MIT Communications Futures Program

Coordinated Innovation: Collaborating Along the Value Chain

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Executive Summary

Many of the CFP discussions about innovation have focused on the potential for the kind of industry disruption that results from a cyclical interplay of "incumbents" and "entrants." But here we are interested in a class of innovation we describe as *cooperative*, and is characterized by the need for several actors along the value chain to work together. We tend to see cooperative innovation in mature industries and/or those with complex value chains where it is unlikely that any one single player—incumbent or entrant—is able to bring about substantial change. Cooperative innovation means engaging the whole value chain in a collaborative effort, often involving firms that would normally compete with one another.

The goals of collaboration are varied, including for example, creating a technical capability, (e.g., the Secure Socket Layer protocol) or a set of industry standards, or a technological roadmap for an industry facing a common challenge (e.g., the Sematech consortium). In all cases, the idea is to solve a problem shared by a diverse group of actors. One of the biggest challenges is ensuring that all actors have an incentive to collaborate.

We explored three sets of case studies of collaborative innovation. The first concerns the United States Postal Service, which has faced a slew of disruptive technologies over the years. In response, the USPS has worked to bring innovation to the market based on timely cooperation with upstream mailers, printers, suppliers, truck companies, software vendors, list providers, and many others.

Our two panels, emergency services and rights management, were focused on the tussles that emerge as technologies and behaviors evolve in these spaces. In the case of emergency services, a disconnect has grown between *reporting* and *response* as emergency and public safety services have moved beyond individuals dialing 911 from a landline telephone to reach Public Safety Access Points. On the one hand, the general public now uses multiple communication technologies and engages in multiple modes of communication, the least important being voice. On the other, emergency and public safety providers are under pressure to evolve their services while facing shifting regulations, a lack of standards, ambiguous jurisdictional boundaries, and major funding challenges that characterize their operating environment.

The rights management case study explored three separate but related problems concerning copyright that are rooted in digital user behaviors, file sharing in particular. The most obvious is piracy. Less obvious is the devaluation of royalties resulting from inadequate measurement of online consumption. Some of the proposed solutions have brought the ISPs into the ring and bumped up against a third problem—privacy. On the one hand, rather than treating file-sharers as value-creating partners, the music industry has viewed them as value-destroying adversaries. On the other hand, audiences refuse to have their consumption-related behaviors tracked or controlled under any circumstances in the name of protecting their rights to privacy and freedom. Without resolution, innovation remains blocked, or will progress in a contentious fashion.

Slides and videos can be found at: http://cfp.mit.edu/events/Nov2012_slides_video_notes.shtml

Creating New Capabilities

by David Clark, MIT

Many discussions about innovation focus on the potential for *disruption*: an outcome where a market entrant may disrupt the stability of an incumbent because the entrant is in a better position to exploit an innovative approach. There have been many studies of this story, including the well-known book by Clay Christensen, *The Innovator's Dilemma.*

Of course, not all innovation leads to disruption. Sometimes the innovation works to the advantage of the incumbent. From the perspective of those who study business dynamics, this outcome is less worthy of analysis, because it seems to fall into the category of an efficient firm's tendency to adapt its operations and products.

But there are other, more complex forms of innovation, which do not fit neatly into one or the other of these stories. And in many of these cases, the distinction between entrant and incumbent does not help our understanding of the factors that lead to success or failure. We are interested in a class of innovation we call *cooperative*, which is characterized by the need for several actors along the value chain to cooperate in order to bring the innovation to the market. No one actor, incumbent or entrant, can accomplish this outcome on their own.

There are many examples, both successful and failed, that illustrate cooperative innovation in the Internet space. The successful introduction of the secure version of the Web, using the Secure Socket Layer protocol (URLs that begin https:// rather than http://) required that browsers and server software be upgraded, new firms called Certificate Authorities come into being, and many thousands of Web providers upgrade their systems. The secure web could not have happened if all of these actors were not willing to play their part in a cooperative way.

However, failures are probably more common than successes. The failure to eradicate spam, implement QoS across the public Internet, or migrate to IPv6, can all be attributed (at least in part) to the challenges of cooperation among the large number of actors required to achieve these goals.

These failures are regrettable because they block progress to a better user experience and to new business opportunities. But even success has its problems; in particular, the benefits may fall unevenly on the different actors, which is part of the coordination problem. It may be possible to compensate a small number of players for incurring costs that benefit other players in the value chain, but when millions of players are involved, e.g., having to upgrade server software in the case of IPV6, the transaction costs of negotiating a compensation scheme are far too high. A successful outcome therefore depends on an approach where each actor has an incentive to cooperate.

Issues of coordination along the value chain have been studied in business schools, of course, but to a large extent the focus is on the product or pricing—for example, what wholesale pricing models motivate a retail pricing model that works to the advantage of

both parties? But in many cases, innovation may be about the collective production of a new capability. We want to understand when the circumstances are such that cooperation was achieved, and why.

