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Regulation 3.0 for Telecom 3.0

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ABSTRACT

Telecommunications infrastructure goes through technology-induced phases, and the regulatory regime follows. *Telecom 1.0*, based on copper wires, was monopolistic in market structure and led to a *Regulation 1.0* with government ownership or control. Wireless long-distance and then mobile technologies enabled the opening of that system to one of multi-carrier provision, with *Regulation 2.0* stressing privatization, entry, liberalization, and competition. But now, fiber and high-capacity wireless are raising scale economies and network effects, leading to a more concentrated market. At the same time, the rapidly growing importance of infrastructure, coupled with periodic economic instabilities, increase the importance of upgrade investments. All this leads to the return for a larger role for the state in a *Regulation 3.0* which incorporates many elements (though using a different terminology) of the traditional regulatory system—universal service, common carriage, cross-subsidies, structural restrictions, industrial policy, even price and profit controls. At the same time, the growing role of telecommunications networks of carriers of mass media and entertainment content will also lead to increasing obligations on network providers to police their networks and assure the maintenance of various societal objectives tied to mass media. These are predictions, not recommendations.

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1. Challenges

Forty-five years ago computer pioneer Gordon Moore came up with his eponymous law that postulated technical improvements for microprocessors at an annual rate of about 40% (Moore, 1965). This measure remained remarkably stable, perhaps because it set a synchronizing pace for the ICT sector. But it is impossible for governmental processes to match that rate of change. This is the structural policy problem for 'next-generation networks'.

Today, a major shock to the existing economic system is the global financial crisis after 2008. There were short-term effects on telecom and internet markets, as business and residential customers disconnected and advertisers vanished. But more important is the long-run impact on the way the industry is structured, run, financed, and regulated. A disruption of this nature questions many established modes of operation. But used creatively, it can set into motion a process of productive change.

A decade earlier, South Korea was hit by a wrenching economic crisis. Out of those ashes Korea rose to world leadership in broadband communications, mobile handsets, interactive gaming, and flat screen TVs. In the same way, the world must now assess how to reform and redirect a key part of its infrastructure. Entrants find it hard to raise funds to establish, upgrade, or expand networks. Incumbents must manage existing debt, while new debt becomes more expensive, and

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obligations secured by declining share prices must be upheld. New acquisitions deals are harder to finance, old ones unravel, and private equity deals dry up. Equipment makers' ability to develop new technology continues to erode. The telecommunications industry is a much more volatile industry than it used to be (Noam, 2006). This is the second severe crisis the industry has faced in less than a decade. Whereas the industry used to be a growth engine for the high-tech sector, it now adds its own woes to the overall economy.

But this situation could also be part of overcoming the crisis. To do so requires acceptance of changed priorities. The short-term economic priority is investment and growth, and the policy priority is to create incentives for such activity. This does not mean that other goals should be lost or forgotten. But the calculus of short-term tradeoff between some of these goals has changed, and some may have to wait their turn for kinder days.

The time has therefore come to engage in a new discussion over regulation of ICT. This is not easy. The rivals in the debate over the treatment of communications networks at times exhibit a messianic fervor and are quick to slay messengers of unwanted news. One side invokes a danger to either the survival of competition, democracy, and the internet; while the other side predicts a grave damage to technology, national competitiveness, and the economy.

To better appreciate the dynamics of the sector, it is helpful to think in terms of three generations of telecommunications. 'Telecom 1.0' was the traditional monopoly system, state owned, or tightly regulated. Technologically it was based on copper analog networks. Culturally it was shaped by an engineering and state bureaucracy. This arrangement lasted for a century and spawned a regulatory system, which focused on cooperation with the monopolist provider in spreading services across society, while constraining its market power. After the 1980s this first-generation system was transformed into a more open structure with liberalized entry, especially in wireless, privatized incumbents, and accelerating innovation, Telecom 2.0.

