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THE JEAN-JACQUES LAFFONT DIGITAL CHAIR

Issue **1** / November 2015

DIGITAL ECONOMY NEWSLETTER

A new initiative is bringing together academics, policy-makers and private partners to discuss the latest research evidence on new digital technologies and their impact on society

Dear readers

In February 2015, the Toulouse School of Economics (TSE) and the Institute for Advanced Study in Toulouse (IAST) launched the Jean-Jacques Laffont Digital Chair to promote research on the impact of digital technology in such areas as industrial organisation, competition policy, education, finance, culture and health. The Chair is named after the late Toulouse economist Jean-Jacques Laffont, whose work led to major advances in public economics and information theory.

Within this initiative, the TSE, the French Ministry of Culture and Communication and seven other public and private sector partners organised a colloquium at the Musée du Quai Branly in Paris in June 2015. The event brought together academics, policy-makers and private partners to discuss the challenges and opportunities provided by new digital technology in cultural, economic and social areas.

A series of research presentations focused on the creative industries and healthcare – and in particular how the interactions of technological advances, legislation and economic incentives drive outcomes for consumers, producers and society as a whole. These were followed by a discussion by Jean Tirole (chairman of IAST and TSE, and 2014 Nobel laureate in economics) and Francine Lafontaine (director of the Federal Trade Commission's Bureau of Economics) on the role of intermediaries in the digital economy.

Some of the research discussed at the TSE colloquium is summarised in this first issue of the **#TSEdigitaleconomy newsletter.** More details are available on the TSE website:

www.tse-fr.eu/conferences/2015-colloquium



Healthcare: the return of the IT productivity paradox

The adoption of information technology (IT) in US healthcare has had no positive effects on outcomes and there is some evidence that it has raised costs. What's more, European healthcare systems are much better positioned to benefit from IT adoption than the American system. These were among the conclusions of a presentation on IT and healthcare productivity by **Fiona SCOTT MORTON** of the Yale School of Management.

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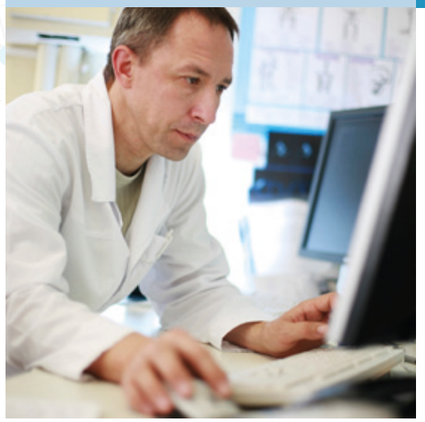

Her study begins by recalling the IT paradox described nearly 30 years ago by Nobel laureate Robert Solow in his remark that 'the computer age is everywhere except in the productivity statistics'. This paradox was resolved by growing evidence of the complementarity between IT and organisational practices: it is the management and organisation of the firm into which IT is placed that determines whether productivity is improved – and the necessary reorganisation of business processes can take time.

No such improvement in productivity has occurred in US healthcare as a result of IT and this may be because there has been no improvement in the organisation of key providers. Indeed, healthcare lags the rest of the US economy in terms of business processes: while there are plenty of drugs, devices, skills, capital and science, the user experience can be poor. Healthcare management is also of variable quality – in part because physicians do not like to be managed (especially by someone who is not a physician) and in part because there has not been enough management training of physicians.

Scott Morton notes that there are two steps in the introduction of healthcare IT such as electronic medical records (EMR): adoption (someone decides to invest in an expensive piece of software); and use (managers take the information generated and make better decisions with it). Adoption may occur because the government requires it or because IT people or hospital management think it is a good idea; but the users will be physicians who can analyse the data to determine appropriate actions.

Given the huge variation in corporate form of healthcare providers, it is not always obvious what are the incentives for physicians – whether their primary objectives are to bill, to prevent disease or to manage chronic diseases. Further complications are added by the multiple partners involved in US healthcare – and the complex nature of competition and cooperation within the sector. Scott Morton concludes that a key reason why the US healthcare productivity problem is so difficult to solve is that it is unclear which organisational unit has the incentives both to adopt EMR and to use it effectively.