Value Chain Dynamics: When Technology and Business Models Collide

by Charlie Fine, MIT

Much of our work has looked at innovation in terms of disruption. In this framing, innovation comes from the interplay of "incumbents" and "entrants" during a cycle of vertical integration and disintegration. In the typical disruption scenario, entrants find opportunities in the cracks of large and lumbering firms that have become too big and taken on too much. But not all innovation happens in this way. A different type of innovation exists that is based on cooperation among firms that would normally compete with one another. This is typically called coopetition.

In the same way that competition happens both horizontally (e.g., AT&T competing with Verizon for wireless service) and vertically (e.g., Intel competing with Microsoft), so does cooperation and coopetition.

We tend to see cooperative innovation in mature industries with very complex value chains. With so many players involved, it is unlikely that any one single player – certainly not a small entrant – will be able to bring about substantial change. Cooperative innovation means engaging the whole value chain. Bringing about change in a cooperative manner is challenging. There are three dimensions of change that must be managed:

Rationalization: There needs to be a rational argument that will motivate all the players to get on the same page. Everyone has to benefit—somehow. The operative word here is *planning*. Industry consortiums like Sematech provide a good example of large groups finding a common goal, in this case in response to a common threat. Facing competition from overseas in the 1980s, semiconductor manufacturers in the U.S. formed a consortium to collectively create an industry roadmap.

Politics: The powerful player(s) may not be interested in the collective good if it conflicts with their own interests. The operative word here is *power*, even if it defies all rationality. Regulation is an important facet of politics. Whichever firm or industry has power in the market will likely have lobbying power and public influence. This set of dynamics will often occur along incumbent and entrant lines, where the big guys fight the little guys in Washington. Although entrants, like Google for example, can be big guys too, with money to spend on their own lobbying efforts. Politics are typically the enemy of cooperation.

Culture: Individual organizations as well as entire industries and their customers have a value system and a way of doing things. In that sense, cooperation is as much about process as

it is about end goals. The operative word here is *habit*. Many barriers to innovation are the result of a culture clash, while synergies can help to find common goals and assuage political battles.

All three dimensions are part of coopetition. The players are not just going to engage in a rational dialogue, they will engage in a political process, while cultural synergies and conflicts flavor the dynamics. Engaging the whole value chain across all dimensions is key. A neutral forum like CFP is helpful, if not essential.

The U.S. Postal Service and Cooperative Innovation

by David Yacobucci*, USPS OIG

The founding fathers recognized the importance of post offices and post roads. In fact, the Postal Service predates the United States Constitution and is one of the few government agencies explicitly authorized in it. Since its inception over 230 years ago, the Postal Service has faced its share of disruptive technologies, innovation, and new entrants. Telegram services, telephony, radio, fax technology, city couriers, package delivery, the internet, and others have each led to a prediction of the Postal Service's ultimate demise. Amidst these disruptive technologies and new entrants, the Postal Service has been the lynchpin of a large, continuously evolving value chain. And, over time, actors along this value chain have cooperated to achieve capabilities they could not achieve alone. This cooperative innovation has unlocked profound value in the communications marketplace. Here are four examples.

Starting in the 1970s, the Postal Service started an innovative program that has evolved to offer reduced postage to mailers who perform "upstream" activities such as barcoding mail, presorting mail by ZIP Code, and inducting mail at a postal facility closer to its final destination. This has led to more than 130 billion pieces of mail being "workshared" and $15 billion in discounts per year. More interesting, it has created an entire sub-industry in the value chain and a willing sales force to sell postal services. This sales force has found new, creative uses of the mail and ancillary value-added services.

Prior to 2001, the Postal Service used commercial airlines and a dedicated air network to fly expedited mail across the country. Then, it signed an agreement with FedEx to provide domestic air services and place FedEx drop boxes at Post Offices. Within ten years, FedEx became the dominant supplier earning an annual payment of $1.5 billion. Curiously, FedEx competes with the Postal Service in the overnight, 2/3-day, and ground package market. This cooperative, competitive arrangement has expedited mail filling FedEx's transportation network, sometimes flying alongside competing products. Further, FedEx entered the ground package market and uses the Postal Service's last mile delivery network to reach

every address in the United States. FedEx uses this for about 30 percent of its ground volume and the business segment is growing.

In the early 20th century, Arthur Pitney and Walter Bowes delivered the first USPS-approved postage meter. Today, Pitney Bowes is one of the largest companies in the global mail industry with annual revenues exceeding $5 billion. Starting as a supplier and partner, Pitney Bowes has expanded its services and competes directly with the Postal Service by presorting over 14 billion letters per year and offering digital mail services with online bill pay. Recently, Australia Post has selected this technology to provide a free and secure digital mailbox to its citizens. Pitney Bowes remains a customer of the Postal Service using downstream processing and delivery for its presorted mail. And it remains a supplier and partner of the Postal Service through its traditional postage meters.

A relative newcomer to cooperative innovation in the mailing value chain is Amazon.com. Amazon.com uses the Postal Service and other shippers to process and deliver its products to its customers. In 2011, its outbound shipping costs were almost $4 billion. However, it also competes with the Postal Service by distributing books, newspapers, and magazines though its Kindle devices. This content could have gone through the postal network and, more importantly, fill mailboxes with highly desired material that keeps people looking forward to the "mail moment." Amazon.com has also recently installed parcel lockers in grocery, convenience, and drugstore outlets in several urban areas. This allows customers to pick up their packages at a time and place that's convenient for them, and allows Amazon.com to avoid failed deliveries and bypass shippers' costs.

These selected examples show how actors within the postal value chain compete and cooperate to fill market needs, acquire competitive advantages, and invent different capabilities. Worksharing has spawned a multi-billion dollar industry that continues to add new and creative ways to identify and communicate with customers. FedEx has evolved from an overnight letters service to a multidimensional company that has filled its internal pipeline, expanded its retail access, and successfully entered a competitive ground market. Pitney Bowes built its traditional postage meter business, expanded into other areas of the postal value chain, and seeks to claim the future with digital mail services. Amazon.com is a digital native who constantly expands its capabilities while relying upon the Postal Service and its network. This summary did not analyze the extent the Postal Service is a bystander, an enabler, or a participant or how the benefits fall. However, it is certain the mailing industry, with over 8 million jobs and $1 trillion in sales revenue, has brought innovation to the market based on timely cooperation between the Postal Service, mailers, printers, suppliers, truck companies, software vendors, list providers, and many others.

**This summary is the opinion of the author and does not necessarily reflect the views of the U.S Postal Service Office of Inspector General or the Postal Service.*

Panel: Emergency Services

by Karen Sollins, MIT

In the context of *cooperative innovation*, this session on Emergency and Public Safety Communications used a real-world, evolving societal demand to examine the balances among a set of forces including: the requirements of the public, the expectations and services of emergency and public safety providers, funding sources for both infrastructure and ongoing and upgraded service, policy makers, and the relationship of all this to other related industries. In this session we explored some of the questions of what currently exists, where the pressures exist for changes—either to take advantage of transformations in technology or to provide increased or different capabilities—and the factors that push either for maintenance of the status quo or for change.

The three speakers offered significantly different perspectives. These should be framed by the position taken by David Clark, as a member of the Technical Advisory Committee of the Federal Communications Commission. The FCC is facing pressure to deregulate the circuit switched network that has been the basis of the wireline telephone service of the United States since its inception. This deregulation is predicted to lead quickly to its replacement by infrastructure based on the packet-switched networking (Internet). The largest concern with this transition is the ability to continue to support the emergency and public safety requirements of the nation. Assuming the technological issues can be resolved, there remains a question of how to fund such a transition. The communications providers are pushing for this transition for financial and business reasons, so one follow-on topic of discussion is whether some of the savings accruing to the communications companies should be put to supporting the associated transition required for emergency and public safety communications. These sorts of questions about what the transforming technology currently will provide or must be made to provide, how to work through the regulatory and political issues, and the business models required to realize such a transformation, were addressed by the panelists.

The first speaker was George Fosque, who is the Director of the 911 Communications Service for the city of Cambridge, Massachusetts. This is one of the more forward thinking PSAPs (Public Safety Access Points), yet there remain enormous challenges in facing the evolution and probably transformation of the supporting technologies. His presentation highlighted the current technologies' approaches and challenges, and those presented by the evolution of technologies, societal expectations, and evolving regulations. Hannes Tschofenig of NSN brought to the table both his experience in the IETF in the ECRIT working group that focused on emergency services' requirements in an Internet context, as well has his work in the European Emergency Services community broadly, with an understanding of the international problems that arise in that context. Paul Kolodzy, a consultant with experience in the wireless spectrum management, cognitive radio, and public safety services community, ended the session.

George Fosque, Emergency Communications Services, City of Cambridge
Providing 911 Services in the City of Cambridge

In the state of Massachusetts, there are 260 emergency (911) response centers, reflecting most of the cities and towns. One of these in the city of Cambridge divides the responsibility among specialized responders, some each for general response, police, and fire. The team fields all calls coming into the city, both emergency and non-emergency (such as calls for driveways blocked by parked cars), and handles all the logistics of dispatching first responders including police, fire, and ambulances. All communication at present is by voice only, although each "station" in the center has many displays that provide a great deal of information with respect to each call, including street address and latitude-longitude information where possible. For each wired phone line, the information may also include apartment number.

Location information is key to providing their current service. For wireline calls this is straightforward because the city provides a database of all known addresses, and a phone company cannot install a new wireline phone at an address that is not in the database, hence, when new addresses are created, they must be added, after verification, by the city. Yet, even in this basic situation, a large "location" problem exists because location is not reflected through private PBXs. So, for example, all calls from each of the universities in town appear to come from the campus switching center.

Mobile devices present a much more serious problem: although a smart phone may have accurate latitude-longitude information, that data is not accessible to the phone portion of the smart phone. At present the state has two wireless centers in eastern and western Massachusetts; all wireless calls are initially routed to one of these two centers for further dispatching. The first question that is asked with each call is the location of the caller. If they can speak and know where they are, this is used to forward a call to the appropriate Public Safety Access Point or PSAP, in this case Cambridge. Without this information, the only information derives from the cell sector, which is problematic for three reasons. First, sectors do not match town and therefore PSAP boundaries. Second, if a sector is overloaded a call may be handled by another sector, perhaps even farther from the location of the caller. The third problem is the "z-axis" problem. Most devices, even if the information is accessible, do not do a good job of estimating altitude, and much of the city is comprised of multiple-story buildings. These problems will only be magnified as the wired network is replaced with an IP network.

The second issue that will confront emergency services is data. Probably the earliest form of this is text, in order to support the deaf and hard of hearing. This is likely to raise problems regarding both location and any ability to verify callers. Furthermore, current approaches involve audio interactions both to learn about a situation ("Is your mother breathing?") and to talk the caller through an emergency procedure, such as a Heimlich maneuver. Because the current unionized staff is generally not skilled at typing, the interactions will be severely challenged in the texting context. Other kinds of data that we may see include photographs and/or medical information from monitors, alarm information, and so forth. Often these appear to provide overload for the call center personnel and, at best, may be valuable to the

responders, rather than the call center personnel. One of the unstated, but clear messages from this discussion was that a careful and thorough review of the user interface for the call center personnel will be critical to their being able to handle the calls they receive.

The third issue will be effective handling of increasing numbers of "calls," as they become easier and richer. The problem is handling peaks, not average load. In analyzing data from 2009 and looking at peaks, Fosque and his team found in one five-minute period, when a transformer blew up, there were 22 calls. The staff of eight in Cambridge could not have handled the load, although on average the number of calls that were made for Cambridge was 3.6 per hour. Because the majority came from cell phones, they went to the Eastern Massachusetts call center, which only forwarded four of the calls, telling the others that they knew about the problem. In the middle of that, there was a call for a person having a heart attack at the other end of the city. As technology permits increasingly rich calls, the challenge will be to filter them effectively during peak times. Advancements in technologies will lead to significantly more complex problems to solve.

Hannes Tschofenig, Nokia Siemens Networks
Challenges to Emergency Communications Services in the Context of the Internet and the Multinational European Environment

In Europe, the challenges go well beyond those presented by Fosque, above. They include: regulatory issues, lack of knowledge among the general public, consolidation for cost savings, a diverse technical community, and enormous problems with respect to security.

A number of these problems are reflective of the fact that the European approach is not unified or standardized. Regulations vary from one country to another, as do social norms. Originally, each country had its own unique approach for reaching emergency services and the countries have not completely unified around the "112" of the EU. Hence, although Europeans are quite mobile, there is little common understanding of how to reach emergency services or what services are provided across national boundaries. Furthermore, there are likely to be different approaches pertaining to the use of Skype, SIP, and other types of communications services, when trying to reach emergency services.

In this complex environment, perhaps the most challenging problem is security. There are three key security problem areas: malicious resource consumption, the attribution problem, and the untrusted end device. The resource consumption problem may overwhelm call takers, but even more disruptive is the abuse of first responders to maliciously fake calls. Some areas report over 50% false calls, although a number of these are either mistakes or unknowing children. But, as with the concerns in the US, the problem of how to handle this kind of load effectively is a challenge.

The attribution problem reflects two key challenges: identification and location. Especially with a move to such services as Skype, identification is completely user defined. Furthermore, location is extremely difficult or not yet possible in the Internet context, so one is dependent on a database operated by the communications service. The Skype user may often be in other locations, making the "location" information irrelevant. SIP-based phone

services may require that a user specify a location, but there is no way to keep that up to date, as the owner of the phone moves and plugs it into a new location. It is easy to fake either or both of identification ("borrow" someone's Skype id) or location. These kinds of challenges fall into four categories:

- Type: source and validity of identification and location information;
- Timing: the different roles that may be important before, during and after an event;
- Investigation: how might different parties exploit attributions as part of deterrence;
- Jurisdiction: who has jurisdiction over misuse of attributes in an international situation.

One of the reasons for poor location information is a lack of standardization across national boundaries. At present, the only information provided with a call is the cell tower information. There are some attempts at standardization, but to date the primary participants are the telecoms operators and regulators. The emergency services and other user communities are not significantly involved. Without any standards, the device manufacturers and service providers are not required to solve the problem of trustworthy identification and location information.

