

NGI101x - Convergence

Hello,

This video will discuss convergence, technical convergence to be more precise.

Technical convergence is described as “the tendency for different technological systems to evolve toward performing similar tasks.”

For example, in the past we used to have a stopwatch and a voice recorder, and now these features, along with many others, come together into the neat package of a smartphone.

For this MOOC, we are primarily interested in convergence phenomena in infrastructures. That is infrastructures evolving toward the performance of similar tasks.

When describing convergence in infra-systems the most distinct examples can be identified in the world of information and communications technology. Once separate infrastructures such as the Public Switched Telephone Network and the cable networks have merged. And with them many more: faxes, radio, telegraphy, and some claim even newspaper and paper magazines. All different types of communication are increasingly provided through a single infrastructure.

In the early 1980s academics feared that convergence would be accompanied with an increased concentration of power. In the twenty-first century it however became clear that the opposite was true. Convergence has boosted competition and innovation. Today’s world of ICT, media and telecommunications is widely diverse, partly because multiple services can be offered via competing infrastructures.

The opposite effect of convergence can also be identified: divergence: dedicated and separate infrastructures.

For example, railway systems have evolved into various highly specialized modes of transportation. Whereas in the past the transportation of people and freight often used the same railway infrastructure nowadays infrastructures are becoming more specialized. For instance high-speed railway trains exist which run on dedicated, specially designed straight tracks. These dedicated tracks discern themselves from regular tracks with for instance sophisticated safety technology.

The same goes for freight trains, where dedicated tracks have been developed especially for the transportation of goods. Furthermore we see the development of ‘intermediate’ train tracks that have been developed specifically for urbanized train traffic.

This is also known as the ‘light rail’ concept, a cross-over between a train and a subway system.

There are a number of issues that almost always come hand in hand with convergence and divergence in infrastructures. Five of these I will discuss here shortly:

First of all, convergence and divergence have an effect on users and companies who are using the services provided through infra-systems. This often leads to uncertainty and the question which technologies should be purchased and which not.

Secondly, convergence or divergence often lead to the inception of new business models. With convergence or divergence, and the introduction of new technologies, new business opportunities arise. New technologies, and especially so-called disruptive technologies, often allow for cheaper or better ways to provide services to customers. The first entrepreneurs who are able to develop new viable business models therewith generate enormous first-mover advantages. An example is the electricity industry where we see a wide range of services emerging where the use of smart technology allows for a more user centered and demand-side focus.

These transformations from old to new business models due to convergence or divergence are however often inhibited by large existing infrastructure companies who may enjoy advantages such as economies of scale, a large customer base and brand reputation. These large existing infrastructure companies are often called incumbents.

Third, convergence and divergence are also connected to processes of liberalization and market evolution. New markets are created and take over older markets. Think about the decay of the telegraph system or about the enormous growth of mobile telephone networks in countries which never had had a reliable traditional telephone network.

Often the processes convergence and divergence which lead to market liberalization and market evolution have to be governed by some form of intervention. The reason for this is because our infrastructures serve public interests. Questions that may arise when observing and analyzing convergence and divergence are for example: How can we enable a transition towards the digitization of our telecommunication sector? Or how can we improve the sustainability of our electricity system? Should governments be allowed to subsidize renewable technologies in power production or is this a form of undesired and market disrupting state aid?

A fourth vital ingredient of convergence are the rules and institutions that emerge during the convergence process and that stimulate or delay this process. Of key importance is the creation of technological standards. Bodies of manufacturers, service providers, but also government agencies can have a large impact on the convergence process by focusing on standardization: setting up the rules and standards that allow for interoperability and interconnectivity of items. For example, the development of the highly successful mobile GSM-standard that has been used all over the world, was in no small measure pushed by the European Union. In fact, rules and institutions that perform these functions are of crucial importance in the energy world as well.

Consider for example a new technology such as the electric vehicle. To allow for a successful large-scale breakthrough of electric vehicles, standardization is an issue. If you've ever travelled abroad, you know how problematic the differences between different electric

equipment can be. It is therefore important to standardize and make electric cars interoperable so that they can be plugged in any power grid. To achieve this interoperability, the European Union and the U.S. are actually collaborating in a center for smart grids and plug-in vehicles to establish global standards that may speed up the mass adoption of electric vehicles.

A fifth and final ingredient is the issue of regulation. As a result of convergence and evolution of infra-systems, roles and responsibilities and public interests change. And this is where regulation steps in. So what role should the regulator have? Should the regulator stimulate the development of a new cheaper infra-system or protect values connected to the old technology? Think for example about the ability to connect to the electric or Public Switched Telephone Network. In the past when electricity and telephone networks were introduced in society, the government ensured – or promised- that rural areas would be connected to the gradually expanding grids. Should this principle remain in place?

In the United States, after hurricane Sandy devastated the Public Switched Telephone Network, a debate emerged whether old standards should force telecommunication companies to actually rebuild their old copper-based public-switched telephone networks to remote communities, or whether they would be allowed to simply provide state-of-the-art wireless connectivity. And what about new roles? For example should regulators in a more competitive environment be especially interested in issues of customer quality or not?

Another problem with convergence for regulation is the blurring or blending of the regimes as two infra-systems converge. For example, the telecommunications industry has been regulated heavily for a long time, whereas internet-infrastructures have not.

What public values should be regulated and how? These types of issues become increasingly important if we also consider that also new types of values enter the realm of regulation. For example should we regulate privacy in the digitized media world that we have entered and how?

Because of the blurring or blending of regimes it often becomes unclear which rules comply, which regulator will be in charge and which incentives will apply. For example, almost everywhere old television industry had public committees which governed what type of information, violence and certain advertisements was broadcasted at what times. Clearly, with the role of internet-broadcasting this authority is changing. The way in which new infra-systems operate lead to different use of technology and thus changing values. For example, 'fact checking' used to be a golden standard with regard to TV-journalism. Nowadays, YouTube and twitter have thoroughly altered the media-landscape and with them set new challenges to high-quality journalism.

So, what can we conclude if we observe the infra-system landscape? Can we identify one universal trend in convergence across infra-systems? It seems that there are multiple developments unfolding in infrastructures including convergence as well as divergence phenomena.

One converging trend we observe is that in almost all infra-systems an increase in digitalization has occurred.

On the other hand, examples of diverging trends are the emergence of a green gas network to transport 'waste'-gas parallel to existing natural gas grids; new communal heating systems; or a new type of water infrastructure where rain water is drained separately from the existing sewage infrastructure to lower water flows that need to be processed at waste water treatment facilities.

Consumer behavior and new technological developments create a hugely dynamic and unpredictable landscape. In the electricity industry, for example, a similar notion of the concept of multi-utilities – just like in the telecommunication industry - has failed miserably. Experiments such as internet via the power cable were often not successful.

As a consequence of the forces of convergence and divergence we do however see an important trend in the evolution of infra-systems.

On the one hand we witness the development of 'prosumer networks' (such as the PV-networks). On the other hand we identify meta-networks such as fibre optic cable networks and electric superhighways that allow data and electricity to be transported across infra-systems in large quantities across large distances.

One thing is certain convergence and divergence are important concepts that are closely interrelated with the evolution of our infra-systems and will lead to a large number of governance challenges for a long time to come.

Thank you for your attention.