent most of his career at Canada's antitrust agency—the Competition Bureau. Most

recently, as Major Case Director, Greg headed up the Bureau's efforts to advance pro-competitive government policy across Canada. This included leading several significant interventions in front of the CRTC and the Broadcasting and Telecommunications Legislative Review Panel. Prior to that role, Greg gained significant experience leading reviews of corporate mergers and acquisitions before the Competition Tribunal and the courts. Greg's major cases during this time involved the telecommunications, airlines, event ticketing, and beverage industries. Greg is a graduate of Wilfrid Laurier University where he trained in economics and business administration. One of his formative experiences with telecom occurred during this time, where he had the opportunity to work as a marketing co-op during the heyday of BlackBerry.

Marja Matinmikko-Blue is Research Director at Infotech Oulu and Director of Sustainability and Regulation at 6G Flagship research program at the University of Oulu, Finland, where she also holds the position of adjunct professor in spectrum management. She completed her Doctor of Science degree in communications engineering in 2012, and Doctor of Philosophy degree in industrial engineering and management in 2018 at the University of Oulu. She has been conducting multi-disciplinary research into the technical, business, and regulatory aspects of future mobile communication systems in close collaboration with industry, academia, and regulators for over two decades. Most recently she has been studying sustainability topics related to ICTs. She has published 210+ scientific publications and prepared 200+ contributions and statements to regulatory bodies at national, European, and international levels. She represents Finland in global 6G definition work at UN based ITU-R.

Romel Mostafa is an Assistant Professor of Business, Economics and Public Policy at the Ivey Business School. Romel's areas of research and expertise include strategy & capability development in new firms, innovation & competitive dynamics, industrial evolution & policy, as well as behavioural decision-making. He has published in a number of leading academic journals, including Academy of Management Journal, Journal of Behavioral Decision Making, Journal of Risk & Uncertainty, Organization Science and Management Science. His research and commentaries have been featured in global media outlets such as CNN, NPR and the New York Times. Romel has taught both at graduate and undergraduate levels, and received several teaching awards. He obtained his PhD and MSc from Carnegie Mellon University, and BA from Lawrence University. As the Director of Ivey's Lawrence National Centre for Policy and Management, Romel spearheads the Centre's research, outreach and teaching initiatives. The Centre advocates for sound policy and corporate action towards unlocking national competitive advantage, by focusing on critical challenges and opportunities around digital, trade and social infrastructural pillars.

Gérard Pogorel is Professor of Economics (since 1995, emeritus since 2010) with the Department of Economic and Social Sciences (SES) of Télécom Paris, a department he headed from 1995 to 2002. He previously worked at HEC Paris, Paris- Dauphine, Paris Panthéon-Sorbonne, at the University of Technology of Compiègne, as well as in universities in Europe (Göteborg, Naples), in the United States (Harvard, UC San Diego) and in Asia (Tokyo, Shanghai, Bandoeng, Bangkok). He holds a Doctorate in Economics, a Doctorate in Organizational Sciences. He graduated in Management Science from HEC Paris, and in Social Sciences from the Sorbonne. He does research on industrial strategies and public policies in the fields of technology, the digital economy, telecommunications, and the media.

Maria Alessandra Rossi is Associate Professor of Economic Policy at the University of Chieti-Pescara and Part-time Professor at the European University Institute. Previously she was Assistant Professor of Economic Policy at the University of Siena, with qualification as Associate Professor.
Her research interests cover the law and economics analysis of innovation, telecommunications & media economics and digital economics, with specific regard to open source software. She was Visiting Researcher at the University of Oxford, the Council of Europe, the Department of Economics at UC Berkeley, the Santa Fe Institute of Technology, at the University of Paris X, and at the Florence School of Regulation. She carried out research and reports for OECD, the Italian Telecommunications NRA (AGCOM), the Italian Ministry of Finance and the Independent Regulatory Group (IRG). She has written numerous essays in national and international journals including: Journal of Economics and Management Strategy, Cambridge Journal of Economics; Telecommunications Policy; Economics of Innovation and New Technologies; Communications & Strategies; European Journal of Law and Economics. Maria Alessandra holds a Ph.D. in Law & Economics from the University of Siena.

Georg Serentschy advises C-level and top experts in the digital sector (platforms, telecommunications, media, and technology) on strategy, regulation & competition, spectrum policies, cybersecurity policies and innovation. A prime focus of his advisory work is the strategic positioning of companies in a specific regulatory environment. Experience shows that regulation is the most critical lever for driving commercial performance, investment and innovation in the digital sector. Georg's professional career spans more than 40 years. It began in nuclear physics, after which he turned to industrial research and development in various high-tech industrial areas such as software development, solar energy, aerospace, and telecommunications. After his career in industry, he joined Arthur D. Little, a strategy consulting

firm. Then, for over a decade, he headed up the Regulatory Authority for Telecommunications in Austria (RTR-GmbH). The highlight of Georg's regulatory career was chairing and vice-chairing BEREC (Body of European Regulators for Electronic Communications). In 2014, he founded his consulting boutique, focused on advising C-suite and top digital sector experts on strategy, artificial intelligence, regulation & competition, spectrum policy, cybersecurity policy and innovation. In parallel, he continues to work with leading consultancies on a project basis.

Salim Teja is a Partner with Radical Ventures where he leads the firm's Velocity Team. Salim is a board member for Aspect Biosystems and Promise Robotics. Salim brings over 25 years of experience in the technology sector as an entrepreneur, venture investor, corporate innovator and innovation ecosystem builder. Prior to Radical Ventures, Salim served as President, Venture Services for Toronto-based MaRS Discovery District, one of the world's largest urban innovation centres. Salim has held leadership roles with Indigo Books & Music, CX Digital and was a Partner with early-stage VC firm Brightspark Ventures. Salim was also a Co-founder of San Francisco-based MobShop Inc, a pioneering e-commerce venture funded by GE Capital, Visa International, Mayfield Fund and Marc Andreessen. Salim is a graduate of the Ivey Business School at Western University.

Peter Wilcox leads a team at Bell pioneering digital transformation solutions for business and government customers using 5G, IoT, Cloud, and Private Mobile Networks. He championed the creating of Bell's 5G developer program, fostering collaboration and accelerating the adoption of next-generation wireless technologies. His lateral thinking and ability to foster cross-functional collaboration, integrating external ideas, consistently yield innovative, competitively differentiated solutions and breakthrough results. Peter is a two-decade veteran of the product industry. He is a member of the Board of Directors for BeWhere Holdings Inc. He thrives on navigating technological disruption and consistently delivers impactful results in competitive markets. A charter member of the Innovative North lab, he is committed to reimagining corporate innovation for a more prosperous and sustainable future. He holds an Honors Business Administration degree from Ivey Business School, Western University.

ANNEX:
Detailed Summary of Innovation and Telecommunications Policy: Shaping Tech, Markets & Networks

May 21, 2025*

Transcribed and annotated by Ray Wang, Graduate Research Assistant (rwang.hba2025@ivey.ca), HBA '25

Welcome and Introduction

Romel Mostafa, Director, Lawrence National Centre for Policy and Management, Ivey Business School

The workshop opened with a reflection on its evolution over the past two years, tracing its origins from earlier sessions on broadband, resilience, and satellites to the current focus on innovation and policy in telecommunications. Attendance has grown steadily, with the current session reaching capacity within two weeks of its announcement, underscoring the increasing interest and engagement within the community. The event's success was attributed to the organic development of a committed network of participants from media, industry, government, and academia, all invested in advancing the telecommunications sector.

A land acknowledgment was delivered, recognizing both the DKJ Center and the Ivey Business School's locations on traditional Indigenous territories. This acknowledgment emphasized the ongoing importance of ensuring that technological advancements and digital infrastructure initiatives are inclusive, respect Indigenous sovereignty, and support digital inclusion for Indigenous communities. The statement served as a call to action for responsible and equitable innovation.

The United States: Shifting Geopolitical Dynamics

Recent geopolitical developments were highlighted as a critical backdrop for the discussion. The United States, once seen as the anchor of a rule-based global order, has become a source of instability, sending shockwaves through international markets and policy environments. Countries worldwide are now reassessing alliances and seeking new sources of economic growth and security, both externally and within their own economies.