An expert in competitive strategy, **Fiona SCOTT-MORTON** came to Yale SOM having previously taught at the Graduate Schools of Business at the University of Chicago and Stanford University. Her research focuses on empirical studies of competition among firms in areas such as pricing, entry, and product differentiation.

http://som.yale.edu/fiona-m-scott-morton

Personalised medicine: the impact of genetic privacy laws

The availability of genetic testing for health risks such as cancer heralds a new age of medical treatments tailored to individual needs – but it also raises serious concerns about patient privacy. Research by **Catherine TUCKER** explores the effects of regulations designed to protect genetic privacy on the diffusion of personalised medicine.

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Personalised medicine – in which patients receive individually tailored treatment based on their unique genetic makeup – promises to revolutionise healthcare. Clinical applications of genetic information can improve public health and medical care productivity by targeting preventive interventions where they are most effective.

Yet at the same time, as more links are uncovered between genes, personality traits and future health risks, people may face discrimination from having parts of their genetic information revealed to employers, healthcare providers or insurance companies. The spread of the potentially revolutionary genetic tests that form the basis of customised medicine may thus be stymied by concerns about privacy.

Strong privacy protection may increase the value of genetic testing because it assures people that they will not suffer harm in future market interactions. But privacy protection may also sensitise them to privacy concerns, increase the costs for providers of testing services and reduce the value to insurance companies of covering the service – all of which makes the outcome ambiguous. What's more, since privacy protection is not an all-or-nothing choice, it is important to understand which features of privacy regulations are most beneficial for patients and which are most costly to providers.

> "Privacy regulations based on informed consent deter people from genetic testing for cancer risks"

In research with Amalia Miller of the University of Virginia, Catherine Tucker has been exploring the different provisions within US privacy laws to identify policies that are most favourable to the spread of personalised medicine. Their study uses variation in state laws over time to estimate the effects of different kinds of genetic privacy laws on the use of genetic testing for predispositions for certain types of cancer. Focusing on cancer risks offers reassurance that what is being measuring is about genetic data and the law rather than something to do with underlying health tastes in different states.

Broadly speaking, state regulations on genetic testing take three alternative approaches to protecting patient privacy:

- Requiring informed consent on the part of the individual.
- Explicitly restricting the use of genetic data by employers, healthcare providers or insurance companies.
- Limiting redisclosure without the consent of the individual or defining genetic data as the 'property' of the individual.

The researchers find that an approach that gives people control over redisclosure encourages the spread of genetic testing, whereas an approach of informed consent deters them from obtaining genetic tests. They find larger effects for patients for whom the potential risks of genetic data being misused are highest, such as those who already know that they have an elevated risk due to a family history of cancer. But there are no effects for individuals who have already received a cancer diagnosis for one of the types predicted by genetic testing (breast, ovarian, colon or rectal cancer).

The study also finds that there is little effect, either positive or negative, from regulation that prevents discriminatory use of these data. And it shows that there are no similar effects of genetic privacy protection on non-genetic opt-in health testing (such as for HIV status) or use of preventive healthcare (such as getting a flu shot).

The researchers evaluate whether these results are driven by individual responses to privacy concerns or by underlying changes in supply-side testing availability due to the laws. Genetic consent laws appear to reduce the availability of testing, which suggests that part of their negative effect stems from the costs that complying with consent requirements impose on hospitals. But there is no positive effect on genetic testing availability as a result of redisclosure laws, suggesting that such laws derive their value from providing reassurance to patients.

> "European and US privacy lawmaking has been focused on the least effective form of protection"

Overall, these findings provide evidence for policy-makers trying to determine the best approach to regulating genetic privacy in a world where personalised medicine is likely to become increasingly desirable. This desirability stems in part from the fact that people may one day use their personal genetic information to anticipate their disease risks, to invest in preventive care and, when facing illness, to select the most effective treatment. But there are also potentially large gains for society as a whole from analysing personal genetic data on a large scale.

