



Internet Technologies and Regulation

Academic Year: 2014-15, Michaelmas Term

Day and Time: Wednesdays, Weeks 1-8, 10:00-12:30 **except** Weeks 4 and 6: 10:00-13:00

Location: Lectures and presentations in LR23, Balliol College; seminars in OII Seminar Room at 1 St. Giles'

Course Providers

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Comments and enquiries in the first instance to the course Teaching Assistant.

Background and aims

The pace of technological change and innovation in the use of information and communication technologies (ICTs) poses significant challenges for policy-makers across a variety of issues, whilst regulation and policy will, in turn, shape the range of choices that can be made about the use, design and development of ICTs. Informed academic study of the network of networks that comprise the Internet must, therefore, be firmly grounded in a sophisticated understanding of the underlying technology and policy contexts in which these networks are embedded. In particular, valuable insights are to be gained by studying policy debates relating to the Internet in the broader context of ICT policy more generally, such that continuity and change can be observed.

The course adopts a “flipped classroom” approach, making maximum use of online resources to enable more face-to-face interaction time. It is critical for students to do the required reading and viewing before each lecture to get the most out of the course.

Key themes

- How far should policy-makers and regulators intervene when new technologies radically transform existing business models and social structures?
- In which ways has the Internet transformed the nature of policy and regulation to govern ICT's?
- How are debates about security, identity and intellectual property being reshaped by Internet technologies?
- To what extent do legal and regulatory issues need to be re-thought in view of the fact that Internet technologies often cross national boundaries?
- How far can regulation shape the “code” of the Internet?
- What can previous disruptive technologies such as the Gutenberg press and telegraph - and the policy debates that surrounded them - tell us about the impact of the Internet?

Course Objectives

This multi-disciplinary course will expose students to basic communications and computer science materials on the core technological principles of the Internet, as well as more traditional social science materials such as public policy documents and reports as well as academic texts. In order to reinforce students' appreciation of the importance of adopting a technologically-informed approach to studying the Internet, the course will cover several key policy debates such as content regulation, privacy and security and Internet governance, in each case identifying the extent to which the range of policy options is narrowed or expanded by fast-moving technological innovation, and shifts in public policy and regulation. This will, in addition, enable students to appreciate the broader implications and relevance of academic study in this field.

Learning Outcomes

By the end of this course, students will:

- Have a good understanding of the origins and history of the Internet, and will appreciate how these factors have shaped (and in turn been shaped by) Internet policy.
- Have a basic understanding of Internet architecture and its development and will appreciate how this has shaped (and in turn been shaped by) Internet policy.
- Have a sophisticated understanding of key Internet-related policy debates, within the wider context of ICT policy.
- Be able to appreciate the broader policy implications of the academic research undertaken in other components of this degree.

Teaching Arrangements

The course is taught in eight weekly classes, each consisting of a lecture or webcast discussion, followed by student presentations and seminar discussions. Classes will begin with either a lecture (weeks 4 and 6) or webcast discussion (other weeks) at 10:00 in LR23 in Balliol College, followed by smaller group seminars, exercises and presentations of the recommended reading, in LR23 and the OII seminar room at 1 St. Giles'.

Students should watch the webcast for each lecture BEFORE each class where the lecture title is followed by a webcast address.

Assessment

The summative assessment will take the form of a three-hour examination that will take place in the 0 week of Hilary term where any three of eight questions related to the topics covered in the course must be answered.

Any student failing this assessment will need to follow the rules set out in the OII *Examining Conventions* regarding re-sitting failed examinations.

Formative Assessment

Each student will also be required to give one ten minute presentation on a specific aspect of the session topic or to review the argument of one of the books under the additional readings for each session topic. Details of these presentations will be agreed in Week 1. Students will also be required to answer two practice exam questions, under exam conditions, on any of the 8 topics covered. These answers will provide a means for students to obtain feedback on the progress they have achieved as well as helping to prepare them for their summative assessment.

Topics

1. Internet architecture
2. History and development of the Internet
3. Internet governance and regulation
4. Privacy and security
5. Digital copyright
6. Regulatory Responses to Public Debates on Emerging ICTs
7. Electronic voting
8. Content regulation and filtering

Key to Readings

A reading list is given below for each class. We recommend that students read as widely as possible in preparation for each class, however those items marked with an asterisk (*) are essential reading and MUST be read by all students each week. Many of the course's issues are covered in Ian Brown and Christopher T. Marsden, *Regulating Code: Good Governance and Better Regulation in the Information Age*, MIT Press (2013).