Canada: Innovation and Productivity Challenges

Canada's economic growth has been largely driven by population increases rather than productivity gains. The central challenge is to enhance productivity, which is fundamentally linked to innovation. Telecommunications, as the backbone of the digital economy, plays a pivotal role in this context. Despite a strong record in generating new ideas, patents, and startups—particularly in fields like AI and biotechnology—Canada faces persistent difficulties in scaling these innovations and achieving widespread adoption. Without effective commercialization and integration of new technologies into the broader economy, productivity and growth remain constrained.

The session framed this as a critical moment for Canada, likening it to a "Sputnik moment" that demands urgent action to bridge the gap between invention and market impact. The workshop aimed to address these issues by fostering dialogue on how to move from ideation to implementation, particularly within the telecommunications sector.

Logistical details were provided, and participants were encouraged to engage with the full agenda and speaker materials.

Erik Bohlin, Professor, Ivey Business School, Chair in Telecommunications Economics, Policy and Regulation

The session continued with a welcome to the assembled guests, many of whom have longstanding professional relationships with the organizers and each other. The importance of integrating innovation and telecommunications policy, both in research and practice, was emphasized. The day's agenda was positioned as an opportunity to advance this integration, with contributions from a distinguished group of speakers and panelists.

Opening Keynote: Aligning Innovation and Telecommunications Policy

Johannes Bauer, Professor and Director, Quello Center, Michigan State University, USA

The keynote addressed the complex relationship between innovation and telecommunications policy, focusing on the need for a more sophisticated approach to regulatory design. It was observed that innovation considerations are not deeply embedded in current regulatory frameworks. Policymakers and stakeholders often fall into two camps: those who argue that regulation stifles innovation, and those who believe that stringent regulation is necessary to prevent the collapse of innovative activity. Both perspectives, while containing elements of truth, fail to capture the full complexity of innovation dynamics.

A central challenge was articulated using a quote from Kenneth Arrow: “Any theory that purports to explain novelty, whether it deals with invention, innovation, or the emergence of new species, is intrinsically difficult and paradoxical. How can you have a theory of the unexpected?” This paradox is particularly acute for policymakers, who must design frameworks that support unpredictable and emergent forms of innovation.

Regulation and Innovation: Historical Context

The historical evolution of telecommunications regulation was outlined in three phases:

1. **Monopoly Era:** Technical progress occurred, but regulatory incentives often hindered innovation, particularly under rate-of-return regulation. While the theoretical case against monopoly incentives was strong, empirical evidence was less clear.
2. **Competitive Reforms:** Liberalization and the introduction of incentive-based regulation (such as price caps) were motivated by the belief that competition would spur innovation and efficiency. While these reforms brought new technologies to market, they also introduced their own biases and limitations.
3. **Digital Ecosystems:** The current landscape is characterized by complex, interrelated digital ecosystems that require a reassessment of how regulation and innovation interact. Traditional models linking market structure to innovation are increasingly inadequate.

Innovation as a Combinatorial Process

Innovation was redefined as a combinatorial process involving the recombination of existing knowledge to create new products, services, or business models. This evolutionary search process is marked by variation, selection, and reproduction, often proceeding through trial and error. The concept of the “adjacent possible” was introduced to describe how innovation explores new opportunity spaces.

Classical economic debates, such as those between Schumpeter and Arrow, were referenced to illustrate the tension between monopoly and competition as drivers of innovation. While competition is generally more conducive to innovation, the reality is more nuanced, especially in dynamic and rapidly evolving sectors.

Heterodox and managerial approaches were highlighted as offering more relevant insights, viewing innovation as an out-of-equilibrium process that cannot be fully captured by traditional optimization theories. Evolutionary theories and the concept of dynamic capabilities in firms provide a more accurate framework for understanding innovation in contemporary digital ecosystems.

Innovation in the Telecommunications and AI Ecosystem

The telecommunications ecosystem now includes a diverse array of players operating at multiple layers—from passive infrastructure to applications and services. Innovation can be radical (transforming many attributes simultaneously) or incremental (making marginal improvements). The degree of integration or modularity in innovation processes affects how different players interact and how innovation unfolds.

Interdependencies between layers are significant. For example, constraints at the infrastructure level can limit opportunities for innovation at higher layers. Conversely, open and standardized interfaces can facilitate modular innovation, as seen in the development of the internet. However, not all innovation can be modularized, and tightly coupled innovations may require more integrated business models.

The discussion extended to artificial intelligence, noting that similar principles apply in AI ecosystems, where interdependent layers and varying degrees of integration shape innovation dynamics.

Deep Uncertainty and Directed Search

Innovation often emerges under conditions of deep uncertainty, where even the underlying models and drivers are unclear. In early stages, traditional economic theories of optimization are insufficient. Instead, theories of entrepreneurship and venture capital become more relevant. As innovation matures, risk becomes more manageable, and established economic drivers—such as technical opportunities, business incentives, and contestability—play a larger role.

Innovation is also a directed search process, exploring a multidimensional opportunity space. While competition can stimulate diverse exploration, it may not cover all socially beneficial directions. Regulatory bans and constraints can limit the search space, sometimes with unintended consequences.

Drivers of Innovation and Policy Levers

The drivers of innovation vary across different phases:

- **Pre- and Early Emergence:** Characterized by inventive tinkering, dynamic capabilities, access to risk capital, and foundational research.
- **Late and Post-Emergence:** Influenced by innovation opportunities, the ability to appropriate returns, and the contestability of markets.

Interdependent Innovation: Coordination and Complementarity

A two-layer model was presented to illustrate how coordination costs and complementarity benefits between platforms and complementors affect the rate of innovation. High coordination costs can slow innovation, while strong complementarities can accelerate it. Regulatory interventions can influence these factors, shaping the overall innovation environment.

Implications for Regulatory Practice

Five key steps were proposed for translating these insights into regulatory practice:

1. **Assess Policy Impact on Innovation Space:** Explicitly examine how proposed policies affect the opportunity space for innovation.
2. **Evaluate Effects on Innovation Drivers:** Analyze impacts on contestability, appropriability, dynamic capabilities, coordination costs, and complementarities.
3. **Consider Effects on Different Players:** Recognize the interdependencies among various actors in the ecosystem.
4. **Explore Alternative Policy Designs:** Seek options that offer greater benefits or fewer downsides.
5. **Design for Agility:** Implement policies that allow for ongoing monitoring, evaluation, and adaptation.

   A recurring challenge is the reluctance of policymakers to evaluate and adjust policies, often due to political considerations. Agile policy design, with built-in mechanisms for feedback and adjustment, is essential for supporting innovation in complex and evolving environments.

Questions and Discussion

Culture and Innovation:
The role of culture in shaping innovation was explored, with examples illustrating how societal attitudes toward risk and failure can influence entrepreneurial activity. In some cultures, failure carries lasting stigma, leading to risk aversion. In others, such as the United States, failure is more readily accepted as part of the innovation process. Political and cultural constraints can direct innovation efforts along different paths, as seen in the contrasting approaches of China and the U.S.

Scaling Innovation in Canada:
A question was raised about Canada's challenges in scaling innovation, particularly why successful ideas often migrate elsewhere for commercialization. While acknowledging

limited expertise on Canadian policy, several potential factors were suggested: regulatory fragmentation, obstacles to scaling, and the need for complementary skills and workforce training. The importance of integrating innovation into socially beneficial outcomes was emphasized, with a call for further discussion on overcoming these barriers.

How 6G Will Change Innovation and What Policy Should Do

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Introduction and Context

The future of mobile communications is being shaped by a multidisciplinary approach that integrates technology, business, regulation, and sustainability. At the University of Oulu, the 6G Flagship program has been conducting research for over seven years, focusing on how these elements intersect to define the next generation of mobile networks. While engineering remains the core of mobile communications research, there is a growing emphasis on collaboration among stakeholders from the public sector, academia, and industry. Finland's ecosystem, with its close ties to major industry players like Nokia and proactive engagement with regulatory agencies, provides a unique environment for this work.

Values-Driven ICT Development

A central theme in European mobile communications research is the shift towards values-driven ICT development. This approach, supported by significant public funding from the European Commission and industry partners, seeks to complement traditional performance metrics with key value indicators. Among these, sustainability stands out as a primary focus.