For Telecom 2.0, there is an appropriate Regulation 2.0, which is based on the concept of competition. Competition leads to innovation and enables deregulation. Government intervention, let alone ownership, is the problem to be overcome. This became the orthodoxy. But this was not the end of history in telecommunications. Technology took another major step forward, this time focused on fiber-optic and high-capacity wireless access networks. Whereas the first-generation created networks that operated at kilobit per second transmission capacity, the second-generation reached mass consumer operations in the broadband megabit range, almost a thousand times as fast. And the third-generation will operate at another thousand-fold increase in speed in the gigabit range.[1]

Today, with experience in hand and with new technologies emerging, the question is, will the policy approach of Telecom 2.0 also work in Telecom 3.0? There are four reasons for this not working: instability of the sector, growing investment requirements, changing economies of scale, and emerging presence of media in the telecommunications industry.

1.1. Challenge 1: instability

The general economic downturn after 2008 shows that boom and bust cycles have not vanished from the economy. A few years earlier, the raging dot.com boom of the 1990s turned into a classic bust. Worldwide, the telecommunications industry accumulated over US $1 trillion in debt, and stock values declined by US $4 trillion. Many new entrants collapsed, some of their leaders in America went to prison for misleading the investor public, capital investment halved, the telecommunications equipment manufacturing sector collapsed, while telecommunications R&D withered. Eventually, the industry stabilized and recovered, though not at the hyperactive level of the 'bubble years'.

One cannot blame erratic consumer demand for this instability. The problem is not inadequate demand but falling prices. (Noam, 2004).[2] More generally, the entire information and communications sectors subject to a substantial price deflation. This is a fundamental trend of the information sector, with far-reaching and long-term effects.

The basic structural reason for this problem is that information products and services are characterized by high fixed costs and low marginal costs. Information goods are costly to produce but cheap to reproduce and distribute, and therefore exhibit strong economies of scale with incentives to oversupply. They also possess strong positive network externalities. At the same time, these information products and services became commoditized, converged with related industries, and therefore increasingly competitive.

These dynamics characterize Telecom 2.0. Do they also apply to Telecom 3.0? A competitive fiber-based network industry is potentially even more unstable than the preceding industry structure, since the ratio of fixed-to-variable cost is higher than before. Investors remember the calamitous impacts of the previous downturn. Thus, in contrast to the Telecom 2.0 period, where outside investors were cheering a competitive market structure, raising their valuations to the blue sky

[1] The term Next Generation Network (NGN) is also often used. It is conveniently imprecise and ever-changing. NGN is focused on an all-IP, all-services concept, in some ways an updated version of ISDN which aimed, one generation ago, to cover all-services Next Generation Access Networks (NGAs) with an emphasis on local infrastructure upgrade is the closest term to the Telecom 3.0 concept. The term is technology-neutral, but, practically speaking, fiber is at its heart. Such NGAs are very-high bandwidth electronic communications networks reaching an end user. Transmission speeds are in the plus 100 Mbps range, and it is foreseeable that they would enter ultra-broadband (1 Gbps and more) territory soon.

[2] For example, for several years, the prices of trans-oceanic circuits dropped at the rate of 40–60% annually; the average price per wireless minute in the US dropped from $1 in 1985 to 6 cents in 2008.

while quoting Joseph Schumpeter, they now realize that they themselves were the ones being creatively destroyed. They now understand better the inherent risk and financial instability of competitive network industries, whether in airlines, electric power, or telecommunications. In the Regulation 3.0 environment these factors are likely to reduce governments' previous emphasis on competition and lead to a greater emphasis on stabilization.

1.2. Challenge 2: investment requirements

The problem with investor reluctance is that it takes hold just when the network industry needs to engage in major investments. Financing is more difficult to obtain by incumbents and especially by entrants. Incumbents are typically leveraged and often must contend with the rollover of often substantial existing debt. Revenues slow or decline for some business lines. Yet at the same time, to create all-fiber networks is very expensive. For Europe or the US, investments required have been estimated to run over EUR 300 billion. This is much money, with much risk. Some are shouldered now by national stimulus plans. In the US, for example, the federal government alone will supply US $7.2 billion for the 2009/2010 budget year, mostly for broadband rollout in rural areas. (Farrell, 2009).

For Telecom 3.0, hardware costs are declining, but the main costs, by far, are those of civil engineering which do not follow Moore's law at all. These costs can be lowered somewhat through better coordination among public utilities and network providers, and by easier access to ducts, rights-of-way, and public facilities such as sewers and subways.

For wireless high-speed access, costs can be reduced in a variety of ways: by the opening of additional spectrum, reducing present wasteful governmental spectrum use practices, as well as by much smarter radios that can access underutilized frequencies and process signals more efficiently. But there is a limit to the ability of wireless technology to be full players in high-speed Telecom 3.0. The spectrum and antenna infrastructure needed to service many millions of people with simultaneous, asynchronous, and two-way gigabit speed capacity is high.[3] The transmission rate of public wireless tends to operate at about one tenth of that of public wireline, with both rising in tandem. This leaves a significant role to wireless for medium-speed uses, which is all that many users need at present. But for multi-channel asynchronous high quality video entertainment it will rarely be the preferred solution.[4]

1.3. Challenge 3: changing economies of scale

For a generation now, Telecom 2.0 policies focused on creating competition, a remarkable departure from the closed and restrictive state monopoly system. But reality proved harder than expected for new telecom entrants in their efforts to compete with incumbents. This is partly due to the high economies of scale of network operations. Another reason is the increased efficiency of incumbents: once they had left the status of state bureaucracies and faced rivals they had to shape up. They were often more effective in using the regulatory system to their advantage. The boom-bust characteristics also favored established companies with deep pockets, staying power, and diversification. Entrants had the alternative option of primarily using the infrastructure networks of incumbents, thus transforming platform competition into a service competition. These factors resulted in a paucity of surviving parallel, infrastructure-based telecommunications carriers for residential users. But this does not doom infrastructure competition per se, only some of its variants. While it limited the vigor of intra-platform competition, inter-platform competition is often alive and well. Here, the different platform is either an incumbent from a related network industry, such as cable television, or it operates in an environment where there are no dominant incumbents such as in mobile wireless.

But for the high-speed Telecom 3.0 environment of ultra-broadband, the number of top-speed voiceline infrastructure providers tends to shrink, usually to at most two – telecommunications and most likely cable, or in some cases metropolitan fiber based networks such as Fastweb, B2, Illiad/Freenet, T1, or Hansanet – plus mobile wireless with a typically much slower *de facto* data rate.

Development paths have differed. North America, Korea, and several of the 'cable-rich' European countries of Benelux, Scandinavia, or Switzerland are moving to such a '2.5 platform' infrastructures.[5,6] In contrast, other European countries are moving mostly to a '1.5' platform system, centered on a single-provider copper/DSL phone infrastructure, which will eventually upgrade to fiber, plus smaller or slower options. This is simplifying, of course. Each country is likely to have more competitive regions, depending on population density.

Possibly, the capacity of fiber and its economies of scale are so high as to permit only one such infrastructure, or the creation of a shared infrastructure for both or more partners. A sharing arrangement may be emerging—'mutualization'. In other cases, not even one network is sustainable in most parts of a region, and such a system might be termed '0.5'.

[3] Femtocell base stations may provide a high-speed short wireless segment in or near the home, but it would require fiber connectivity to reach quite close to the user.

[4] It is, though, in countries like Austria and the Czech Republic.

[5] In some areas there might be even more platforms.

[6] Only a few years after Intel's CEO Andrew Grove opined that "cable modems will be awfully difficult to implement" (1996), broadband over cable was well ahead of the telecom operators. Even before launching 50 Mbps service utilizing DOCSIS 3.0, cable television operators were gaining share. In 2008, of overall net additional broadband subscribers, cable got 52%, and this share had been rising.