There is a final challenge in moving forward in Europe: a business model. Regulation, to the extent it exists, states that providers must support emergency services at their own expense. They cannot charge or receive any governmental support for it.[1] This is complicated by the fact that an ISP or other communications provider will not want to provide this service to a company such as Skype, which is a direct competitor. The lack of a business model is a significant hindrance to moving forward.

Paul Kolodzy, Kolodzy Consulting
The complex web of requirements, expectations and opportunities for public safety and emergency services

This talk concentrated on providing communications capabilities for public safety and first responders. It examined the challenges to providing adequate communications capabilities for responses to situations such as emergency service calls. The challenges arise at all scales. Such efforts will be locally funded through local taxes and fees, regionally controlled through regional spectrum management (this talk focused on the use of wireless technologies as the scalable approach), national control of policies, often reflecting national politics, and internationally through the development of technologies that are manufactured and sold internationally.

In this context, one can consider three primary aspects of the problem: technology, policy and economics. The technology problems fall into a number of categories: availability (reaching the most users), coverage (reaching the widest geographic areas), security,

[1] In contrast, as Fosque reported, in the US, there is a Federal 911 fee on every phone bill. In the state of Massachusetts, that provides about $75M in infrastructure and facilities support (about $3B nationwide), in addition to the municipal budget item for about $4M for operations in the city.

interoperability or lack of it, and Smart Radio Technologies. Smart Radio Technologies point to new opportunities that reflect interoperability of heterogeneous networking, the integration of policy into devices, shared spectrum (previously thought to be a non-starter), support of distributed services (by moving services into the devices), and the ability to extend networks to a rich topology.

The policy challenges have to do with a lack of national coordination regarding requirements, and who is responsible for what, as reflected in the scale issues mentioned above. There is currently little agreement about which agency or organization at the national level is in a position to set requirements or define standards. The current approach is to create unfunded mandates, leaving funding as a local responsibility. This leaves mayors, chiefs of police, etc., responsible for both funding and implementation, without any ability to control the decisions about what is done. This sort of political imbalance is unlikely to lead to success.

On the economic side, there is the question of who decides what is to be built; those who are buying capabilities or those who are paying for them? Each group will make significantly different choices based on where their responsibilities lie. In general, it is unlikely that there will be resources that are totally controlled by public safety, so some sharing will be necessary between commercial and public uses. A key question is who controls those resources (e.g., spectrum)? If public safety controls resources, and resources are only available for commercial use when not in demand for public safety purposes, then it is not viable as a commercial resource. If commercial uses control the resources, public safety may find interference during crises. There is not yet any clear understanding of how to negotiate for peak usage. Finally, in terms of funding, there is a tendency to fund a single solution and then step aside. Kolodzy argued that a spiraling or evolving approach will be necessary to move into the future without dropping off a cliff. The challenge is to find the set of people who will be the most motivated and have the deepest understanding of both present and future demands, and how those relate to evolving technologies, policies and funding models.

Conclusions

Across these three presentations on the present and future 911 Communications services in an urban American setting, international emergency communications services in Europe, and the provision of a public safety communications substrate in the United States, several themes arise: pressure for increased capabilities and services; funding and business models; the role of policy, politics, and standardization; and finally, the interplay among these with the forward march of technology. In all three domains, increased capabilities are presented as extremely important, suggesting that current capabilities are not adequate. This may take the form of enabling the hearing-impaired and deaf, or providing location information as an enhanced capability in an IP network setting, or the ability to share spectrum resources, rather than having each spectrum allocation capable of providing the full functionality of control and communications. Funding and business models are central to any discussion of provision of community, regional, national, or international capabilities. The questions about who will pay for what, and how that relates to who will be responsible for

the choices made in spending the money demonstrate a rich complexity in structuring, creating and managing these systems. Tightly coupled with this are the set of issues having to do with agreements or disagreements with respect to policy, the politics that come into play, and the decisions not only about standards themselves, but how they will come into existence, and who will do that. Finally, in all three domains, we find a combination of pull from technologies that are evolving to support new kinds of capabilities, and the push to solve problems, such as the security and trustworthy location capabilities that may be driven by needs within the emergency and public safety communications communities.

Panel: Rights Management in the Music Industry

by Natalie Klym, MIT

The rights management case study provides an example of a problem that requires coordination and agreement among multiple players in the music industry value chain. I framed the coordination issue in terms of the alignment of *cultural values* associated with a rapidly changing music industry. As Charlie Fine notes above, entire industries and their customers have a value system—a way of doing things—and many barriers to innovation are the result of a culture clash. This set of talks highlighted several conflicts concerning *copyright* and *privacy* resulting from the integration of both end users and ISPs into the music industry value chain. In order for the current set of conflicts to be resolved, all actors in the value chain must share the same set of values.