Sustainability in this context is defined broadly, encompassing environmental, social, and economic dimensions. The ICT sector is seen as both an enabler—helping other sectors reduce emissions and operate more sustainably—and as a source of its own sustainability challenges, such as increased energy consumption and environmental impact from rapid technological change. The research community is actively discussing how to integrate these values into technology development, even though it remains a complex and sometimes contentious process.

The European perspective on sustainability is distinct. While sustainability is a key value in European technology development, it does not hold the same priority in all regions

globally. In Europe, sustainability is viewed as an umbrella term that includes climate and environmental concerns, social inclusion (such as affordable and meaningful connectivity for all), and economic viability. The aim is to ensure that technological advancements do not come at the expense of future generations, balancing economic opportunity with environmental and social responsibility.

Global 6G Policy and Frameworks

The discussion then turned to global policy developments and frameworks guiding 6G. In 2023, the EU and US issued a joint statement—the 6G Outlook Annex—emphasizing the role of future technologies as enablers of sustainability across environmental and economic dimensions. The statement called for reducing carbon footprints, improving energy efficiency, and minimizing pollution and other environmental impacts, while also contributing to long-term social sustainability.

At the international level, the International Telecommunication Union (ITU) has established a global framework for 6G, which includes four design principles: sustainability, security and resilience, connecting the unconnected, and ubiquitous intelligence. The framework also outlines six usage scenarios, expanding on those introduced with 5G. Achieving consensus on these principles required significant negotiation, particularly as not all regions were equally supportive of embedding sustainability into the core of 6G policy.

Changing Market Structures and Local Networks

Market structures in mobile communications are evolving, with a notable increase in the number of local 5G and 6G networks. This shift is the result of collaboration among academia, industry, and regulators. In Finland, for example, the development of local spectrum licensing models began over a decade ago, driven by the need to open mobile markets to a broader range of stakeholders. This process involved advocating for local spectrum availability at the European regulatory level, despite resistance from traditional operators.

The result has been a gradual adoption of local spectrum licensing across Europe, though the degree of availability still varies by country. These local networks can be either public or private and are increasingly being deployed for vertical-specific applications, such as industrial or municipal networks. However, this trend has also led to greater market fragmentation and competitive challenges, with significant divergence in how spectrum is allocated and managed across different countries.

Four key drivers and research challenges have emerged in this context: technology, data, cost, and competence. Addressing these challenges requires ongoing collaboration and adaptation to rapidly changing market conditions.

6G Spectrum Challenges

Spectrum management remains a central issue in the development of 6G. The introduction of local 5G spectrum awards has changed market structures, enabling more localized and specialized networks. However, spectrum is a finite resource, and competition for access remains intense. Traditional methods for estimating spectrum requirements may not accurately reflect the needs of future stakeholders, particularly as new use cases and applications emerge.

A persistent challenge is ensuring connectivity for unserved and underserved populations. Flexible mechanisms are needed to make spectrum available to stakeholders who currently lack access, but such approaches are not yet widely implemented. Even in countries like Finland, where policy goals prioritize maximizing spectrum availability, practical limitations and competing interests make it difficult to achieve universal access.

Sustainable Spectrum Management and Cross-Sectoral Collaboration

The concept of sustainable spectrum management is still evolving. It involves minimizing transmitted data, improving energy efficiency per bit, and strategically deploying technologies to reduce environmental impact. There is also a social dimension—ensuring affordable access to digital services and supporting community-driven networks.

One unresolved question is how long-term, exclusive spectrum licenses without sharing obligations fit into the sustainability context. While such licenses can provide stability for operators, they may also limit opportunities for broader access and innovation. The lack of transparency around the environmental footprint of different technology and service combinations is another barrier; consumers and end-users currently have little information to guide sustainable choices.

Collaboration across sectors is essential for advancing 6G and addressing its complex challenges. European research initiatives such as Hexa-X-II and SUSTAIN-6G exemplify this approach, bringing together dozens of organizations to explore sustainability and value creation in the 6G ecosystem.

The research community plays a critical role in providing evidence-based insights to inform policy and decision-making. However, effectively communicating research findings to other stakeholders remains a challenge, as academic knowledge must be translated into actionable information that can influence industry practices and regulatory frameworks.

Conclusions

Europe continues to prioritize values-driven ICT development, with sustainability as a central value. Spectrum management decisions are long-term compromises among competing stakeholder interests, and integrating spectrum sharing into 6G policy

discussions from the outset is essential. Strengthening the role of the research community can provide the evidence base needed for informed decision-making, benefiting all stakeholders.

Audience Questions

Question: Is sustainability in 6G primarily about use cases, technology, or deployment strategies?

Answer: Sustainability in 6G encompasses all these aspects. Engineering efforts are focused on building sustainability into both implementation and architecture, including improvements in energy efficiency and local processing. The broader goal is to enable sustainable operations across different use cases, technologies, and deployment models, recognizing that different stakeholders will address different parts of the challenge.

How Network Virtualization is Changing Fundamentals of Telecom Policy

Gérard Pogorel, Professor Emeritus, Télécom Paris, France

The ongoing transformation of the European telecommunications regulatory framework is driven by two major areas under review: merger guidelines and the Electronic Communications Code, which has remained largely unchanged for two decades. The current research effort seeks to identify how these frameworks can be made more adaptive and supportive of innovation, particularly in the context of substantial technological and structural shifts within the industry.

Virtualization of Network Management

A central trend shaping the sector is the virtualization of network management. This development is not theoretical; it is already a reality across both mobile and fixed communications. The increasing reliance on software for network service differentiation, combined with the migration of management tools to the cloud, has fundamentally altered how telecommunications networks are operated. Standardized management tools now enable operators to manage physical network elements that they do not directly own, effectively decoupling the management layer from the physical infrastructure layer.

This separation allows any telecommunications operator to utilize components of networks—whether fixed or mobile—to provide services across undefined or previously inaccessible areas. The result is a disaggregation of network operations, with multiple

layers and operators able to functionally control and operate segments of networks without direct ownership. This trend is particularly significant in Europe, where the market is highly fragmented: over 100 operators serve more than two dozen countries, each with its own regulatory authorities. The challenge is to harness these technological changes to drive innovation and overcome the barriers presented by fragmentation.

The shift from traditional telecommunications companies ("TelCos") to technology-driven companies ("TechCos") is a key aspiration within the industry. Service-oriented telcos, unburdened by heavy infrastructure investments, are perceived as more agile and better positioned to innovate rapidly. The virtualization of network management accelerates this shift, enabling the creation of a more horizontal, potentially pan-continental market for access connectivity—both fixed and mobile—open to any service operator.

Despite these advances, not all segments of the industry have fully embraced this transformation. In some countries, structural separation between operators managing fixed networks and those owning physical infrastructure has occurred, as seen in Italy, the UK, and the Czech Republic. However, the longstanding belief that control over physical networks is essential for innovation is being challenged. Increasingly, operators are separating the management and physical layers, often for financial reasons: a service-focused telco can operate more efficiently and pursue innovation without the capital burden of infrastructure ownership.

Divesting of Physical Resources

Another significant trend is the divestment of physical resources by telecommunications operators. This phenomenon is evident in several regions, including Europe, Canada, Australia, and Paraguay, where specialized infrastructure companies—such as TowerCos and FibreCos—have emerged to own and manage physical assets. The scale of this shift varies by country: in France, 66% of mobile towers are not owned by a single telco; in Finland, the figure is 79%; in Ireland, 68%; and in Germany, 20%. This diversity reflects differing national approaches to infrastructure ownership and competition.

The decoupling of physical infrastructure from core corporate finances is not a marginal trend but a substantial change in industry structure. It creates opportunities for infrastructure companies to expand into adjacent sectors beyond traditional telecommunications. For telcos, this opens new avenues for growth along three axes: developing new services, acquiring new types of assets, and reaching new customer segments, including those outside their traditional scope.

The regulatory response to these changes is under active consideration. The aim is to facilitate these industry evolutions by updating merger guidelines and the Electronic Communications Act to allow for service-level or infrastructure-level mergers, rather than restricting consolidation to the corporate level. The overarching goal is to simplify

regulation, reduce unnecessary constraints, and enable the market to capitalize on technological advancements.

Addressing Market Fragmentation and Innovation Barriers

A persistent challenge in Europe is the difficulty of translating high-quality research and technological development into large-scale industrial innovation. While significant resources are invested in research, the transition from laboratory to market remains slow, particularly in the context of a fragmented regulatory environment with numerous national and sectoral regulators.