In a 1.5 platform system, competition is likely to be that of service providers offering resale or re-bundled services, and utilizing primarily incumbent and public infrastructure rather than building alternative networks. Such an arrangement is highly regulation-intensive due to competitors' requiring the ongoing protection by the regulator. In 2.0 there was often the hope that this approach – 'to regulate in order to deregulate' – was temporary only. It is a stage in a migration, with a hypothesized 'ladder of investment' (Cave, 2006) that would move competitors from 'piggybacking' on the incumbent's transmission network to become infrastructure providers of their own. But in that system of one platform and unbundling, there are disincentives to invest. They affect incumbents who shoulder the risk but share benefits. They also affect new entrants who can utilize the incumbent's infrastructure instead of building their own networks.

1.4. Challenge 4: migration of mass media to telecommunications networks

How would consumers use the extraordinarily powerful connectivity? For residential households the answer to this question is video entertainment, broadly defined. Greater bandwidth creates categories of content capabilities: the first is the *widening* of content options. And the second is the *deepening* of content, an increasing richness of content in terms of the bit rate of information supplied per time unit to human sensory receptors. In either case, media content increasingly flows over what used to be described as telecommunications networks. This raises major issues: first, the regulatory treatment of such media operations. Second, the role of infrastructure companies in this environment.

The deepening of the entertainment medium will affect the nature of television considerably. Entertainment service offerings will become immersive, interactive, 3-dimensional, more realistic, more personalized, and more 2-way (Noam, 2008). This leads to a whole set of issues and conflicts. Media disputes are much more public and bitter than telecommunications fights. Who in the greater public knows or cares much about unbundled local loop elements? But the issue of violence or bias in media can mobilize millions.

Governments always maintain some regulatory control over electronic media to protect a variety of societal goals. Whether such controls are justified is less important than the fact that they will not disappear just because the platforms change. Many believe that one cannot regulate the internet, even if one wanted to. But it is only difficult for regulators to establish controls over the content part of communication. If one cannot reach the bits themselves and their source, one can still go after the physical elements of delivery: the networks. Networks cannot hide, and a two-way medium cannot easily operate across borders without permission.

Inevitably, internet-based TV will be used for controversial applications and content. Beyond stopping such uses, additional societal media policy goals will enter. It's a long list, and includes, in no particular order, child protection, diversity, political balance, privacy, morality, trade, national culture, consumer protection, revenue generation, coverage across geography, income, and cyber-security. Some of these problems can be dealt with by commercial content providers. But much content is supplied by users themselves, in one of the more interesting aspects of internet-TV. And some such users inevitably generate disruptive and anti-social content. Because most of the originators of the content cannot be easily reached directly by a national government, it is likely that blocking prior to content delivery to citizens will become a responsibility of network operators, who will be subject to regulations along these lines. Networks will therefore operate as a kind of national cordon sanitaire.

This raises the stakes of telecommunications regulation considerably. Media regulation is always highly sensitive, controversial, and confrontational. It deals with culture, politics, morals, influence—thus locating telecommunications network providers in the midst of major battles.

2. Policy implications

What are some of the policy implications, beyond those already discussed? The basic tension in the new environment is to balance one major goal – an advanced network infrastructure with another overarching important policy goal – access. The tension between those goals confounds policy makers, alarms investors, and inflames rival entrants. After many years of strife, a temporary set of arrangements was forged for Telecom 2.0. But does it hold for Telecom 3.0?

Telecom regulation has evolved for a reason. It is quite a sophisticated tool relative to the ones existing for other industries. A major reason for telecommunication regulation's complexity has been the large number of goals that it tries to accomplish. The result has been a convoluted set of rules which try to balance the multiple objectives and accommodate the political forces.