To provide some theoretical framing and historical context for the focus on industry culture, I would like to briefly summarize the work of music theorist Alan Durant from the late 1980s-early 1990s. Durant wrote specifically about "musical cultures" as they were organized around various technological trajectories, starting with the gramophone. Durant's premise is that a series of major technology shifts have altered not just the type of music that is created, but more importantly, the overall conditions under which it is produced, circulated and consumed. And so in terms of our theme of "coordinated innovation," the object of coordination is the culture of the new digital and networked music industry.

Very briefly, Durant identified several trajectories along which the music industry evolved. With each new technology, the primary musical product, the industry value chain, the source of profits, and behaviors associated with both creating and consuming changed. These include: the *gramophone*, which marked the birth of the music *recording* industry: Music became an object of mechanical, and later electrical reproduction, and thus subject to mechanical royalties (which originated with piano rolls—the first instance of mechanically reproduced music). The record thus became the musical commodity. Before recording technologies, the music industry was organized around live performance and notation (sheet music publishing). The recorded music industry was initially rooted in consumer electronics. The gramophone manufacturers produced "software" to market their hardware, making records based on what the live music industry deemed popular rather than

developing artists and musical tastes themselves. Eventually, a distinct record industry evolved around the development of recording artists, with its own economics of production, distribution, and promotion. The record gave rise to new sorts of musical consumption and use.

Broadcasting was initially a threat to the record industry but then served to promote records. Radio led to the establishment of new audiences and a new breed of music professionals involved in the engineering aspects of broadcasting. Radio brought a sense of "liveness" into the home. The broadcast became a new musical commodity, subject to performance royalties and advertising.

Tape recording (first analog, then digital) completely changed the way music was produced. Recording, while initially regarded as a technical process whose goal was to reproduce a live performance as faithfully as possible, soon became a creative process. The studio was regarded as one large musical instrument. Another category of professionals entered the picture; recording engineers who became increasingly involved with the music itself. The manipulation that recording allowed for raised many issues regarding recording standards and what was considered legitimate music by the public.

Durant's last writings on music were in the early 1990s. At the time, he was focused on the significance of the integration of music with other media technologies through the MIDI interface, which was the frontier at that time. He regarded MIDI as an extension of tape recording.

If Durant were to update his framework today, one can imagine that he would have included the combination of *digital and the Internet* as a fourth trajectory, and described it as introducing a new culture defined primarily by the technological integration of music production, distribution, and consumption, as well as its convergence with other media. The boundaries between producers and consumers has broken down; new business models have turned music into a service, making traditional notions of ownership irrelevant and commoditizing the music itself; and most relevant to this discussion, bringing audiences directly into the value chain and enabling consumption practices that challenge copyright law, most notably, remixing and sharing. Our panel sessions focused primarily on the implications of the latter.

No longer simply consumers, audiences (or fans) are integral to the value chain. Fans have always played an important role in the music industry beyond just buying music or concert tickets. Fandom in and of itself is a promotional activity, but today, digital tools enable fan-related behaviors as a matter of course, and in the process, audiences are deeply integrated into the industry value chain.

In terms of copyright, the rights management panel actually explored two separate but related problems. The most obvious is piracy—the unauthorized procurement or use of copyrighted music. The less obvious but equally important problem is the devaluation of music in terms of royalty rates, where musicians earn a fraction of what the traditional model would have paid them, which one of our panelists argued is due to a lack of accurate

accounting of consumption. The solutions to both of these have brought the ISPs into the ring and bumped up against privacy issues in the process.

One the one hand, rather than treating digital audiences with their sharing behaviors as value-creating partners, the music industry has viewed them as value-destroying adversaries. On the other hand, audiences refuse to have their consumption related behaviors tracked or controlled under any circumstances in the name of protecting their rights to privacy and freedom of expression. Both sides need to understand the new "consumption" as partnership, and its various implications.

The panel was divided into two parts. Part 1 focused on music broadcasting through both music and television distribution channels. John Cate, a musician and entrepreneur presented an introduction to the basics of copyright law, followed by a proposal to convert the current reporting system to a usage-based system on the basis that a significant portion of broadcast music consumption remains unaccounted for. The proposal raised questions regarding the role of ISPs in the rights management value chain, particularly in terms of their reluctance to get involved in activities that were viewed as a fundamental violation of privacy by *their* customers. John's presentation is rooted in deep personal belief that ISP involvement is the only way to ensure fair compensation to artists. His quest is to find the "right" way to bring ISPs into the value chain.