Reports by former heads of government, such as Letta and Draghi, have highlighted the sources of delay in European innovation, emphasizing the need to better leverage technological trends for competitiveness and sovereignty. The ongoing regulatory review seeks to address these barriers by promoting a more integrated and innovation-friendly market structure.

Questions and Discussion

The session concluded with questions from the audience, focusing on the implications of these trends for competition policy. One participant raised the issue of facilities-based competition in Canada, noting satisfaction with the current model but questioning its adequacy in a virtualized network environment. Concerns were expressed about the potential for new monopolies to form around infrastructure ownership.

The response acknowledged that telecommunications is inherently subject to network effects and potential monopoly risks. The regulatory challenge is to determine whether to address these risks proactively (ex ante) or reactively (ex post). While competition remains a cornerstone of economic policy in Europe, there is ongoing debate about the appropriate balance between preemptive regulation and post-hoc intervention. Infrastructure operators, such as tower companies, are often reluctant to engage in active network management, preferring to avoid direct competition with their service provider customers.

How an Open Market for Wholesale Access Can Reshape Innovation in Wireless

Peter Cramton, Professor Emeritus, University of Maryland, USA & International Research Fellow, Max Planck Institute for Collective Goods, Germany

The Case for Open Access and Wholesale Competition

Telecommunications markets have evolved from monopoly structures to competitive environments enabled by technological advancements and spectrum auctions. Initially, the communications sector was dominated by monopolies, but the advent of mobile technology and the introduction of spectrum auctions facilitated the entry of new competitors. This shift led to a more dynamic and competitive landscape, with countries around the world expanding the number of participants in the communications sector.

However, recent years have seen a trend toward consolidation. As the industry matured, it became apparent that significant economies of scale existed, favoring larger, more efficient competitors. The capital requirements for each new generation of technology (such as 5G) have grown so substantial that supporting multiple robust physical networks has become increasingly difficult. This has prompted a reevaluation of how competition can be maintained in a market with fewer, but larger, players.

A key insight from this evolution is the recognition that communications, like electricity and transportation, are time- and location-dependent commodities. Scarcity in these markets arises at specific times and places, and efficient allocation requires transparent and dynamic pricing mechanisms. By applying economic principles to these challenges, it is possible to maximize the overall value created—what economists refer to as "making the pie as large as possible."

The future envisioned for communications markets is one where competition is enabled at the wholesale level through open access. This approach involves sharing spectrum and facilitating a more robust exchange of spectrum rights, allowing those best positioned to use resources at a given time and location to do so. Drawing on experience from electricity markets—where supply and demand must be balanced in real time to avoid blackouts—Professor Cramton argued that similar principles can be applied to communications to enhance flexibility, resilience, and innovation.

Open access at the wholesale level would allow for more efficient use of infrastructure and spectrum, particularly as the industry faces the challenges of consolidation. By enabling virtual operators to access network resources, the market can support a broader range of innovative services and business models. This approach also addresses the limitations of traditional competition, which is constrained by the high fixed costs and limited scalability of physical networks.

The Telco-to-Techco Transition and the Role of Big Tech

A significant theme in the discussion was the contrast between the performance of traditional telecommunications carriers and large technology companies over the past decade. Big tech firms have experienced exponential growth by acquiring vast numbers of

customers and expanding across multiple domains, such as applications and digital services. In contrast, telecommunications carriers have reached near-total market penetration, limiting their ability to grow their customer base further.

The challenge for carriers is to find new avenues for growth, such as increasing average revenue per user (ARPU). However, this is only possible if new value opportunities are created. The transition from “telco” to “techco” represents an opportunity for carriers to leverage their infrastructure and participate in the broader digital ecosystem, potentially unlocking new sources of value through innovation and expanded service offerings.

Market Design: Enabling Forward Trade and Managing Risk

Central to Professor Cramton’s approach is the concept of market design, with the primary goal of maximizing social welfare. This involves identifying potential market failures—such as incomplete markets, market power, adverse selection, and moral hazard—and designing mechanisms to address them. One of the most effective tools for achieving this is the creation of forward markets, which allow participants to manage risk by trading future rights to use network resources.

In commodity markets, including communications, the ability to engage in forward trade is essential for managing the risks associated with real-time pricing and fluctuating demand. By enabling robust forward and spot markets, participants can hedge their positions and make more informed investment decisions. This approach has been successfully applied in electricity markets and is increasingly relevant as communications markets become more commoditized.

The trading platform developed by Professor Cramton and his collaborators supports both forward and spot trading of communications resources. It has been tested extensively in electricity markets, using rich datasets to simulate participant behavior and market dynamics. The platform’s design accommodates the granularity required for time- and location-specific trading, allowing participants to adjust their positions gradually as new information becomes available.

Applications: From Satellite Communications to Merger Remedies

The principles of open access and forward trading have a range of applications in communications markets. One notable example is the emerging convergence between satellite and terrestrial networks, particularly with the development of optical mesh networks in space. These networks offer significant capacity, but the uplink and downlink connections to Earth remain a bottleneck, often subject to congestion. Real-time pricing and forward trading of communications rights can help allocate these scarce resources more efficiently, even in remote regions such as Canada’s Northwest Territories.

Another application is in the context of market consolidation, where mergers reduce the number of competitors. Open access wholesale markets can serve as a remedy by requiring merged entities to offer a portion of their capacity—such as 15%—to the open market. This ensures sufficient liquidity for virtual operators and fosters continued innovation and competition, even in markets dominated by a few large players. Similar mechanisms can be incorporated into future spectrum auctions or as license conditions in markets with limited competition.

Managing Congestion and Encouraging Efficient Investment

Current approaches to managing congestion in communications networks often rely on non-price mechanisms, such as dropped calls or throttling. These methods do not necessarily align with the goal of maximizing value for users. By introducing dynamic pricing based on real-time utilization, networks can allocate resources more efficiently, encouraging investment where it is most needed and providing incentives for innovation.

The trading technology developed for these markets supports a range of products, including premium and regular service tiers, with optimized routing and real-time measurement of usage. Prices are determined at the intersection of supply and demand, similar to power markets, ensuring that resources are allocated to those who value them most highly.

Addressing Market Failures and Enhancing Participation

A well-designed market must address common failures such as market power and incomplete markets. The trading platform incorporates features such as gradual trade, allowing participants to adjust their positions over time and move toward balanced portfolios. This reduces the potential for market manipulation and aligns individual incentives with broader social welfare.

Participation in the market is facilitated through user-friendly strategies, such as trade-to-target approaches, which enable participants to manage large portfolios of products with relative ease. The platform's open-source nature and adaptability make it suitable for a wide range of applications, from electricity to communications.

Big event auctions, held infrequently, may not provide the flexibility needed to respond to rapidly changing conditions. In contrast, continuous or frequent trading allows participants to make incremental adjustments, reducing risk and improving overall market efficiency. Recent developments, such as Ontario's move to a nodal pricing structure in electricity markets, illustrate the potential for granular, location-specific pricing to guide investment and operational decisions. The ability to trade small quantities frequently enables participants to hedge risks effectively, even in the face of price volatility.

Q&A

Question: Is this just robust network planning, or is it a dynamic blockchain application that relies on smart contracts for continuous trading?

Answer: The frequency and nature of trading depend on the specific market context. In financial markets, trading can occur at very high frequencies—sometimes every second—though this is considered slow compared to high-frequency trading standards. In electricity markets, trading typically occurs hourly, but as real time approaches, the frequency can increase to every four seconds or so. The granularity of trading in both time and space is expected to improve as technology advances and as market participants' needs become clearer. The core technology underlying these markets is flow trading, which is built on foundational optimization principles that scale linearly with the size of the problem. This allows the system to accommodate virtually any level of granularity required. The process is algorithm-driven, with automated agents interacting with the marketplace and making gradual adjustments in response to observed information. While blockchain and smart contracts can be components of such systems, the essential feature is the ability to support dynamic, algorithmic trading that enhances market efficiency and participant flexibility.

