

The economics of information for citizens, communities and commerce

FIA Valencia: 15.00 – 17.30 Thursday 15 April

Background

Digital information is the principal asset of the Internet and systems are increasingly focusing on evolving networks of autonomous applications and people interacting with processes for the production, publication and retrieval of information. The growth in Internet usage and system-to-system interaction will require infrastructures that support billions of information exchanges. Understanding of the micro- and macro dynamics in terms of structure, information, behaviour and economics. Digital information is now the enabler for creativity, innovation, decision making, economic output and enjoyment but also of retrograde changes. For example, the phenomenon of 'Internet addiction' shows what ought to be a *means* to better transactions, interactions, decisions, etc. expands to consume vast amounts of attention becoming an *end* in itself and rendering many decisions so complicated as to threaten the effectiveness with which people make them. Understanding the nature of digital information, how it can be used for societal and economic benefit, and how it is governed will be essential for the success of the Future Internet.

The Future Internet is expected to become a ubiquitous interconnecting fabric, dynamically linking users with other users, services, content and embedded devices and networks in an more 'converged' and seamless fashion. In this 'converged' Future Internet, such information exchanges across organisational boundaries will become more pervasive, complex and dynamic, yet also more critical to successful business and societal interactions. The impact of this transition is a matter of opinion. One vision of hopes that the Future Internet will become effectively neutral and invisible to our senses, like pure water whilst others believe the Internet will become our perspective, defining how we interact with services and what benefits or harms we experience as a result. Increased complexity needs to be taken seriously. Greater interconnectedness between systems will introduce emergent behaviour that needs to be identified, evaluated, reacted to and monitored (in time). Emergent behaviour in a complex system is often seen as a positive outcome - 'greater than the sum of its parts.' This is by no means clear, especially if the speed and breadth of communication outstrips those of reasoning, computation, etc. in the component parts. Emergent stupidity is just as likely as emergent intelligence.

Linking to content and linking *through* content will be increasingly important. We expect to get beyond current textual communities to non-textual material where presumptions of a common language and sequence of access are no longer assumed, such as video and music (where at least the sequence may hold until mashing takes over) and images (where even the 'language' of expression may differ by individual or group) – in this case, we may hope for a more 'generative' discourse. In this case 'information' develops much richer societal meanings, property rights become fluid and collective, and defined as much by user's attributes as by any payment or technological channel of access.

In the recent EC communication “A public-private partnership on the Future Internet” the Future Internet is described as a tool for a smarter world¹. Smart infrastructures are cited in energy, environment, transport and healthcare sectors all promising *to make extensive use of connectivity and distributed information processing to redesign their business and operational processes and make them ‘smart’*². This leads to the question of how do infrastructures become smart? or to put it more explicitly how can infrastructures determine core aspects of opportunities and threats in open environments (including people, applications, sensors, actuators, etc) in which they interact and make clear decisions at huge scale in real-time which bypasses irrelevant information and achieve solutions smoothly, effectively and efficiently.

The key ingredient is the ability to share information (e.g. network, application, users, location, time, etc) between citizens, communities and commerce. For example, smart energy systems that deliver efficiency savings will require accurate real-time information from consumers (smart meters), the environment (meteorology forecasts), and transport infrastructures to predict future demands; consumers want more accurate and timely Quality of Experience (system behaviour as experienced and measured by consumers) and Quality of Service (system behaviour as measured by providers) to intelligently select the best supplier for their requirements; network operators want to know the characteristics of application packets to optimise delivery paths, business performance and to preserve levels of investment; e-Commerce retailers, search engines and social networks want personal information and derived behaviours so that applications can be wrapped in highly personalised advertising; enterprise systems will increasingly rely on knowledge sharing as well as digital assets trading to become far more flexible, adaptable and open than today, thereby enabling enterprises to tap into the latest business opportunity and form dynamic value networks³. However, there is a strong assumption that increasing the quantity and availability of information (regardless of its alignment with cognitive capacity, power to act or objectives) is a good thing. Our current systems of markets, laws, etc. do not assume this; indeed, they take great care to align information with other characteristics. This calls for an enormous leap of faith and should not be made without very careful reflection.

In all cases, individuals or businesses assess the relative benefits of protecting or disclosing information, sometimes governments mandate disclosure. For citizens, this decision is often not a conscious process but for most businesses and governments risks are assessed, even if imperfectly. Non-disclosure may produce information asymmetry in markets (P2P vs Network Operators) and significantly affects the balance of power and its overall performance. In such cases, where greater balance is required regulatory bodies can mandate information disclosure, but only by assessing the rights of one side over another considering specific relative costs and benefits of those involved. Disclosure can also create asymmetry, unless it takes into account differences in: reasoning power, prior knowledge, common knowledge (what each person knows that others' know, etc. which in turn lets them draw appropriate inferences from what they hear from others or see them doing), powers to act, etc.

For Enterprises operating in the digital economy, determining and maintaining the value of information and risks in respect to decision makers depending upon information is increasingly important. Digital information is extremely heterogeneous (e.g. media content, sensor data, software, etc) and business must adopt corporate structures, processes and agreements to govern information but in a way that does maximises innovation for themselves, partners and customers.