The research provides the first empirical evidence on how individual behaviour responds to regulations that protect the privacy of genetic information rather than general health data. The finding that genetic privacy laws have distinct effects above and beyond standard health data privacy laws provides some support for the need for separate legislative action.

In general, the results support privacy regimes that focus on establishing rules of data ownership rather than merely informing the patient how their data will be used and obtaining upfront consent. The results also suggest that there are only weak effects from privacy regimes that focus on restricting data usage. Strikingly, it is this least effective form of privacy protection that has been the focus of privacy law-making in Europe and the United States.

One potential limitation of the researchers' study is its focus on early adopters of genetic testing and their response to early genetic privacy regulations. Although the mapping of the human genome and the identification of millions of mutations have already advanced science, the full potential of the genetic revolution for medical care has not yet been realised.

But at the same time, the progress of genetic science will also increase the risks to individuals stemming from damaging uses of genetic information and so the results reflect considerable uncertainty over how these technologies and corresponding privacy concerns will develop. In particular, it is not clear how the results apply to new direct-to-consumer genetic testing services.

These limitations are in addition to the standard caveats that apply to any study using variation in state laws to identify effects. Notwithstanding these limitations, the researchers believe that their study provides a useful first attempt to understand how different types of privacy regulations affect the diffusion of technologies that create very sensitive data.

Catherine TUCKER is at MIT's Sloan School of Management. More details on her research with Amalia Miller are available in 'Privacy Protection, Personalized Medicine and Genetic Testing'

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2411230

Digital Renaissance: how new technology is driving a golden age of cultural creativity

Technological change has transformed creative industries such as films, books and recorded music. But far from causing the crisis of which some industry insiders warn, research by **Joel WALDFOGEL** indicates that there has been a flowering of creativity with increases in both the quantity and quality of many cultural products.

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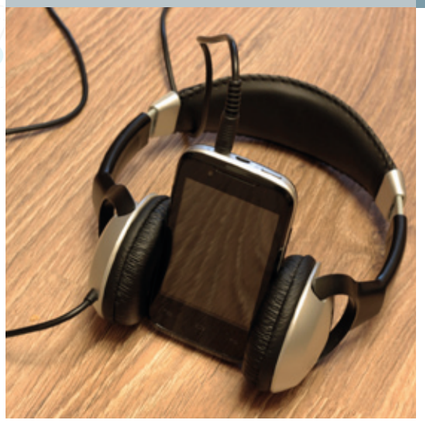

Over the past two decades, innovations in digital technology have had a dramatic impact on the effective copyright protection of many cultural products. The recorded music industry was the first to face the challenge of digitisation with the arrival of the Napster file-sharing service in 1999. Given the opportunity to obtain music files without payment, consumers largely withdrew from purchasing recorded music. Industry representatives warned that the ensuing collapse in revenues would undermine the flow of new products – a creative crisis.

Yet at the same time that file-sharing weakened effective copyright protection, other technological changes reduced many of the costs of bringing digital creative works to market. The production, promotion and distribution of music have all become far less expensive and, as a result, the revenue needed to cover costs to maintain the traditional flow of products may have declined. Research by Joel Waldfogel investigates whether despite being weakened by Napster, the effective copyright protection still available is sufficiently strong to facilitate a continued flow of valuable new music products.

To do this, he constructs three indices of music quality. The first is based on critics' retrospective lists of the best music. It encompasses 88 different rankings from Canada, Ireland, the UK and the United States, and covers more than 16,000 musical works since 1960. Statistically combining information from these sources results in an overall quality index that rises between 1960 and 1970, declines in the 1980s, rises again in the mid-1990s, declines in the latter half of the 1990s and is stable for the period after 2000. Waldfogel concludes that although the index was falling prior to the appearance of Napster, it is stable after 2000 and thus shows no evidence of a decline in quality.