The Return of Industrial Policy in European Telecommunications

Maria Alessandra Rossi, Associate Professor, University "G. d'Annunzio" of Chieti-Pescara & Scientific Coordinator, Centre for a Digital Society, European University Institute, Italy (Virtual Presentation)

Introduction: The Changing Status of Industrial Policy in Europe

For many years, "industrial policy" was a term largely avoided within influential policy circles across Europe. The prevailing consensus favored market-led solutions, with explicit state intervention in industry considered outmoded or even controversial. However, over the past decade, this stance has shifted markedly. Multiple external and internal pressures—from stagnating productivity and global competition to geopolitical tensions and technological dependence—have prompted a renewed interest in industrial policy and its practical application.

The recent resurgence of industrial policy is not limited to academic debate or localized pockets of industry. There is now widespread recognition at the highest levels of European policymaking that targeted industrial strategies are essential for addressing competitiveness gaps and responding to both old and new policy challenges. This broad reframing has extended the traditional goal of economic growth to encompass objectives such as green technology development, sustainability, public value creation, technological sovereignty, and strategic autonomy.

In this context, the consequences of low productivity growth, highlighted especially after the 2008 financial crisis, have accentuated the need for renewed action. At the same time, high-visibility events—such as the COVID-19 pandemic and related supply chain disruptions—have underlined the importance of resilience and autonomy in critical sectors. A further layer of complexity arises from the rapid pace of digital transformation: the increasing centrality of digital infrastructure, mounting concerns about dependence on large technology providers, and the growing prominence of cybersecurity risks all require a proactive approach.

Three key aspects of this evolution in European industrial policy—particularly as they pertain to telecommunications—are explored below.

1. Technology-Specific and Whole-Value-Chain Industrial Policy

A fundamental shift in European industrial policy has been the movement away from the long-standing vertical and horizontal approaches. Vertical policies, characteristic of the early European Union era, focused on nurturing "national champions" in specific sectors. Horizontal policies, as exemplified by the Lisbon Agenda, promoted general R&D investment across the economy rather than targeting any single sector. The current trend, however, is toward a technology-specific and value chain–oriented strategy.

This approach acknowledges the blurring of traditional sector boundaries, particularly given the extent to which foundational technologies now cut across multiple industries. Rather than supporting entire sectors, policymakers increasingly target critical technologies—such as 5G, artificial intelligence, and advanced processors—viewing these as enablers of broader industrial transformation. Critically, the focus is not confined to the development of these technologies but extends to their adoption, recognizing that diffusion and real-world application are as important as innovation itself.

Telecommunications provide a compelling example. Networks such as 5G and the emerging 6G are no longer regarded solely as infrastructure assets, but as general-purpose technologies with the potential to enable transformation across a range of sectors. This reframing positions telecommunications as a strategic lever for industrial change, necessitating a policy focus that considers the full value chain, from upstream research and supply of components to downstream applications and services.

The adoption of such a strategy also brings to the fore the importance of both supply-side and demand-side tools. While subsidies and direct investments remain relevant, there is a growing appreciation for policy mechanisms that create or shape demand—such as public procurement, standardization initiatives, and regulation that incentivizes adoption. Nevertheless, the European experience underscores the reality that policy documents often outpace practical implementation. The effectiveness of these new tools hinges on follow-through at both the national and EU levels.

Early and effective standardization has emerged as a crucial bottleneck. The European Union's efforts to harmonize security standards (for example, the 5G security toolbox) have encountered challenges, with member states varying in their adoption timelines and approaches. The GAIA-X project—involving the creation of a pan-European cloud infrastructure—has been hampered by a lack of interoperability protocols, certification schemes, and divergent governance models. These difficulties illustrate the broader lesson that early coordination and alignment among stakeholders are essential for technological initiatives to gain traction.

A further lesson is the need for rigorous prioritization. There is a tendency within Europe to label a wide array of technologies as "critical," but the financial resources allocated at the EU level remain limited—approximately 0.14% of GDP, compared to nearly 0.7% in the United States and almost 2% in China. Such dispersion of effort, with insufficient backing, risks diluting the impact of policy measures. Decisive criteria for selecting technologies worthy of public support, and a willingness to concentrate investments, are necessary to maximize societal value.

2. Open Strategic Autonomy and the Geopolitical Dimension

A second defining trend is the European pursuit of what is termed "open strategic autonomy." This represents a balancing act between the Union's historic commitment to open trade and the evolving need for independence and unilateral action in strategic sectors. The rationale for this shift is rooted in the growing power of state-led competitors, such as China, and the recognition that Europe's liberal trade model leaves it exposed in certain domains.

The policy response has included a measured relaxation of state aid rules, adoption of national measures to protect local markets, and a preference for domestic or EU-based providers in sensitive infrastructures. In addition, there has been a noticeable shift in global standard-setting. Where European bodies once prided themselves on openness, there is now greater emphasis on promoting EU regulatory values, sometimes limiting the participation of non-EU actors in standardization processes.

However, this turn towards strategic autonomy is not without risk. The inherent ambiguity of the approach—straddling openness and protectionism—creates significant uncertainty for private investors. Ambiguous signals about future policy direction may deter

investment, undermining the intended effects of industrial policy. Policy effectiveness depends heavily on the ability to provide clear, predictable expectations for stakeholders.

Distributional consequences are also significant. As national governments exploit relaxed state aid rules, disparities in investment capacity among member states risk being exacerbated. For example, the majority of funding from the European CHIPS Act and other strategic initiatives has been secured by wealthier countries with the fiscal capacity to match EU support—most notably Germany and France. This trend, unless addressed, threatens to undermine cohesion and equity within the Union.

A critical takeaway for other jurisdictions is the importance of balancing industrial policy objectives with internal equity and fairness. The risk of "subsidy races" and uneven development must be actively managed, lest the overall goal of economic and technological resilience be undermined by divisive competition among regions.

3. Industrial Policy and Its Interface with Competition and Regulatory Policy

A third notable development is the way in which industrial policy is increasingly intersecting with, and sometimes challenging, traditional boundaries in competition and regulatory policy. Historically, the European Union has relied on state aid rules and competition frameworks as safeguards, intended to prevent market distortions from excessive or improperly targeted subsidies. With the publication of the Draghi Report and other recent policy documents, there has been a marked shift toward reinterpreting established policy frameworks through the lens of industrial competitiveness. Regulatory and competition policies—once regarded primarily as checks on state intervention—are now increasingly seen as potential tools to advance industrial policy objectives, particularly growth and innovation.

This reorientation is most visible in the ongoing debate over telecommunications market consolidation. The discussion has moved beyond routine merger review to encompass broader questions about the dynamic impact of consolidation on investment, innovation, and sectoral competitiveness. While there is increasing acknowledgement that static price competition is not the only relevant metric, operationalizing this insight remains a challenge. As of now, European merger guidelines continue to emphasize traditional conditionality, though a revision is anticipated by the end of 2027. Transparency and monitoring remain fundamental. The use of public, structured reporting systems to track the effects of digitalization targets, infrastructure investments, and subsidy impacts offers a model for other jurisdictions.

Ensuring that competition implications are fully considered, and that the rationale for state support is clear and publicly available, can help maintain confidence in industrial policy, even as its boundaries shift. The complexity of contemporary industrial policy also places a premium on policy coherence and inter-institutional coordination. As objectives multiply and policy tools become more complex, effective communication and alignment among

government agencies, regulators, and other stakeholders become essential. Europe's experience points to ongoing challenges in this regard, particularly when regulatory frameworks have not yet adapted to incorporate new geopolitical and technological realities.

Q&A

Question: How do we define "optimal competition" across different industries? The concept of competition is often viewed positively, but isn't its optimal form different in each sector, especially with respect to the balance between competition and investment?

Answer: This is a central challenge currently facing the European Commission. The evolving consensus recognizes that competition is no longer solely about static price effects; factors such as innovation, investment in infrastructure, and dynamic market processes must also be considered. Nevertheless, translating this broader acknowledgment into concrete guidelines for what constitutes the optimal degree and type of competition in different industries remains unresolved. At present, there is no universally accepted framework for determining optimal competition across sectors, and this remains an area of active policy development and debate.

Quantum Communications – Network Security, Resilience, and Geopolitics

Georg Serentschy, Managing Partner, Serentschy Advisory Services, Austria

Rethinking Security in the Age of Quantum Technology

Recent developments in quantum communications are prompting policymakers and industry leaders to fundamentally reconsider the future of secure communications. Driven by rapid technological change, the increasing threat of sophisticated cyberattacks, and a shifting geopolitical context, quantum technologies now sit at the intersection of technological innovation, national security, and digital sovereignty.