¹ http://www.future-internet.eu/fileadmin/documents/reports/Final_Report_Model_PPP_270409_.pdf

² We should also not ignore the importance of the Enterprise's and media sector's contribution to European economic output even though these are not included in the communication.

³ European Commission (2008), *Unleashing the Potential of the European Knowledge Economy – Value Proposition for Enterprise Interoperability, Final Version (Version 4.0)* http://cordis.europa.eu/fp7/ict/enet/ei-isg_en.html

However, what constitutes business innovation has exercised scholars for a long time⁴. One main challenge is to understand the economic properties of digital information and how it can practically be governed. This has led to tussles between those that want to close and control and those that want openness and freedom. Technical platforms, business models and laws have been developed that try to assert or apportion control over digital information (e.g. Amazon, Apple, and - accordingly to some - Google) arguing the need to protect investment, whilst the open communities continue to promote the use of the “commons”, as the basis for greater innovation and societal good⁵. The challenge is not whether one is right or wrong but how both situations can coexist.

Information sharing is a complex issue with many deep socio-economic concerns, phenomena and tussles. It is related to aspects such as open vs closed cultures, intellectual property, privacy, information value, risks and rewards, incentives and even societal freedoms and values. The objective of this session will be to examine information sharing from an economic perspective as the basis for providing insights into how smartness can be achieved in the Future Internet.

Agenda

- 15.00: Overview - Michael Boniface (IT Innovation Centre)

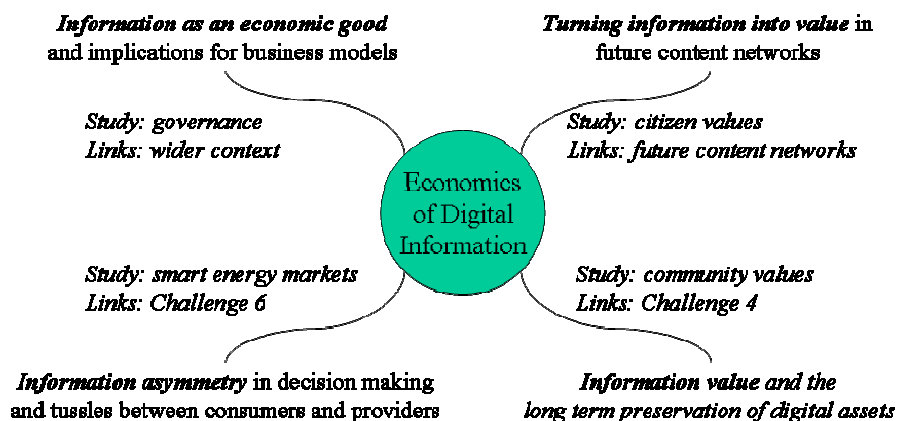


Figure 1: Economic aspects of Digital Information

- 15.05 : Information as an economic good and implications for business models Prof Claudia Keser (Georg-August-Universität Göttingen)

What are the economic foundations for treating information as a good? What is the impact on the economic mode of exchange and the relationships between providers and consumers? Is a “new” economy on the horizons as a consequence? In the so-called “race to the bottom”, is there money to be made?

Format: 25 minute presentation with Q&A

- 15:40 : Turning information into value in Future Content Networks - Doug Williams (BT), Peter Stollenmayer (Eurescom), Adolfo M. Rosas (Telefonica)

Where will value exist within the Future Internet? How will value be created, delivered, shared and protected? How will value change as a consequence of the envisaged

⁴ See, e.g., the work of Clay Christensen, Henry Chesbrough, Eric von Hippel, Donald Tapscott, Kim and Mauborgne, to name but a few.

⁵ There is a large amount of literature in this area, e.g. Benkler, Lessig, Shapiro, Varian

technological advances within networks and applications? How will value be distributed amongst the various stakeholders for a sustainable Future Internet ecosystem?

Projects: TA2, ENVISION, COMET

Format: 30 minute role-based discussion

- 16:10 : Information value and the long term preservation of digital assets - Roeland Ordelman (Netherlands Institute for Sound and Vision)

Title: Audiovisual content exploitation in the networked information society

The concept of technology-enhanced audiovisual indexing may have been a holy grail in earlier research, but recently it has become an urgent prerequisite in the context of our present-day information society. The effective exploitation of our Digital Libraries however, is currently impeded despite a wealth of technological progress. It becomes increasingly apparent that there may be an underlying problem, rooted in the disparity between technology and user needs. In order to respond to the demands of the information society advanced techniques and new workflow practices of use need to be explored by focusing on the needs of contemporary users, both professionals and non-professionals. At the same time, we need to foster opportunities for drawing user communities into the Digital Libraries, to involve them in enhancing content exploitability, e.g., by community tagging or capturing user generated content from the internet and aligning this with archived items. In this talk, the area of tension between the current state of technology and user needs is discussed in more detail in the context of the exploitation of the audiovisual archive of the Netherlands Institute for Sound and Vision. Projects: LiWA (Living Web Archives), PrestoPRIME and EUscreen