> "while music industry revenues plunged post-Napster, the quality of new products has risen"

His second and third indices are derived from data on radio airplay and sales of music. Music is aired on radio less, and sells less, as it gets older – but if a vintage is better, it will receive more sales or airplay after accounting for such depreciation. Using data on the frequency with which songs originally released as early as 1960 were aired on the radio in the 2000s, Waldfogel's airplay-based vintage quality index suggests that music quality rose from 1960 to 1970, fell until at least 1985 and rose substantially after 1999.

The analogous sales-based index is derived from Recording Industry Association of America Gold (sales greater than 500,000 copies) and Platinum (sales greater than one million copies) certifications. The sales-based index echoes the result of other indices: it rises from 1960 to 1970, falls to the 1980s and then rises sharply after 1999.

The movements of these three indices over time suggest that the post-Napster flow of product has been as strong or stronger than it was before Napster, with independent labels accounting for a growing share of successful albums. Although it is impossible to determine whether creative output is as high as it would have been without Napster, the evidence suggests that innovations in digital technology and associated changes in effective copyright protection have not reduced the quality or quantity of new music.

> "There might be reasons to strengthen enforcement of intellectual property rights, but a creative crisis is not one of them"

So why is music quality up despite the collapse in industry revenue? The answer seems to lie in the fundamental unpredictability of the appeal of creative products – the idea that screenwriter William Goldman encapsulates as 'nobody knows anything'. When success is hard to forecast and it is expensive to bring new works to market, producers bet on a few artists with high 'ex ante' promise. But when technology reduces the costs of production, distribution and promotion, more products can be brought to market and some 'ex ante' losers become 'ex post' winners. This is reflected in the growth of 'indie' artists who would not have been released before digitisation.

Similar effects are being seen in other media. In research with Imke Reimers at Northeastern University, Waldfogel examines the market for books, where lower marginal costs have reduced prices by 10-15% in the past four years, and digitisation has given creators the ability to circumvent traditional gatekeepers and publish their work directly. The number of self-published works has grown by almost 300% since 2006 and now exceeds the number of traditionally published works.

As with music, given the inherent difficulty in predicting the 'ex post' appeal of books, the growth of new products can substantially expand the appeal of available products. Using bestseller lists in conjunction with title-level data on physical sales and estimates of e-book sales, the study documents that many self-published books have substantial 'ex post' appeal to consumers. Works that began their commercial lives through self-publishing - think Fifty Shades of Grey - began to appear on bestseller lists in 2011 and by 2013, such works accounted for a tenth of both bestseller listings and estimated unit sales. In romantic fiction, self-published works account for almost a third.

Is smething similar happening with films, where digitisation has also reduced the costs of production, distribution and promotion? Certainly, the authors note, there has been a substantial growth in movies made, a proliferation of new distribution channels and a changed environment for critical information. What's more, 'indie' films are taking a growing share of total US box office, and data from the film review-collecting website Rotten Tomatoes suggests that there has been an overall improvement in film quality since 2000.

All of hese creative industries are facing a threat to their revenues, but costs have fallen and new product introductions are rising sharply. That's why Waldfogel describes what the new technologies have made possible as a 'Digital Renaissance' - a golden age of plentiful and appealing cultural products. He concludes that while there might be reasons to strengthen enforcement of intellectual property rights, a creative crisis is not one of them.

Joel WALDFOGEL is at the Carlson School of Management, University of Minnesota. More details on his research are available in 'Copyright Protection, Technological Change, and the Quality of New Products: Evidence from Recorded Music since Napster'; and 'Storming the Gatekeepers: Digital Disintermediation in the Market for Books', co-authored with Imke Reimers, Information Economics and Policy, June 2015.

http://www.nber.org/papers/w17503

Copyright and creativity: lessons from Italian opera

What effect does the adoption of copyright laws have on artistic creativity? Research by **Petra MOSER** looks back to nineteenth century Lombardy and Venetia, where legislation following Napoleon's annexation led to a flowering of Italian opera. Her findings have important implications for modern debates about protecting intellectual property.

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In 1984, the US Supreme Court noted that 'the purpose of copyright is to create incentives for creative effort'. To achieve this goal, copyright creates temporary monopolies in creative output, ranging from literature, music and films to web content and computer software. But because of data constraints and the paucity of experimental variation in copyright laws, hard evidence of the effectiveness of copyright in promoting creativity is scarce.

In research with Michela Giorcelli of Stanford University, Petra Moser makes use of variation in the adoption of copyright laws in Italy – as a result of Napoleon's military victories – to examine their effects on the quantity and quality of creative output. Lombardy and Venetia adopted copyright laws in 1801 after they fell under French rule. Due to the timing of their annexation, these two states remained the only ones in Italy to offer copyright until 1826, while six other Italian states continued to offer no copyright.

To measure how creative output responds to copyright laws, the researchers have collected a new dataset of 2,598 operas that premiered across eight Italian states between 1770 (the beginning of the Italian bel canto period) and 1900 (the end of the verismo period and the Italian ottocento).

Comparisons of new operas per state and year reveal a substantial increase in the number of new operas in states with copyright. Baseline estimates indicate that Lombardy and Venetia produced 2.12 additional operas a year compared with other Italian states after 1801. Relative to an average of 1.41 operas per state and year before 1801, this implies a 150% increase. Analysis of the full dataset – including all copyright adoptions until 1900 – implies that states with copyright produced 2.68 additional operas a year compared with other states. Relative to a mean of 2.21 new operas per state and year, this implies a 121% increase.

> "Napoleonic copyright laws raised the quantity and quality of nineteenth century Italian opera"

Was this increase in output driven by low or high quality creative work? If copyright increases the profitability of creative output independently of quality, the adoption of copyright laws can reduce average quality by raising low quality output above the threshold of profitability. But if copyright laws disproportionately raise the profitability of high quality work, they can increase the average quality.

An exceptional wealth of historical records on operas makes it possible to create alternative measures of the effects of copyright on quality, based on the historical popularity and durability of operas. A variable for historical popularity captures operas that entered a standard work of notable performances between 1597 and 1940: Alfred Loewenberg's Annals of Opera, which includes 245 (nearly 10%) of the operas in Moser's dataset. Analysis of these data implies a 4.6-fold increase in the creation of historically popular operas in response to the adoption of copyright.

An alternative measure captures the creation of exceptionally durable operas that continue to be available as full-length recordings on Amazon today. Analysis of these data indicates a ten-fold increase in response to the adoption of copyright laws.

> "Copyright extensions are unlikely to encourage rational investments in creative work by the average author"

Comparisons of composers' places of birth and the places of premieres further indicate that the creation of copyright encouraged composers to move to Lombardy and Venetia after 1801. Even though native composers also began to produce more operas after 1801, immigrants produced the majority of additional operas in these two states after 1801 and they accounted for a disproportionate share of high quality operas.

When other Italian states begun to offer copyright from 1826, there was no comparable shift in migration. These results suggest that the introduction of copyright may disproportionately benefit states that offer intellectual property rights while culturally related neighbours offer none. In the case of Italy, the adoption of copyright in Lombardy and Venetia may have stopped a 'brain drain' of composers to Austria and France.

Overall, these findings suggest that offering some basic level of copyright protection can increase both the quantity and quality of works that create revenue through repeat performances. Intuitively, copyright of any reasonable length increases composers' incentives to produce high quality works (which tend to be repeated more frequently) by allowing them to appropriate a portion of the revenues from repeat performances.

But these effects appear to be limited to the first introduction of copyright laws: there is no clear evidence of any effects of extending copyright beyond the duration of a composer's life. This is consistent with data on repeat performances, which indicate that 37% of operas are only performed in the year of their premiere and 47% of operas are performed only within the first five years.

This suggests that extensions in the length of copyright beyond the duration of the author's life create a negligible increase in income for the average author. Instead, copyright extensions only benefit the authors of exceptionally long-lived works. To the extent that these works are difficult to identify in advance, copyright extensions are unlikely to encourage rational investments in creative work by the average author.

More generally, the results suggest that narrowly defined intellectual property – in the form of copyright – can encourage innovation. This finding contrasts with historical evidence on more broadly defined intellectual property rights such as patents, which suggests that policies that weaken patents encourage innovation while policies that strengthen patents discourage innovation. For example, Moser's analysis of nineteenth century innovations indicates that countries without patent laws are as innovative as countries with patent laws.

Intuitively, the narrow scope of copyright, which protects an individual expression of a work, prevents a key problem with patents. When patent rights are broad and their boundaries are poorly defined, innovators are at risk of unintentionally infringing on existing intellectual property, and patent examiners may issue overlapping patents for the same invention. These characteristics of patent laws increase the risks of litigation and discourage innovation. Comparison of patents and copyright suggests that intellectual property policies that reduce the breadth of patents (for example, by disallowing patents for abstract ideas) can encourage innovation.

Petra MOSER is at New York University's Stern School of Business. More details on her research with Michela Giorcelli are available in 'Copyright and Creativity: Evidence from Italian Operas'.
Her work on nineteenth century patents is summarised in 'Patents and Innovation: Evidence from Economic History', Journal of Economic Perspectives, Winter 2013.

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2505776

Two-sided markets: the role of intermediaries in the digital economy

Jean TIROLE and his former TSE colleague Jean-Charles Rochet conducted the pioneering economic analysis of these 'two-sided markets' – and their work has profound consequences for business strategies and competition policy, especially as it applies to the internet and information technologies.

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The digital economy is characterised by 'platforms' that bring together multiple user communities that want to interact with each other: gamers and game developers for videogames; users of operating systems and app developers for operating systems; 'eyeballs' and advertisers for search and media platforms; cardholders and merchants for payment card transactions (see Figure 1).

Tirole's analysis explains how the most viable business model for platforms often results in very skewed pricing patterns, with one side paying nothing (free search engines, portals, newspapers) or even being paid to enjoy the service (payment cardholders receiving cash-back bonuses), while the other side is heavily taxed. The simplest example is that of platforms financed by advertising and sponsored links: advertisers put a high value on interacting with (especially well-to-do) buyers, while the latter attach little value to (or possibly perceive as a nuisance) the presence of ads.

A regulator failing to understand the nature of two-sided markets might misleadingly complain about predation on the low-price side or even excessive pricing on the high-price side, despite the fact that such price structures are also selected by small platforms entering the market. Tirole notes that regulators should refrain from mechanically applying standard antitrust ideas where they do not belong. But this does not mean that they should turn a blind eye when facing two-sided platforms.

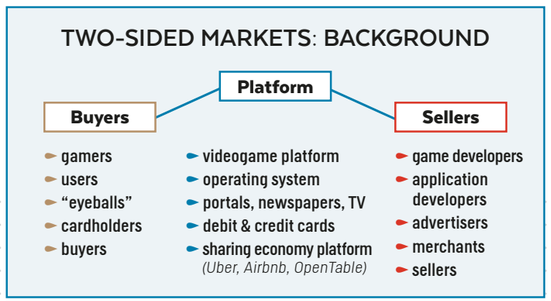

Figure 1

An example is platforms that supply a service to their members but are not the only route for a purchase. For example, American Express provides the cardholder with a service, but other payment methods such as cash, cheque or other card systems are also available. A hotel or airline flight can be booked either through an online booking platform (such as Booking.com) or directly.

> the most viable business model for platforms often results in very skewed pricing patterns

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Such platforms usually charge a merchant fee and demand 'price coherence' – the merchant is not allowed to surcharge for a transaction performed through the platform relative to a transaction that does not use it. While price coherence has sound justifications (it prevents surcharging hold-ups by the merchant), it also comes with hazards: for example, high merchant fees are in part passed through to consumers who do not use the platform, which may result in excessive fees.

Further regulatory challenges are emerging from the so-called 'sharing economy – platforms like Uber and Airbnb. Among other things, