

Feb 28 2013

The new architecture of the internet: The LSE Tech approach in relation to recent work of Martin Fransman, Brett Frischmann, & Christopher Yoo

Blog Editor



*The LSE Tech approach in relation to recent work of Martin Fransman, Brett Frischmann, and Christopher Yoo – by **Silvia Elaluf-Calderwood** and **Jonathan Liebenau***

The dominant, textbook description of the structure of the internet dates from the masterful conceptualizations of the early 1970s when [a layered model was proposed](#) to explain [the relationships among transmission and link protocols](#). Since then there have been variations and refinements on the four or five layer transmission control protocol [TCP] and the seven layer open systems interconnection [OSI] models mainly for the purpose of explaining the roles and design constraints of various protocols and functionalities. The application of the model has had profound influence in two additional ways: in shaping business models for internet related activities and in specifying how regulators might differentiate their remit. This approach has been an input into the thinking behind defining what constitutes an “information service” (with respect to FCC delineations) and “broadband infrastructure” (for European regulatory guidelines). It also structures much rhetoric about regulatory reform, as for example with the proposal from [Richard Whitt of Google \(at the 2012 Telecommunications Policy Research Conference\)](#) that US regulatory controls focus on lower layers.

While there remains a kind of elegance to the layered model that attracts much loyalty from engineers, in recent years the practices of regulators and especially of businesses undermines the logic of the model. Various theories of modularity and new applications of open software, walled gardens and especially of integrative, collaborative and allied business practices defy the neat boundaries of the layered concept. In our own work, the LSE Tech team has explored boundary-spanning, modular activities such as the functions of content delivery networks [CDN] and of internet exchanges [IX] and shown how traditional roles, especially with regard to what was thought of as the physical, data-link, network and transport layers (i.e. the lower levels of the OSI model), have become so blurred as to negate the utility of the layered model altogether. Indeed, business models and regulatory actions now commonly incorporate or impinge on session, presentation and application functions in ways that call into question the sequencing as well as the boundaries of layers. Our research took as its starting point the basic characteristics of network traffic: type, use, volume, price and business models. From there we have taken aspects of the work of Fransman, Frischmann and Yoo to extend our understanding of the policy, infrastructure and economic/legal perspective of the European internet.

Let us consider the contributions of three scholars who draw from economics, law, engineering and business studies who have recently provided especially cogent explanations of this change in perception as well as practice. Martin Fransman's *The New ICT Ecosystem—implications for policy and regulation* (Cambridge 2010), Christopher Yoo's *The Dynamic Internet: how technology, users, and business are transforming the network* (AEI Press 2012), and Brett Frischmann's *Infrastructure: The Social Value of Shared Resources* (Oxford 2012) all propose thoughtful alternatives to the layered model and explain both how new business models are working and how we can better conceptualize network interrelationship using theories of dynamic interactions, ecosystems, and infrastructural resources. For the European perspective, these three authors help describe how critical aspects of the internet and telecommunications industry have been affected by the changes to the physical architecture and the move to digital infrastructures for earlier provision of services.

Martin Fransman's ideas primary address the differences in policy and regulation that result in successful cycles of innovation associated with a modular model of the internet. We regard this as a very important tool to understand why certain aspects of the relationship between telecoms and the internet are underperforming in Europe. Innovation is overwhelmingly driven by USA based companies, something of a disappointment given that the world wide web was invented by a UK citizen working in Switzerland (Tim Berners-Lee, working at CERN). Throughout the 1990s Europe was dominant in mobile technology, which is now driving the expansion of the internet to the smartphone.

Brett Frischmann focuses his analysis on the USA, but deals incisively with the differences surrounding the “best effort vs. quality of service” debate between the USA and Europe. Most advocacies of net neutrality regulation argue that inadequate competition for broadband access shows the need for the government to step in to avoid abuses of market power. While this is largely true in the USA, Europe has been since 1998 followed a competitive market policy for the internet provision. Competition, Frischmann argues, has not solved the problem of how to provide for the bandwidth hungry services emerging at

reasonable pricing for consumers. He demonstrates the significance of the lack of understanding of the complexity of the internet architecture among stakeholders throughout the system.

Christopher Yoo, approaching the study of this new conceptualization of the internet exclusively from a legal and economic point of view, excludes Europe from his analysis in this book (but he promises to deal with it in later writings). So far, there is no similar analysis for Europe, which is a real shame given the insight he provides and the potential it has to illuminate the distinct European situation. In particular, he shows that although the internet is a market where for important segments the winner takes it all, the current status quo is threatened by the rapid increase in the number and diversity of end users, the diversity and intensity of applications, the variety of technologies, and the emergence of more complex business relationships (e.g. those utilizing CDNs).

These approaches, although complementary, lack a bridge to key variables – as we have pointed out in previous blogs – hence the current research goal to understand metrics, dynamics and structures of the emergent internet, which is LSE Tech's primary focus.

Further resources

The LSE Tech group has been providing insight into these problems in publications including:

Liebenau, J., S. Elaluf-Calderwood, and Karrberg, P. (2011). [A Critical Analysis of the Effects of Traffic on Business Models of Telecom Operators](#) – White paper of the LSE and ETNO Research Collaboration Programme. London School of Economics: 16.

Liebenau, J., S. Elaluf-Calderwood, and Karrberg, P. (2012). [“Strategic Challenges for the European Telecom Sector: The Consequences of Imbalances in Internet Traffic.”](#) *Journal of Information Policy* 2: 248-272.

Liebenau, J., S. Elaluf-Calderwood, and Karrberg, P. (2013). European Internet Traffic: Problems and Prospects of Growth and Competition – White Paper. London School of Economics and Political Science 32.

Liebenau, J. and S. Elaluf-Calderwood (2013). Metrics for Assessing Internet Models and Sustainability. London School of Economics and Political Science (under review)

Liebenau, J., S. Elaluf-Calderwood, and Karrberg, P. (2013). Institutions, regulation and governance of the internet; A European perspective on traffic, uses and business practices in the digital economy. Submitted to the Academy of International Business Conference 2013 – Track 1 “Institutions, Governance and CSR”. Istanbul, Turkey: 29.

This article gives the views of the authors, and not the position of the London School of Economics.

[We welcome your comments! Please take a look at our comments policy](#)

About the authors

Silvia Elaluf-Calderwood – LSE Management Department

Dr Silvia Elaluf-Calderwood is a Research Fellow at the LSE Department of Management. She holds wide experience in the telecommunications industry in the UK and the Netherlands, and has a technical and managerial background in the Internet and Telecoms business.



Jonathan Liebenau – LSE Management Department

Dr Jonathan Liebenau is a Reader in Technology Management, LSE. He Specializes in fundamental concepts of information, and the problems and prospects of ICT in economic development. Previously worked in academic administration, technology policy, and the economic history of science-based industry, all positions in which he has emphasised the use of information in organizations. He is the author or editor of a dozen books and over 70 other major



publications. He has provided consultancy services to leading companies and strategic government agencies, including Dell, BT, IBM, Microsoft, TCS, Nortel, EDS, Lloyd Thompson, and in the UK Government, the Office of Science and Innovation, the Department of Trade and Industry and the Home Office.

This entry was posted in [broadband](#), [convergence](#), [ICT](#), [innovation](#), [internet](#), [internet economics](#), [Jonathan Liebenau](#), [LSE Tech](#), [media](#), [Research](#), [Silvia Elaluf-Calderwood](#) and tagged [CDN](#), [IX](#). Bookmark the [permalink](#).