It has been easy to belittle the resultant complexity as old-fashioned legacy telecom regulation. Any accumulated set of rules has its share of inconsistencies and holy cows. And, as in any system, everyone despises those aspects of the provisions in which they had to concede something, and takes for granted those that benefit them.

2.1. Policy goal 1: infrastructure upgrade

What the numerous economic and social activities on the broadband internet make clear is the obvious: that advanced networks and network applications benefit society and economy. To reach this state of upgrade, many countries proceeded

to draft and enact active approaches for Telecom 3.0 that are quite different from those of Telecom 2.0. These include pro-competitive, deregulatory approaches, but also much of the following more interventionist policies, in no particular order[7]:

(a) common-carrier-like access rules for content and applications;
(b) tax incentives;
(c) government as lead user;
(d) subsidies, especially to rural areas or to low-income users;
(e) ease of access to ducts, poles, and public rights of way;
(f) coordination of civil construction activities;
(g) 'social compacts' of upgrade commitments in return for approval of higher prices;
(h) permission of infrastructure sharing among competitors;
(i) re-creation of government ownership, especially in rural areas; stimulate basic research;
(j) provision of more spectrum, especially from underutilized government frequencies (whose use needs to be audited);
(k) creation of wireless usage regimes for secondary and low-power usage;
(l) collection of data on infrastructure availability to facilitate targeted policies and investment;
(m) reduction of localities' ability to unreasonably delay construction;
(n) support of the demand side by removing barriers to the entry of entertainment providers, educational services, and tele-medicine;
(o) financial and regulatory support of the supply of content and its access;
(p) unbundling of network elements and wholesale; and
(q) break-up of networks into wholesale infrastructure and retail services.
(r) pricing rules of non-discrimination and reasonable prices

2.2. Policy goal 2: access

The free speech goals are important to society since they affect culture and politics. Therefore, proponents tend to latch to them their other concerns which are often more in the nature of an economic 'dogfight' among companies. Network companies argue that the result of imposing conditions on them will only result in the most open network that was never built. But where network operators control a near-monopolistic or oligopolistic pipe they cannot expect to be left alone to function as unregulated gatekeepers.

2.3. Policy goal 3: universal connectivity

In the Telecom 1.0 world, the goal of widespread *connectivity* is a key reason for government ownership and regulation. In the Telecom 2.0 world, the emphasis shifted to *choice*. Mobile wireless and the internet are not placed under obligations of universal service offerings. Though there are some redistributive actions (such as the e-rate and the Gore initiative for subsidized service for schools in the US) on the whole market forces and unregulated prices governed the new offerings.

Is the same true for Telecom 3.0? The financial costs of fiber upgrade to rural areas are substantial on a per capita or per square kilometer basis. At the same time, lack of connectivity significantly retards the participation in economic activity, politics, and popular culture. It is therefore unavoidable that universal service to ultra-broadband connectivity will emerge as an issue of political entitlement. And with it arises the questions of service level and payment.

The challenge for policy makers lies in the timing. Universal connectivity, unless funded from outside the telecommunications system, imposes costs on the system and reduces investment, and slows network upgrades. Thus, if imposed early and financed only internally, universal connectivity would retard service for many other people. There is a tradeoff.

3. Policy process goals

3.1. Policy process goal 1: regional granularity.

Telecom 1.0 evolved remarkably similar regulatory structures across the world. Telecom 2.0 initially diversified the approaches, but they soon became relatively similar. This had several reasons, including a messianic advocacy from the US, jurisdictional expansionist ambitions from Brussels, and a burst of private sector globalization into previously public and national markets. Will third-generation technology lead to more or the less regulatory homogenization?

For Telecom 3.0, it seems clear that networks and regulatory policy varies greatly across countries and within nations. For example, some countries have a well-developed cable television infrastructure which supplements and competes with

[7] The case for public network upgrade programs is strongest for high-cost rural areas to prevent them from falling behind. It can also be extended to encouraging the demand side by supporting content and applications. But such supportive policies can also be a double-edged sword, because they are likely to be tied to regulatory conditions.