Week 1: Internet architecture

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20121010_472

Unlike the intelligent circuit-switched telephone network, the “dumb” Internet carries data in packets that are routed through the federation of networks that communicate using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite. This lecture will cover the basic concepts and policy implications of the Internet technical architecture, including the end-to-end principle, the IP “hourglass”, and how real-time and best-effort reliable communications are carried over lossy networks. It will also explain the significance of newer developments such as IPv6.

Key questions:

- Is the “future” Internet likely to be an evolutionary or revolutionary change from the current network?
- How much “smarter” should the Internet become?
- How do social, economic and technological factors interact in the development of the Internet?

* Lessig, Lawrence	<i>Code: And Other Laws of Cyberspace, Version 2.0</i> . 2006. New York: Basic Books. <ul style="list-style-type: none"> • Parts I & II
* Kurose, James F. Ross, Keith W.	<i>Computer Networking: A Top-Down Approach</i> (6 th edition). 2012. Boston: Addison-Wesley. <ul style="list-style-type: none"> • Chapters 1 & 2
Zittrain, Jonathan	<i>The Future of the Internet - And How to Stop It</i> . New Haven: Yale University Press. <ul style="list-style-type: none"> • Part II
Kurose, James F. Ross, Keith W.	<i>Computer Networking: A Top-Down Approach</i> (6 th edition). Boston: Addison-Wesley. <ul style="list-style-type: none"> • Chapters 3-7

Saltzer, Jerry H. Reed, David P. Clark, David	"End-to-End Arguments in System Design." 1984. <i>ACM Transactions on Computer Systems</i> . 2(4): 277-288.
Blackman, C. et al.	<i>Towards a Future Internet: Interrelation Between Technological, Social and Economic Trends</i> . 2010. Luxembourg: European Commission.
Clark, David	Why the Internet is the way it is (and why it will be very different in ten years). 2006. OII webcast at: http://webcast.oii.ox.ac.uk/index.cfm?view=Webcast&ID=20060428_143

Week 2: History and development of the Internet

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20121017_473

While the Internet became a mass medium during the 1990s, its direct antecedents stretch back to the early 20th century, and historically through the telegraph to the Gutenberg press. This lecture will cover the network's origins and history, and explore the ways in which it has shaped and been shaped by public policy.

Key questions:

- How far can the Internet be understood within traditional patterns of print, broadcast and telecommunications regulation, and how far has it generated a novel response from policymakers?
- Which aspects of the Internet are best understood as an evolution of the printing press, radio, television, newspaper and telegraph, and which as having entirely new patterns of social impact?

* Naughton, John	<i>A Brief History of the Future: From Radio Days to Internet Years in a Lifetime</i> . 2000. New York: The Overlook Press. <ul style="list-style-type: none">• Part II
Zittrain, Jonathan	<i>The Future of the Internet - And How to Stop It</i> . 2008. New Haven: Yale University Press. <ul style="list-style-type: none">• Part I
Eisenstein, Elizabeth L.	<i>The Printing Revolution in Early Modern Europe</i> . 2004. Cambridge: Cambridge University Press. <ul style="list-style-type: none">• Chapter 7
Standage, Tom	<i>The Victorian Internet</i> . 2007. New York: Walker & Co.
Edgerton, David	<i>The Shock of the Old: Technology and Global History since 1900</i> . 2006. London: Profile Books.
Abbate, Janet	<i>Inventing the Internet</i> . 1999. Cambridge, MA: MIT Press.

Yates, Jo Anne	<i>Control Through Communication</i> . 1993. Baltimore, MD: Johns Hopkins University Press.
Campbell-Kelly, Martin	<i>From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry</i> . 2003. Cambridge, MA: MIT Press.
Cerruzi, Paul E.	<i>A History of Modern Computing</i> (2 nd Edition). 2003. MA: MIT Press.
Wu, Tim	<i>The Master Switch</i> . 2010. London: Atlantic Books. <ul style="list-style-type: none"> • Parts 1-4

Week 3: Internet governance and regulation

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20131030_545

International telephony and telegraphy links were built slowly on a bilateral basis between governments and then under the auspices of the United Nations. The Internet has been a global federation of networks since its earliest days, with little concept of national borders, whose standards are set by a voluntary Internet Engineering Task Force. Its few centralised resources are managed by ICANN, a private Californian corporation, under an agreement with the US Department of Commerce. The United Nations has responded with the Internet Governance Forum, an annual conference where countries and a range of other stakeholders discuss governance issues. This lecture will cover the range of bodies that have an Internet governance role, and the tensions between them.

Key questions:

- How far can governments control the decentralised and global Internet?
- Is ICANN or the ITU the best model for future Internet governance?
- Can supranational governance bodies build political legitimacy without explicit intergovernmental agreement?

* Mueller, Milton	<i>Ruling the Root: Internet Governance and the Taming of Cyberspace</i> . 2004. Cambridge, MA: MIT Press. <ul style="list-style-type: none"> • Part I
*Hoffman, P	<i>Tao of the IETF: A Novice's Guide to the Internet Engineering Task Force, Request for Comments</i> . 2009. Available at http://www.ietf.org/tao.html
Tambini, Damian Leonardi, Danilo Marsden, Chris	<i>Codifying Cyberspace: Communications Self-regulation in the Age of Internet Convergence</i> . 2007. Oxford: Routledge. <ul style="list-style-type: none"> • Chapters 6-12
Weber, Rolf H. Grosz, Mirina	"Legitimate Governing of the Internet." 2009. <i>International Journal of Private Law</i> , 2(3): 316-330.
Drake, William J.	"The Rise and Decline of the International Telecommunications Regime." In Marsden, C. T. (Ed). 2000. <i>Regulating the Global</i>

	<i>Information Society</i> . London: Routledge. pp. 124-177.
Mueller, Milton	<i>Networks and States</i> . 2010. MA: MIT Press. <ul style="list-style-type: none"> • Parts I and II
Mueller, Milton Kuerbis, Brenden	<i>Towards Global Internet Governance: How to End Unilateral U.S. Control of ICANN Without Sacrificing Stability, Freedom or Accountability</i> . 2014. Working paper, at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2408226
Brown, Ian Ziewitz, Malte	"A Prehistory of Internet Governance." 2013. In Ian Brown (ed.) <i>Research Handbook on Governance of the Internet</i> . Cheltenham: Edward Elgar.

Week 4: Privacy and security

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20121114_476

The increased data gathering, sharing and storage capabilities of digital technology has led to an explosion in the amount of personal data processed by governments and companies - often without a commensurate investment in measures to protect that data. This lecture will cover key technological and legal trends in data protection and information security; and consider the two key drivers of security and efficiency in government use of personal data.

Key questions:

- How likely is a repeat of the unfortunate loss in 2007 by HM Revenue & Customs of personal data on 25m UK citizens?
- How far are information security measures necessary or sufficient to protect population-scale databases of personal information?

Anderson, Ross J.	<i>Security Engineering: A Guide to Building Dependable Distributed Systems</i> (2 nd edition). 2008. Indianapolis: John Wiley & Sons. <ul style="list-style-type: none"> • Part III
*Brown, Ian Korff, Douwe	"Terrorism and the Proportionality of Internet Surveillance." 2009. <i>European Journal of Criminology</i> , 6(2): 119-134.
*Mayer-Schönberger, Viktor	<i>Delete - The Virtue of Forgetting in the Digital Age</i> . 2009. Princeton University Press.
House of Lords Constitution Committee	<i>Surveillance: Citizens and the State</i> . 2009. HL Paper, 18-I.
Court of Justice of the European Union	<i>Google Spain SL and Google Inc. v Agencia Española de Protección de Datos (AEPD) and Mario Costeja González</i> , Case C-131/12, 13 May 2014, at http://curia.europa.eu/juris/document/document.jsf?text=&docid=152065&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=243691

Brown, Ian	"Communications Data Retention in an Evolving Internet." 2009. <i>International Journal of Law and Information Technology</i> , 19(2).
Sommer, Peter Brown, Ian	"Reducing Systemic Cybersecurity Risk." 2011 <i>Organisation for Economic Cooperation and Development</i> , IFP/WKP/FGS (2011) 3.
Brown, Ian Marsden, Chris	<i>Regulating Code: Good Governance and Better Regulation in the Information Age</i> . 2013. Cambridge, MA: MIT Press. Chapter 3: Privacy and data protection.
Brown, Ian	<i>Expert witness statement for Big Brother Watch and others v the United Kingdom</i> , European Court of Human Rights Application No. 58170/13, at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2336609 .

Week 5: Digital copyright

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20121031_474

The ability of the Internet and PCs to distribute at almost zero marginal cost perfect digital copies of creative works has presented a significant challenge to global copyright law. This lecture will cover the policy responses of governments, intergovernmental organisations and large right holders, and the Digital Rights Management and file-sharing technologies that are key to the policy debate.

Key questions:

- Can the file-sharing genie be put back in its bottle?
- How well are Technological Protection Measures and anti-circumvention laws maintaining the efficacy of copyright law?
- How equitable are global intellectual property agreements such as TRIPS and the WIPO Copyright Treaty?