The current digital environment is marked by a complex interplay of innovation and vulnerability. Incidents such as the recent blocking of the International Criminal Court's (ICC) chief prosecutor's email account by Microsoft serve to highlight the growing challenges of reliance on external digital platforms. While the underlying dispute between the U.S. government and the ICC is not the focus here, the ramifications for operational

continuity and judicial independence are a clear warning. These events underscore the urgency for nations—including both Europe and Canada—to pursue greater digital sovereignty, especially as they contemplate the architecture of new systems such as quantum communications.

Short-term solutions offer only limited relief from structural dependencies on global digital platforms. The path to true digital sovereignty—defined as the capacity to dictate one's own economic, social, and democratic future in the digital realm—requires deliberate, forward-looking planning. When designing next-generation infrastructure like quantum communications, digital sovereignty should be a foundational consideration, rather than an afterthought.

Fundamentals of Quantum Communication and Its Role in Security

Quantum communication leverages the principles of quantum mechanics to create channels that are fundamentally secure against today's and tomorrow's cyber threats. Unlike conventional cryptography, which is rooted in complex mathematical problems, quantum communication introduces two distinct approaches: post-quantum cryptography (PQC) and quantum key distribution (QKD).

Post-quantum cryptography refers to new classes of mathematically based algorithms designed to withstand attacks from quantum computers. These algorithms are expected to become a standard feature within everyday digital services, permeating cloud platforms, personal devices, and software applications. Their primary purpose is to maintain the confidentiality and integrity of data, even once quantum computing power matures enough to break current encryption methods.

Quantum key distribution, on the other hand, represents a departure from the mathematical approach. QKD harnesses the laws of quantum physics to create unbreakable encryption keys. The strength of QKD lies in its ability to detect any attempt at interception, guaranteeing the security of communication channels used by critical infrastructure, such as inter-data center links, defense systems, and national grids.

Canada is actively pursuing a leadership role in quantum communications. The country's National Quantum Strategy aims to cultivate a comprehensive, full-stack ecosystem—spanning hardware, software, skilled talent, and secure networks. The strategy's ambitions include building a national quantum communications network and providing robust quantum cryptography capabilities. By aligning investments in research, infrastructure, and talent, Canada hopes to position itself at the forefront of secure digital infrastructure for the coming decades.

Linking Quantum Communication to Network Security and Resilience

The integration of quantum communication into network architectures is set to become a cornerstone of next-generation security strategies. Effective network security is essential to protect sensitive data and the backbone of modern societies' critical infrastructure from an ever-expanding array of cyber threats. The increasing use of artificial intelligence by malicious actors, the inherent vulnerabilities of existing infrastructures, and the demand for more resilient encryption have all raised the stakes.

Resilience, in this context, refers to the ability of digital and communication networks to withstand disruptions—whether from technical failure, malicious attack, or geopolitical tension. Achieving resilience requires both physical redundancy (multiple physical routes and components) and logical redundancy (failover protocols and secure, adaptive software mechanisms). Quantum communication, particularly through QKD, provides a layer of security that is not merely incremental but transformative. Its implementation strengthens the integrity and confidentiality of data flows, delivering robust protection against espionage and exploitation.

In practice, quantum technologies promise to secure the backbone of national critical infrastructure. Their deployment can mitigate risks to sensitive operations, ranging from banking transactions and defense communications to energy grid management and autonomous transport systems. The threat posed by quantum computers to existing encryption protocols—wherein, once they reach sufficient maturity, they could decrypt most current communications—makes the timely adoption of quantum-secure methods not just desirable but necessary.

The Geopolitical Context: Sovereignty and Strategic Autonomy

At the international level, the geopolitical landscape is rapidly evolving. Major powers, including the U.S., China, and the European Union, are vying for technological leadership and digital influence. The traditional line separating "like-minded" and "non-like-minded" countries is becoming less clear, eroding the cohesion of longstanding alliances such as the Western Alliance. Confidence in shared standards and mutual reliance has weakened, with technology policy and national security now deeply entwined.

In this environment, the concepts of digital sovereignty and strategic autonomy have gained primacy in both Canadian and European policy discourse. Strategic autonomy is defined as a country's ability to independently determine and execute its economic, social, and democratic objectives, free from undue external influence. This capability is increasingly regarded as a prerequisite for national resilience and security.

Achieving digital strategic autonomy rests on three pillars: capabilities, capacities, and control.

- **Capabilities** encompass the skills, expertise, best practices, and organizational intelligence present within a country. These are foundational to innovation and responsive adaptation to technological change.
- **Capacities** refer to the scale and scope of resources available, including the number of qualified professionals, the robustness of physical and digital infrastructure, access to capital, and the presence of domestic manufacturing and intellectual property.
- **Control** addresses the degree to which a country or its national actors exercise direct authority over critical technologies and infrastructure. This includes ownership structures, voting rights, regulatory jurisdiction, and the ability to exclude or manage foreign involvement when necessary.

A robust strategy for digital sovereignty evaluates each of these dimensions and actively seeks to strengthen them. For Canada and Europe alike, this extends from nurturing domestic talent to securing ownership and operational control of vital networks and technology providers.

Key Applications of Quantum Communication

Quantum communication's practical relevance spans a variety of high-stakes domains. Critical infrastructure across sectors faces increasing pressure from more sophisticated cyber threats, further amplified by the intersection of quantum and artificial intelligence technologies.

- **Banking and Financial Services:** Quantum-secured communication channels between data centers are essential for protecting sensitive financial transactions, customer data, and preventing fraud. As financial institutions are prime targets for cyberattacks, quantum communication will provide a new benchmark for resilience.
- **Defense:** National defense networks depend on confidentiality and operational integrity. Quantum technologies are being integrated to secure communications, protect assets, and guard against espionage and digital sabotage.
- **Logistics and Transportation:** The supply chain's growing digitization brings both efficiencies and vulnerabilities. Quantum-secured channels can enhance the safe and timely flow of goods, safeguard logistics operations, and protect sensitive data about shipments and inventory.
- **Autonomous Systems:** With increased reliance on automation in transport and logistics, secure and resilient communication becomes critical. Quantum communication can help prevent malicious interference with autonomous vehicles and control systems.

- **Electricity Generation and Distribution:** The energy sector, with its reliance on interconnected grids and real-time control systems, is particularly exposed. Recent incidents in Spain and Portugal have highlighted the vulnerability of electricity infrastructures. Quantum communication can provide secure grid management, protect critical data, and enable real-time monitoring and control against both cyber and physical threats. Particular attention is required for devices such as solar cell inverters, which often interface with global cloud services and create significant security concerns.

Across all these sectors, the integration of quantum communication is not only about elevating security standards but also about ensuring the continuity and reliability of essential services against an evolving threat landscape.

Policy Recommendations and Future Prospects

Looking ahead, the evolution of quantum communications will be shaped by both technological development and policy choices. Anticipated trends include the creation of more sophisticated quantum encryption protocols, the convergence of artificial intelligence and quantum technologies, and the scaling of quantum-secure networks beyond pilot projects to widespread deployment.

Policymakers are encouraged to prioritize investment in research and development, facilitate the growth of a “full stack” quantum ecosystem—from foundational science to market-ready solutions—and foster international partnerships. Regulatory frameworks should be designed to encourage responsible innovation while aligning with broader national interests and values.

Industry, for its part, should view quantum technologies as opportunities for differentiation and long-term growth. Close collaboration with customers in critical sectors—using testbeds and pilot deployments—will be indispensable for translating quantum research into operational advantages.

A call to action emerges from the past years’ geopolitical shocks: digital sovereignty and strategic autonomy can no longer be regarded as optional. The adoption and integration of quantum communication is essential for creating secure, resilient digital infrastructure capable of withstanding global disruptions.

A guiding blueprint for the digital future, derived from European initiatives such as the development of the “Eurostack,” emphasizes several principles: sovereignty and security (including jurisdictional control over critical infrastructures), interoperability, sustainability, a view of data as a common good, decentralized and sovereign infrastructure, inclusive governance, and strong democratic oversight. These principles should inform digital strategies not only in Europe but also in other countries seeking to safeguard their technological and social autonomy.