Telecom 1.0, while other nations have no such infrastructure and are not likely to acquire one. Within countries, there are high and low density regions, with less likelihood of fiber being economically viable in a single infrastructure (Amendola and Pupillo, 2008). Hence, the more degrees of freedom national policy retains, the more likely it will serve society. This might create international inconsistencies. But those inconsistencies are unavoidable anyway as telecom converges into the television realm, where national approaches predominate.

One of the least effective ideas is to seek a 'one-size-fits-all' when it comes to Telecom 3.0. It is likely to satisfy none, too much for some places and not enough for others. There is a price to be paid for uniformity.[8]

Within a country, it is useful to differentiate conceptually between three types of regions:

(a) the regions that cannot seem to sustain a private sector fiber network upgrade, except in niches and with significantly less powerful networks. These areas can be called the 'Zone 0.5';
(b) on the other end of the spectrum are regions that sustain many full-fledged infrastructure NGAs (the 'Zone 2.5 plus'); and
(c) in between is the region with a single major NGA ('Zone 1.5').

The extents of these zones differ in countries based on their geography and population dispersion, the network life cycle, wealth, and historic factors. Regulatory policies differ in the three zones. Generally, Zone 0.5 would be the most regulated. This is based on the fact that public money supports the upgrade, and hence can set some conditions. Financial support for multiple parallel infrastructure networks is not likely. At most a shared infrastructure would emerge. On the other hand, regulatory burdens are paid for indirectly through a public subsidy. That is, private investment must meet a 'hurdle' rate of return; should regulatory mandates provide returns below this rate, then the subsidy has to be increased in order to attract investment.

In the Zone 2.5 Plus, a 'lighter-touch' regulation is justified. The US leaves this zone essentially unregulated, though subject to a set of principles of openness. Another approach is to apply, in principle, the same rules as for the other zones, but to 'forbear' from exercising them ex ante, leaving them as a stand-by if problems emerge. And a third approach is to set specific rules that are different from those for the other zones.

For the intermediate Zone 1.5, two basic and interrelated issues that must be dealt with are: (a) the extent of regulation and its nature and (b) how to narrow the zone by helping to move parts of it into Zone 2.5 Plus.

On the first issue, it is difficult to maintain a long-term different approach to whatever exists for metallic networks. However, the timing and the sequencing might be different. This is discussed below, under temporal granularity. Further, the rules for metallic networks themselves might be subject to change in the light of experience.

The key effort is to narrow the Zone 1.5 infrastructure with its market power. The consolidation of little rival networks could be legally eased. Rivals could be given greater access to ducts and rights of way of the incumbents, based on some analysis of the bottlenecks. The sharing of infrastructure could be eased, as long as the partners genuinely compete and not foreclose non-partner entry. More spectrum could be made available for rival wireless entry. Cable networks could be given incentives to upgrade their infrastructure. Municipalities would engage in active public–private partnerships to upgrade their communities, including becoming owners of municipal fiber systems.

3.2. Policy process goal 2: temporal granularity.

Similar to the regulatory differentiation based on geography, the timing in the regulation of network infrastructure need not follow a 'one-size-fits-all' approach. Even where regulatory obligation is determined to be policy for the long run, it may still make sense to differentiate over the investment life cycle. This means giving an early incentive to investments, when net cash outflow is high and revenues still low. Tools of taxation can work similarly, such as accelerated depreciation, and special tax credits.

4. Regulation 3.0

It is mutually counter-productive if the two sides – incumbents and new-style entrants and internet users – block rather than reinforce each other for fears that are, on the whole, resolvable. The time has come for a "grand bargain". Accepting the key concerns – investment incentives, as well as openness to end-users and advanced service providers – are legitimate and helpful to both sides.