*Benkler, Yochai	<i>The Wealth of Networks</i> . 2007. New Haven: Yale University Press. <ul style="list-style-type: none"> • Part I
*Brown, Ian	"Copyright Technologies and Clashing Rights". 2014. In M. David and D. Halbert (eds.) <i>The SAGE Handbook of Intellectual Property</i> , at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2358808
Drahos, Peter Braithewaite, John	<i>Information Feudalism: Who Owns the Knowledge Economy?</i> 2002. London: Earthscan.
Lessig, Lawrence	<i>Remix</i> . 2008. London: Bloomsbury Academic
Samuelson, Pamela	"Anticircumvention Rules: Threat to Science." 2001. <i>Science</i> , 293(5537): 2028-2031.
Hugeholtz, Bernt	Why the Copyright Directive is Unimportant, and Possibly Invalid. 2000. <i>European Intellectual Property Review</i> , 11: 499-505.
Poort, J	"Baywatch: Two approaches to measure the effects of blocking access to The Pirate Bay". <i>Telecommunications Policy</i> , 2014-5, p. 383-392.

Leenheer, J van der Ham, J Dumitru, C	
Danaher, Brett Smith, Mike Telang, Rahul Chen, Siwen	“The Effect of Graduated Response Anti-Piracy Laws on Music Sales: Evidence from an Event Study in France” (forthcoming, <i>Journal of Industrial Economics</i>), at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1989240 .

Week 6: Regulatory Responses to Public Debates on Emerging ICTs

Lecturer: Anne-Marie Oostveen

Effects of new technologies do not have an autonomous logic and are partly determined by the national and local social context into which they are introduced. It is important that people (as citizens or consumers) realize that the introduction of new technologies is not just a process that happens to societies, but that it can become an active, deliberative process with public debate and a democratic choice influencing how a society chooses to use and shape technology. In this lecture we will be examining the interaction between policy makers and the general public. Illustrated by several case studies (e.g. e-voting, surveillance technologies) we will investigate how policy makers and regulators respond to public debates about emerging ICTs in both the public and private sphere.

Key questions:

- Can lay people meaningfully engage in discussions about emerging technologies and the changes they bring to everyday life?
- How does public trust (or distrust) impact on the implementation of large-scale ICT systems in the public sector?
- What is the role of policy makers in regulating emerging technologies in the *private* sphere?
- What are the motivations and social trends behind new ICT innovations? Whose beliefs, values and morality do these technologies mirror?
- How can a balanced societal debate be created, leading to a social responsible use of ICTs?

* Hagendijk, Rob Irwin, Alan	“Public Deliberation and Governance: Engaging with Science and Technology in Contemporary Europe.” 2006. <i>Minerva</i> , Vol. 44, pp. 167-184.
* Irwin, Alan	“The Politics of Talk: Coming to Terms with the ‘New’ Scientific Governance”. 2006. <i>Social Studies of Science</i> , Vol. 36 (2), pp. 299 – 320.
* Rowe, Gene Frewer, Lynn J.	“Public Participation Methods: A Framework for Evaluation.” 2000. <i>Science, Technology & Human Values</i> , Vol. 25 (3), pp. 3 – 29.
Hagendijk, Rob	“ <i>The Public Understanding of Science and Public Participation in Regulated Worlds.</i> ” 2004. <i>Minerva</i> , Vol. 42, pp. 41 – 59.

Webster, Andrew	“Crossing Boundaries Social Science in the Policy Room.” 2007. <i>Science, Technology & Human Values</i> , Vol. 32(4), pp. 458 – 478.
Jacobs, Bart Pieters, Wolter	“Electronic Voting in the Netherlands: from Early Adoption to Early Abolishment.” 2009. <i>Foundations of Security Analysis and Design Tutorial Lectures</i> . Springer LNCS 5705, pp. 121 – 144.
Perusco, Laura Michael, Katina	“Humancentric Applications of Precise Location Based Services.” 2005. <i>Proceedings of the IEEE International Conference on e-Business Engineering (ICEBE'05)</i>

Week 7: Electronic Voting

Lecturer – Anne-Marie Oostveen

In the last decade there have been an increasing number of government initiatives to modernize the election process by moving from paper ballots towards electronic voting, both at polling stations and remotely. Critics have argued that there are significant technological threats to the security, integrity and secrecy of such ballots, and issues such as access, public trust, and the loss of civic ritual also need to be taken into account. This lecture will cover the drivers behind the implementation of e-voting, the requirements, the technical and non-technical risks, and the impact on voter turnout.