Panel Discussion: Innovation and Technology Adoption in Canada

Moderated by Romel Mostafa, Director, Lawrence National Centre for Policy and Management, Ivey Business School

Panelists:

- **Salim Teja,** Partner, Radical Ventures, Canada
- **Peter Wilcox**, Director, Enterprise Wireless Products & Services, Bell
- **Carlos Cabrero**, Director, Customer Experience Excellence, TELUS Agriculture and Consumer Goods

Salim Teja: The Venture Perspective on AI Innovation

Salim Teja opened the discussion by introducing Radical Ventures, a global venture capital fund specializing exclusively in AI. Founded in 2019, Radical anticipated that AI would transform both industry and society—a view that seemed far from consensus at the time. Since then, the firm has raised $2.5 billion across five funds, investing in more than 55 companies after evaluating over 9,000 AI startups worldwide, with offices in Toronto, Palo Alto, and London.

Initially, the majority of AI startups were focused on building the infrastructure needed for widespread AI adoption. Radical invested in companies working on semiconductors, data centers, foundational models, and tools. Now, with a robust foundation in place, the innovation focus is shifting toward application-layer startups, which are injecting AI into existing software or creating entirely new software categories. This shift has triggered a period of "hyper-experimentation," as enterprises across sectors pilot, adapt, and seek to scale AI to reinvent workflows, value propositions, and collaboration.

Teja highlighted three leading trends in this AI revolution:

- **Enterprise Adoption:** Organizations are working toward AI literacy—educating teams, evaluating adoption paths, and prioritizing investments.
- **Physical AI:** AI is transitioning from the digital realm into the physical world, especially in robotics for manufacturing, logistics, and mobility. The wave of robotics-driven innovation is poised to affect sectors as varied as housing, supply chains, and advanced manufacturing.

- **AI Accelerating Science:** Life sciences, materials discovery, and drug development are being profoundly accelerated by AI, which enables new therapies and breakthroughs across industries. Over the next five to ten years, these scientific advances are expected to be profound.

Teja underscored the importance of infrastructure—advanced computing, networks, and cybersecurity—as critical enablers of AI's real-time deployment across both B2B and B2C sectors.

Audience Q&A with Salim Teja

A key question addressed the challenge of digital sovereignty in a world where leading AI infrastructure and software are dominated by U.S. and Chinese companies. Teja described Canada's Pan-Canadian AI Strategy as a three-pronged national effort: investing in AI talent through institutes like Vector, Mila, and Amii; funding critical digital infrastructure with major data center investments; and preparing Canadian industries for AI adoption, including the navigation of data sovereignty challenges.

Teja acknowledged the tension between leveraging the scale and capabilities of hyperscalers (large global cloud firms) and preserving domestic control over data and innovation. While Canada has seen notable startup successes—such as Promise Robotics (industrial robotics for housing construction) and Aspect Biosystems (AI-driven regenerative medicine)—there is a need for strategic coexistence between global and domestic technology providers, with a strong policy focus on Canadian capability and control.

Teja cited promising Canadian companies:

- **Promise Robotics:** Using robotics and AI to industrialize and accelerate housing construction through factory-built homes.
- **Aspect Biosystems:** Applying AI and 3D printing to regenerative medicine, achieving notable advances in the treatment of type 1 diabetes and other conditions, and securing major partnerships such as a $2.6 billion deal with Novo Nordisk.

These examples illustrate how Canadian innovators are addressing urgent national challenges and scaling their solutions in domestic and international markets.

Peter Wilcox: Enterprise Solutions and Real-World Connectivity

Peter Wilcox outlined Bell's focus on translating advanced network technology into practical enterprise solutions. While most know Bell for its consumer business, Wilcox emphasized Bell's work with mission-critical services and enterprise clients.

Bell's managed services support over 80,000 frontline users in areas like public safety—serving police, fire, and ambulance agencies. Wilcox stressed that successful innovation depends on deep engagement with clients to identify and solve frontline challenges, rather than simply pushing generic solutions.

Discussing the evolution of private mobile networks, Wilcox described how Canadian mining OEMs, now electrifying their fleets, face challenges in digitizing and automating these vehicles. Bell works with such clients on end-to-end digitalization, moving beyond connectivity to support operational monitoring, semi-autonomous functions, and eventually global scalability—issues that raise complex questions of data management and sovereignty when solutions spread internationally.

Wilcox pointed to the importance of open innovation models and humility in enterprise partnerships. Bell's 5G developer program and collaborations with academic-industry incubators (e.g., ACSA in Montreal) are designed to bring together startups, universities, and enterprises. These enable rapid prototyping, field trials, and the development of integrated solutions—not just for Bell's own network, but for broader industry use.

Audience Q&A with Peter Wilcox

An important thread in Wilcox's remarks was the shift toward user-driven innovation: enterprises increasingly shape technology by appropriating and customizing it for their specific needs. Telecoms must build trust, be transparent about standards and best practices, and support open—not closed—systems.

On intellectual property, Wilcox noted that most enterprise collaborations remain consultative rather than IP-generating, but recognize that as solutions develop further, joint or independent IP filings may emerge.

Wilcox provided an illustrative case involving Autodata, a Montreal-based tank monitoring company. Initially operating their own 900 MHz network, Autodata needed to scale but lacked capital to build a national infrastructure. Partnering with Bell, they transitioned to LTE-M, gaining access to Bell's network while retaining their own IP. Now, Autodata is the world's largest tank monitoring provider, serving over five million tanks globally, using AI to optimize logistics and operations.

Carlos Cabrero: Technology, Agriculture, and Social Purpose at TELUS

Carlos Cabrero explained TELUS's expansion into agriculture and health, fields not typically associated with telecoms. Cabrero described how TELUS uses its core strengths in connectivity and technology to address systemic challenges in underserved, high-impact sectors.

In **healthcare**, Cabrero cited the difficulty Canadians face in accessing their electronic medical records—only four in ten know how, often requiring weeks of waiting and

sometimes additional costs. TELUS has invested in electronic medical record platforms to streamline access and improve emergency care.

In **agriculture**, the challenges are staggering: one-third of food produced is wasted, hundreds of millions are malnourished, water resources are strained, and food supply chains are inefficient—all as demand for food grows with the global population. TELUS's approach is to apply technology and connectivity to optimize yields, reduce waste, and promote sustainability along the entire food value chain.

TELUS's flagship farm management platform, TELUS Economist, supports farmers of all sizes in maximizing yield while minimizing inputs like water, fertilizer, and chemicals. The platform enables more precise, efficient, and environmentally friendly farming, contributing to both economic and social goals.

Cabrero detailed the company's efforts to promote **AI literacy and democratization** internally, building platforms like FuelX that let employees and customers create their own AI copilots for support and troubleshooting. In the field, AI-guided tools are used by technicians and customers to repair issues more efficiently, even allowing for remote or self-service interventions.

Audience Q&A with Carlos Cabrero

Cabrero noted that TELUS's most fruitful innovations have come from close, risk-sharing partnerships with customers. A notable example was when TELUS worked with a supplier to co-design compact network equipment for multi-dwelling units, solving a specific business challenge that later enabled both companies to offer the new product more broadly.

He reflected on the **barriers to technology adoption** in agriculture, emphasizing the risk aversion and resource constraints of many farmers. Convincing them to adopt new technology requires clear, demonstrable ROI and support in integrating solutions. Rural connectivity remains a crucial limitation—while high-speed internet is widely available in towns and cities, 90% of farmers still lack it, limiting access to digital tools.

Barriers, Policy, and Scaling Innovation

The panel discussed several systemic inhibitors and possible policy levers:

- **Rural Connectivity:** Many Canadian farmers lack access to high-speed internet, constraining the adoption of digital tools. Addressing the "last mile" requires ongoing telco-government collaboration.
- **SME Resource Gaps:** Small and medium-sized businesses, especially in traditional sectors, lack the scale and IT resources of large firms. Policy needs to consider how to make AI, data tools, and expertise accessible to these businesses.

- **Fragmented Procurement:** In domains like smart cities, Wilcox and Cabrero noted that while funding is often available, fragmented procurement and overwhelming complexity hinder municipalities from deploying innovate solutions at scale.

- **Technology Literacy:** Driving technology and AI literacy across the economy is essential if innovation is to impact more than just large enterprises. Government and industry must collaborate to build a problem-solving, risk-tolerant culture.