The main principles should be acknowledged but the specifics need not be resolved in advance. To resolve the details *ex ante* creates a major battle ground. The issues are complex; many of the problems are new, uncertain, or perhaps hypothetical; the remedies are unclear, the involvement of new industries such as cable television is unavoidable; and the emotional pitch is high.

[8] Similarly, when it comes to platforms, convergence does not mean uniformity. Although the cable TV and the telecom platforms have widely divergent histories, their increasing overlap will require an increasing overlap in regulatory treatment of these segments. But given where they are coming from a differentiation will persist for some time.

Nor are the issues identical to those of slower legacy copper network. There, the tradeoffs are simpler: the network is already constructed, often with public/regulatory support, and its sharing had less of a social cost than for the NGNs, the yet unborn next generation of networks. At this point, the emerging infrastructure market structure in many locations – monopoly, duopoly, or competition – is uncertain. Add the possibility of organizational restructuring and its implementation, and a gridlock is almost assured.

This suggests that a process of designing *ex ante* rules will be lengthy and unstable. Yet solely relying on future resolution after some regulatory holiday also stokes the fear that legitimate concerns would be buried and could not be revived later. They also create uncertainty among network providers and investors.

An intermediate position is to: (a) establish broad principles today and have the industry participants – incumbents as well as leading new entrants – accept them; (b) leave the participants to find their way to operate under those principles; (c) create a fast-track system of semi-judicial hearing, determination, arbitration, and enforcement based on *ad hoc* disputes, with such determinations being made public to provide some precedent value; and (d) review how things work out in actuality, by at a date certain, perhaps in three years, and set rules in light of actual problems identified.

It would not be effective to simply extend the rules of Telecom 2.0 to the Telecom 3.0 environment. One major reason is that the new infrastructure environment needs to be built whereas much less of such investment is required for the internet part of Telecom 2.0. Thus, the tradeoffs of construction with openness are different. This does not mean an abandonment of those goals, but a refinement of their timing and geography. A more flexible, common-law style system based on broad principles would be established.

But it is natural that organizations, whether private or public, will display inertia and nostalgia about their preferred policies. If these encounter problems they will tend to argue that their past approach needs to be pursued with greater purity, rather than reverse course. But in this field there is no end of history, and yesterday's reformers become today's orthodoxy and tomorrow's problem.

Looking ahead, without sentimentality, a different system – Regulation 3.0 – is emerging. (It should be stressed that observing and expecting these tendencies is not an endorsement; it is merely an observation.) The elements of this Regulation 3.0 include:

(a) governmental focus on infrastructure upgrade and national competitiveness versus other economies. This is often described as an industrial policy;
(b) market structure, in many markets, mostly based on one or two major infrastructure providers, plus mid-speed wireless;
(c) consolidation to large regional, national, or supra-national providers;
(d) access requirements to content and new-type resellers, resembling common carriage;
(e) universal service requirements gradually expanded to fiber;
(f) wholesale and access pricing rules that incorporate profit measures, like rate-of-return regulation;
(g) governmental subsidies for rural areas, and for R&D; and
(h) a new-style role for telecom companies as 'national champions' in the economy.

Tendencies in this direction have existed for a number of years. But the economic crisis has accelerated them after 2008. It has also made interventionist government policy more acceptable. In the process, the emphasis on preserving industry competition will decline, to be replaced by an emphasis of network upgrade, investment, and national competitiveness.

In examining these elements it is striking how many of them are those of the old system of Telecom 1.0. Have we come full circle? Is Telecom 3.0 merely a high-speed version of the original system Telecom 1.0, extended across the borders of countries and media, and supplemented by oligopoly, at best? Unhappily, some of this is indeed the case, and is happening, and this means a greater role for governments. Liberalization made sense for the 1990s. Today the priorities have changed. Tomorrow they might change yet again. In a dynamic, volatile, and even cyclical environment, policy will not stand still, but will also be dynamic, volatile, and cyclical.

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