Format: 25 minute presentation followed by 5 minutes questions

- 16:40 : Information asymmetry and tussles between consumers, providers and operators - Dr. Tuan Anh Trinh (Budapest University of Technology and Economics, Department of Telecommunication and Media Informatics)

Title: Smart Information for Smart Energy

Information asymmetry will - at some points in the value chain - create unfairness which in turn might have undesirable consequences on the performance of the Future Internet. Regarding Future Internet governance, we need to address the issue of decision making if only incomplete and uncertain information are available. Finally, the roles of the stakeholders in the Future Internet are getting more and more complicated with the borders are getting blurred and event one stakeholder might have different roles at the same time. We argue that this phenomenon will have a significant impact on Future Internet architecture in general and the business models of the Future Internet in particular.

Projects: EARTH (IP project): Energy Aware Radio and Network Technologies COST , Action IC0804 - Energy efficiency in large scale distributed systems, COST 605: Econ@Tel - A Telecommunications Economics COST Network

Format: 25 minute presentation followed by 5 minute questions

- 17:10 : FI3P Socio-Economic Study – Prof Jonathon Cave (Rand Europe)
- 17:20 : SESERV Support Action and Conclusions – Michael Boniface (IT Innovation)
- 17:30 : Close

Further Reading

Cave, J., Carter, K., Marcus, S., Elixmann, D. and S. Simmons (2008) "Tuning the Innovation System: Final Report (D4) of the Study of the Impacts of IST-RTD on Key Strategic Objectives Related to Growth and Jobs" report prepared for DG Information Society and Media of the European Commission at: http://ec.europa.eu/dgs/information_society/evaluation/data/pdf/studies/s2006_04/final_report.pdf.

Cave, J., Marsden, C. and S. Simmons (2008) "Options for and Effectiveness of Internet Self- and Co-regulation" RAND TR-566-EC at: http://ec.europa.eu/dgs/information_society/evaluation/data/pdf/studies/s2006_05/final_report_v2.pdf.

Marsden, C., Cave, J., Nason, E., Parkinson, A., Blackman, C. and Rutter, J. (2006) "Assessing Indirect Impacts of the EC Proposals for Video Regulation" Ofcom, London at: <http://www.ofcom.org.uk/research/tv/reports/videoregulation/vidregexec.pdf>.

Horlings, E., Marsden, C. van Oranje, C. and M. Botterman (2006) "Contribution to Impact Assessment of the revision of the Television Without Frontiers Directive", TR-334-EC DG at: http://ec.europa.eu/dgs/information_society/evaluation/data/pdf/studies/s2004_01/tvwf_ran d.pdf.

Esp. Cave, J. van Oranje, C., Schindler, R., Shehabi, A., Brutscher, Ph-B and N. Robinson (2009) "Trends in connectivity technologies and their socioeconomic impacts" RAND TR-776-EC at: http://ec.europa.eu/information_society/newsroom/cf/itemlongdetail.cfm?item_id=5448.

Van Oranje, C., Cave, J., van der Mandele, M., Schindler, R., Hong, S., Iliev, I. and I. Vogelsang (2008), report prepared for OPTA at <http://www.opta.nl/download/convergence/convergence-rand.pdf>.

Cave, J., Frinking, E., Malone, K., Rossum, W. Van, Velde, R. Te (1999) "Modalities of R&D funding: an international comparison" report to DG Research of the European Commission at: <http://purl.org/utwente/21371>

Networked Media of the Future, European Commission, October 2007

User Centric Media - Future and Challenges in European Research, European Commission, 2007

PEWInternet "Future of Internet IV", February 2010 (<http://www.pewinternet.org/Reports/2010/Future-of-the-Internet-IV.aspx?r=1>)

TA2 Deliverable "Market Perspective - Version 1", July 2009 (<http://www.ta2-project.eu/deliverables/deliverables.html>)

TA2 evaluation concepts, February 2010 (<http://www.ta2-project.eu/deliverables/deliverables.html>)

Eurescom Message 3/2009 "The Networked Home of the Future" (<http://www.eurescom.eu/message/>)

Monitoring-Report Deutschland Digital - Der IKT-Standort im internationalen Vergleich 2009, BMWi, November 2009

- X. León, T. A. Trinh, L. Navarro, Using Economic Regulation to Prevent Resource Congestion in Large-Scale Open Infrastructures
- T. A. Trinh, S. Plósz, Interactive Energy Management System in Households, ERCIM News: Toward Green ICT, Number 79, pp. 37-38, October, 2009.
- L. Gyarmati, T. A. Trinh, How Architecture Can Help to Reduce Energy Consumption in Data Center Networking, ACM SIGCOMM Energy-Efficient Computing and Networking conference, Passau, Germany, April 13-15, 2010.
- D. Horváth, I. Bertalan, I. Moldován, and T. A. Trinh, An Energy-Efficient FPGA-Based Packet Processing Framework, accepted to 16th Eunic International Workshop and IFIP TC6.6 Workshop: Networked Services and Applications – Engineering, Control and Management, 2010.