Key questions:

- What are the drivers of government e-voting projects?
- Outside government elections, what are the likely impacts of e-voting?
- What are the security risks of e-voting, and how far can these be managed?

* Boulus-Rødje, N. Laanggaardsvej, R.	“Mapping the Literature: Socio-cultural, organizational and technological dimensions of e-voting technologies.” 2012. In <i>Electronic Voting</i> (pp. 227-241).
* Oostveen, A.	“Outsourcing Democracy: Losing Control of e-Voting in the Netherlands.” 2010. <i>Policy and Internet</i> , Vol. 2 (4), pp. 201 – 220.
Bishop, M. Peisert, S. Hoke, C. Graff, M. Jefferson, D.	“E-voting and forensics: Prying open the black box.” 2009. In <i>Proceedings of the 2009 Electronic Voting Technology Workshop/Workshop on Trustworthy Computing (EVT/WOTE'09)</i> , Montreal, Canada.
Olusola, O.O., et al.	“A Review of the Underlying Concepts of Electronic Voting.” 2012. <i>Information and Knowledge Management</i> , Vol. 2, No. 1.
Di Franco, Anthony Petro, Andrew Shear, Emmett Vladimirov, Vladimir	“Small vote manipulations can swing elections.” 2004. <i>Communications of the ACM</i> , Vol. 47 No. 10, pp. 43-45
UK Electoral Commission	Vote 2005: A review of social and academic research into voting at UK Parliamentary general elections. At https://www.whatdotheyknow.com/request/your_2005_report_vote_2005_a_rev/new

Oostveen, A. "Human-centric Applications of Precise Location Based Services." 2005.
 van den Besselaar, P. *Proceedings of the IEEE International Conference on e-Business Engineering (ICEBE'05)*

Week 8: Content regulation and filtering

http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20121107_475

Governments have long regulated the broadcast media, and are increasingly turning their attention to content distributed via the Internet. Democracies and non-democracies alike are requiring that Internet Service Providers block access to child pornography, hate speech, and in some cases political and minority campaigns. This lecture will cover the blocking technologies used and the policies being developed in a range of nations including the UK, the US, China and Australia.

Key questions:

- Can controls on the "chaos and cacophony" of the Internet be put in place consistent with constitutional protections for freedom of expression?
- How effective are current and future blocking technologies likely to be?

*Deibert, Ronald Palfrey, John Rohozinski Rafal Zittrain, Jonathan L.	<i>Access Denied: The Practice and Policy of Global Internet Filtering.</i> 2008. Cambridge, MA: MIT Press. • Chapters 1-3
Tambini, Damian Leonardi, Danilo Marsden, Chris	<i>Codifying Cyberspace: Communications Self-regulation in the Age of Internet Convergence.</i> 2007. Oxford: Routledge. • Chapters 1-5
Wu, Tim Goldsmith, Jack	<i>Who Controls the Internet? Illusions of a Borderless World.</i> 2006. Oxford: Oxford University Press.
McInrye, T J Scott, Colin	Brownsword, R. and Yeung, K. (Eds). <i>Regulating Technologies: Legal Futures, Regulatory Frames and Technological Fixes.</i> 2008. Portland, OR: Hart. • Chapter 5: <i>Internet Filtering: Rhetoric, Legitimacy, Accountability and Responsibility, pp. 109-124</i>
Brown, Ian	"Internet self-regulation and fundamental rights." 2010. <i>Index on Censorship</i> , 1: 98-106.
Dutton, William H. Dopatka, Anna Hills, Michael Law, Ginette Nash, Victoria	Freedom of Connection, Freedom of Expression: the Changing legal and regulatory Ecology Shaping the Internet. 2011. UNESCO. Available at: http://portal.unesco.org/ci/en/ev.php-URL_ID=31397&URL_DO=DO_TOPIC&URL_SECTION=201.html

Brown, Ian
Marsden, Chris

Regulating Code: Good Governance and Better Regulation in the Information Age. 2013. Cambridge, MA: MIT Press. Chapter 5: Censors.

Livingstone, Sonia
Smith, Peter

Annual research review: "Harms experienced by child users of online and mobile technologies: the nature, prevalence and management of sexual and aggressive risks in the digital age". 2014. *Journal of Child Psychology and Psychiatry*, 55 (6). pp. 635-654.

Notes

Students should note that over the course of the year, small changes may be made to the content, dates or teaching arrangements set out in this reading list, at the course provider's discretion. These changes will be communicated to students directly and will be noted on the internal course information website.