Salim Teja expanded on the changing economics of AI, noting that as compute shifts from negligible to significant marginal cost, the door opens for smaller countries to compete—if they focus on infrastructure, talent, and strategic, problem-driven innovation policy. Canada must support homegrown champions not just in funding but also in procurement and market adoption.

The discussion explored how digital ecology could, in theory, support more decentralized, rural, or public-interest innovation models. Teja cautioned that while technologies like Promise Robotics offer models for both large and small participants (with "robots as a service" for smaller homebuilders), the large-scale impact of AI may remain concentrated without sustained investment in infrastructure and data accessibility. Wilcox added that sectors like utilities may be poised for such regional digital transformation, with platform-based approaches emerging alongside localized pilot projects.

Data and Technological Sovereignty, Security, and IP

The topic of **data sovereignty** and the associated national security and infrastructure challenges was discussed at length. Teja stressed that Canada must carefully manage its compute and data infrastructure, especially as AI capabilities are embedded in sensitive domains like health, education, and defense. This is not just about building data centers, but also about building the network and ensuring real-time, secure, and resilient connectivity.

Wilcox spoke on the democratization of enterprise security tools, which make it possible for smaller companies to adopt robust security practices from the outset. Medium-sized companies are increasingly able to monitor and secure their operations with off-the-shelf solutions, lowering the barrier to innovation.

On the topic of supporting Canadian champions, Teja highlighted Cohere—a Canadian firm and one of only five globally to build foundational AI models. Despite international success and significant capital raised, Cohere faces challenges in selling its technology domestically, illustrating the need for Canadian procurement and industry to better support homegrown innovation.

Closing Reflections and Recommendations

Carlos Cabrero

Cabrero emphasized the need for **stability** in government and economic policy, particularly in uncertain times marked by global instability and trade friction. He argued that stable frameworks encourage investment and enable organizations to plan confidently. Cabrero expressed strong optimism about Canada's AI future, urging that the national momentum in AI research and adoption be harnessed and sustained.

Peter Wilcox

Wilcox called for efforts to **ignite local innovation ecosystems**, for example through smart city initiatives. He argued that many of Canada's persistent challenges—urban congestion, environmental impact, and public safety—can be addressed by fostering innovation at the municipal and community level. Wilcox advocated for collaborative, cross-sector projects that can be replicated and scaled across the country.

Salim Teja

Teja concluded by highlighting the **urgency and opportunity** of the present moment. He stressed that new, collaborative models between government and industry are needed to remove persistent barriers to productivity and the scaling of innovation. Teja recommended that Canada view innovation as an economic development strategy, focusing on exporting Canadian-born solutions and supporting the global competitiveness of domestic champions.

The panel closed on an optimistic note, and all three leaders expressed hope that Canada can position itself as a global leader in innovation—if it acts decisively, supports both large and small innovators, and aligns policy, industry, and society around shared objectives.

Q&A

Question: How can Canada maintain digital and technological sovereignty as AI infrastructure remains dominated by large U.S. and Chinese firms?
Answer: Canada must invest in domestic talent, infrastructure, and national champions. It should pursue coexistence with hyperscalers while building out local compute, network, and cybersecurity capabilities. Policy should enable both industry adoption and the development of homegrown, globally competitive companies through procurement, education, and strategic investment.

Question: What are the main barriers to technology adoption in agriculture, and what policy responses could help?
Answer: Reluctance to change, lack of resources, and especially inadequate rural connectivity are the key barriers. Solutions include better telco-government partnerships

to bridge last-mile infrastructure, targeted subsidies or incentives for technology adoption, and efforts to make AI tools accessible to small and medium businesses.

Question: What is the prospect for decentralized or rural innovation in the AI era?
Answer: While rural and decentralized innovation is possible, the scale and cost of AI infrastructure mean that most transformative impact will occur where infrastructure investment is concentrated. New models—such as robots as a service—can help smaller players, but scaling such innovations broadly requires policy support, sustained investment, and industry collaboration.

Question: How can Canada better support its homegrown technology champions?
Answer: Beyond funding, Canada must prioritize domestic adoption, procurement, and market access for companies like Cohere and Promise Robotics. This means aligning public and private sector demand, supporting IP creation and retention in Canada, and building pathways for national innovators to compete and grow globally.

Concluding Remarks

Greg Lang, Senior Strategic Officer, Office of the VP, Canadian Radio-television and Telecommunications Commission (CRTC)

As the final speaker of the day, Greg Lang provided a concise set of closing reflections, drawing from both the breadth and depth of the workshop's discussions. Speaking in his capacity as an advisor to the Vice President of Telecommunications at the CRTC (but carefully emphasizing that his views were personal and not those of the Commission), Lang reflected on the major ideas he would be taking back to colleagues, commissioners, and the broader regulatory team.

Point 1: Integrating Innovation Analysis into Regulatory Practice

Lang's first point drew on Professor Bauer's presentation early in the day, which advocated for a systematic, structured approach to embedding innovation analyses within regulatory decision-making. While the CRTC is attentive to the impacts of regulation on innovation, Lang noted that much of the discussion around innovation can be abstract or general; what he valued from Bauer's approach was the operational clarity—specific steps, questions to ask, and ways to assess impacts—which could provide a more actionable framework.

However, he cautioned that every new policy lens adds complexity to the regulatory process. The challenge for the CRTC, he noted, will be how to incorporate explicit

innovation analysis without slowing down decision-making, especially given an ongoing objective to improve regulatory agility and timeliness.

Point 2: Re-examining Wholesale Pricing: Towards More Dynamic Approaches

The second major takeaway centered on Professor Cramton's suggestions regarding innovative pricing mechanisms for wholesale access in telecommunications. In Canada, Lang explained, wholesale prices are typically set by calculating long-term incremental costs with an additional markup to cover fixed and common costs. The underlying logic is straightforward: if a competitor can succeed at these rates, they are considered efficient and competitive; if they cannot, the market is left to sort itself out.

Lang acknowledged the depth and complexity of the current approach, which demands expertise across engineering, telecom operations, accounting, and economics, and results in highly data-intensive and often static rate-setting. These rates, once set, can remain in place for extended periods, sometimes becoming disconnected from evolving market dynamics. The idea of exploring more dynamic, flexible methods for pricing wholesale access—potentially better aligned with current network utilization and market realities—resonated as a particularly compelling regulatory consideration.

Point 3: The Return of Industrial Policy and the Imperative of Policy Coherence

The third theme Lang highlighted came from Professor Rossi's analysis on the resurgence of industrial policy within telecommunications. He saw strong parallels between the European context and current shifts in Canada, especially in the wake of the 2023 policy direction that marked a move away from exclusive reliance on market forces. Instead, there is now an expectation that the CRTC address a set of more defined, multifaceted policy objectives that go beyond simple market efficiency.

A central lesson from this discussion was the need for **policy coherence**—not just within the CRTC, applying consistent principles and tests across decisions, but also across government departments and agencies. Lang noted the importance of ongoing collaboration with agencies such as the Competition Bureau and other relevant institutions to ensure effective alignment and reduce policy fragmentation.

Cross-Cutting Reflections: Learning from International and Evidence-Based Practice

Lang emphasized two further cross-cutting themes that emerged throughout the event:

1. **International Perspective:** He acknowledged the particular value CRTC staff gain from these conferences' international focus. Decision-making at the Commission is

often centered on Canadian-specific regulatory questions, and exposure to international best practices and comparative perspectives is less common than in the competition policy world. Lang encouraged participants to continue bringing global context and examples to CRTC proceedings and consultations.

2. **The Practical Challenge of Evidence:** Whether for business or for the regulator, uncertainty is a significant challenge. CRTC decision-makers, like business leaders, seek clarity and specifics—not broad assertions but evidence, models, and justifications that inform policy trade-offs. While the formal written record is central to regulatory proceedings, Lang stressed the importance of informal engagement outside those confines. He invited industry stakeholders to proactively engage with the CRTC, share perspectives and experiences, and help regulators understand the practical impacts—positive and negative—of policy decisions.

Final Thoughts

Lang concluded by reiterating his openness to additional feedback and observations from participants, encouraging ongoing dialogue beyond the confines of formal processes. He ended with a reminder that the CRTC values these opportunities to step back from daily work, absorb new perspectives, and reflect on broad trends shaping the sector. The aim remains to translate the “big ideas” discussed into actionable policy, ensuring that Canada’s communications regulatory framework stays responsive, coherent, and informed by both evidence and lived experience.