Dave Clark followed with a first-hand account of his experience with SOCAN's attempt in Canada to propose a rights management model requiring the involvement of the ISPs that differed slightly from John's proposed model, and added to the perspective regarding what role, if any, the ISPs should play, specifically in terms of their more general struggle to expand the scope of their revenue-generating activities (i.e., "jumping the open barrier") in light of the "broadband incentive problem." He also highlighted some of the more general issues regarding what it means to transmit and consume online. More specifically, he points out that the SOCAN proposal defined all transmissions over the Internet as a broadcast, meaning there would be no more "sales" in an online world, shifting the bulk of profits from sales (mechanical reproduction royalties) to broadcast (public performance royalties).

The second half of the session gave us a glimpse of what online music and video distribution looks like without any copyright enforcement, where instead of seeking to measure or monitor consumers' usage, content owners are doing what the first speaker, Nancy Baym from Microsoft Research, calls "embracing the flow." Nancy focused on the music industry in Sweden, and was followed by Daniel Pereira, formerly with the Convergence Culture Consortium at MIT, who presented the work of Ana Domb Kraukopf, which provides a value chain analysis of copyright-free models that traces the flow of value—monetary and non-monetary—created by audiences, and the cultural values that underpin this subculture. I have summarized the talks as follows:

John Cate, American Music Partners
Copyright Futures for Broadcast: A Songwriter's Story of Change

There are two primary ways to consume recorded music: through sales (ownership) and broadcast (radio and television), or what copyright law refers to as "public performance." The main concern of this talk is the latter.

The key challenge concerning broadcast as it moves online is as follows: As broadcast moves from a licensed, regulated and finite universe to one that is unlicensed, unregulated and virtually infinite, how do songwriters get paid fairly? This is not about preventing piracy – it's about the capture and fair monetization of broadcasting activity online.

The crux of the matter is that while distribution models have changed, the royalty system has not adapted adequately. The traditional broadcasting system is based on a reporting scheme, where a licensed (and therefore known) set of radio and television stations report to performing rights organizations (PROs) on what songs they have played to a somewhat "bounded," and therefore easy to estimate, audience. Songwriters are paid on the basis of how many people hear their music. Any re-distribution (or what we now commonly call sharing) is limited by what is technologically possible and convenient, which generally does not go beyond recording radio content onto cassette tapes and sharing those with friends, an activity that has pretty much died out.

Today, anyone can broadcast over the Internet without a broadcast license (although you still need the music licenses), and sharing—posting links to YouTube for example, or recording off of YouTube—is integral to the consumption experience. This makes the "outbound" data that is submitted to the PROs (i.e, the reports on what was played) a less reliable metric for what was actually heard, resulting in both uncaptured royalties and the lowering of royalty rates. In short: The old broadcast reporting system doesn't fit the new broadcast environment.

A more appropriate system for Internet broadcasting would be one that tracks "inbound" data, i.e., what is actually consumed by end users. In other words, the current *broadcast reporting* system must be converted to a *usage-based* system. However, while the potential for such a system exists for Internet broadcasting, the required gathering and/or sharing of information by ISPs is fraught with problems. Technologies such as deep packet inspection (DPI) add costs to their operations, but perhaps more significantly, any tracking of usage in general creates an antagonistic relationship with customers who tend to perceive the gathering and use of personal data—particularly by telecom operators—as a violation of privacy. And in many countries it is simply not legal.

Some attempts have been made to get ISPs involved in the copyright value chain—not as an Internet "police" force, but rather, as part of the PRO value chain, or even functioning as the PRO itself. The next talk by David Clark is a first-hand account of an attempt by a PRO to change the broadcast copyright system by getting the ISPs involved.

Dave Clark, MIT
The SOCAN Experience

SOCAN is the PRO in Canada. It is analogous to ASCAP, SESAC, and BMI in the U.S., except that there's only one such organization in Canada. They operate under the Copyright Board of Canada. Dave Clark served as an expert witness during the Copyright Board hearings in the mid 1990s concerning SOCAN's proposal.

SOCAN interpreted Canadian telecom law such that any transmission over the Internet constituted a public performance (which means that there's no such thing as a sale on the Internet.) SOCAN wanted the Copyright Board to compel ISPs to function as their collection agent. This is a slightly different position than John Cate has taken in that they were not looking to the ISPs to actually track usage. Rather, SOCAN had proposed a per subscriber monthly "music tax" of 25 cents, which the ISPs would collect on behalf of SOCAN. The PRO would then redistribute these fees to their artists. This agreement would thereby indemnify all ISPs for any unauthorized transmissions of music licensed by SOCAN.

Not surprisingly, the ISPs fought the proposal. Although David's role was to explain how the Internet works, not comment on business models, his personal view was that in principle, this was not a bad deal for the ISPs and for users. However, it's not clear that this is a good model for artists, especially if the new system effectively eliminated revenues from "sales" of recorded music (something the labels and trade associations would surely prevent). Furthermore, the ISPs were wary that the monthly fees would increase beyond their control.

In any case, what was interesting was the observation that the ISPs fought this based on a very classic view of the ISP industry as a "layered" industry whose boundaries followed those of the corresponding technology layers—and should not be crossed. The logic was that if they start collecting money on behalf of music publishers, then who will be next? This was unfamiliar territory at the time.

Secondly, it was an attempt for broadcasters to extract money from end users. Broadcast has traditionally been an ad-based business, free to users. But this signaled an attempt to introduce a transaction-based model to broadcasting, which, in combination with defining all transmissions over the Internet as public performance vs sales, transformed the very consumption model for music. In short, SOCAN was proposing a whole new framework, and one that brought a new set of players into the industry.

Nancy Baym, Microsoft Research
Embracing the Flow

Artists should get paid for their work, but the current copyright system is not always the best way to ensure payment. Part of the reason for that is due to the special nature of music. Music is not like other goods, e.g., socks. Music, unlike socks, lasts forever and it affects us on a profound emotional level. This presentation offers a reframing of copyright by talking about the cultural values that surround music.

Copyright is usually positioned in the context of an economic market exchange, i.e., music is intellectual property that is exchanged according to certain economic terms. But these terms are not stable and should not be taken for granted. That music is part of an economic exchange system—an industry—at all is a relatively modern invention. Recording technologies, starting with the player piano, made it possible to buy music itself; music became separated from performance, a commodity to be purchased. (Before recording, you could buy sheet music.) And this system of recording and distributing copies of music required a centralized industry model, which the Internet has all but destroyed (by making the means of production and distribution affordable to artists and smaller labels).

Within this economic framework, audiences—people who listen to music—can only be one of two things: they are customers or pirates. But there are other ways to think about audiences, more specifically, as creators of value.

Most importantly, to audiences, music is primarily a system of social rather than economic exchange. Fans love to share music and copyright law has focused on controlling these consumption practices, trying to turn sharing into buying and selling. The alternate approach affects distribution practices. There are portions of the music industries (call them micro-industries or sub-industries) that do not work on the basis of copyright and in fact thrive on the recognition that consumer behaviors actually create value, including monetary and non-monetary, or directly and indirectly.

What is fair is a different question. For example, it is fair to get lower royalty rates through online distribution channels? If I listen to a song on Spotify 100 times, am I obligated to pay for it? The answer is not straightforward, but what is clear is that we need alternative ways for consumers top contribute financially, e.g., tipping, or paying what they want to pay. Experiments have shown that when audiences connect with musicians, they want to support them, in other words, payment is driven by the desire to support the artist rather than procuring their product. This is a more direct transaction that reflects the more direct relationship consumers have with the artist.

Daniel Pereira, MIT (presenting on behalf of Ana Domb Krauskopf, Universidad Veritas in Costa Rica)
Tacky and Proud: Exploring Technobrega's Value Network

Ana Domb Krauskopf's study can be the contextualized within the core concepts of MIT's Convergence Culture Consortium, which emphasize the cultural characteristics of the digital music industry. These included:

- Participatory culture: Forms of public engagement based more on social and cultural protocols and less on technology as the primary driver.
- Collective intelligence: A term coined by Pierre Levy which refers to the capacity of virtual communities to leverage the special interests of their community members, normally through collaboration and large scale discussions.
- Spreadability: the wide disbursement of content through both formal and informal networks

Ana Domb Krauskopf's case study of technobrega—a grassroots music industry in Brazil—provides a detailed analysis of the flow of value throughout a music industry ecosystem that does not rely on copyright. This study highlights the basic concept that the more music (or any media) circulates, the more valuable it is.

Technobrega refers to both a musical genre and the subculture and industry that has developed around it. It is homegrown music with small budgets, and there are no official labels. The artists in this community refuse to enforce copyright restrictions and intentionally distribute through "pirate" file sharing networks. These networks serve to promote live performances. The industry is thus described as "audience-centric," in that audiences play a key role in the functioning of the industry as value creators.

The main "product" is the live performance. However, it is not a live performance of the music by the artists. It is the "sound system party"—a large spectacle involving elaborate sound systems and stages where the DJs are the performers and the primary object of the fans attention and loyalty. DJ's integrate fans into the performances, creating an engaging social experience. And live recordings of the events serve to directly involve the audiences in the music itself. Audiences align themselves with various DJs and compete amongst themselves in teams of "super fans."

The musicians are actually the most fragile stakeholders, despite the fact that they produce the musical content. Fans are more drawn to the DJ parties than the live performance of the music by the musicians themselves, and the popularity of the musicians is short-lived. Although they do make money from their live performances, most musicians supplement their income with other jobs. Clearly, the musician does not have the best place in this ecosystem.

We have seen some experiments outside the more isolated cases like technobrega, for example, the TV show, The Colbert Report, has leveraged audiences, recognizing them as important creators of both monetary and non-monetary value.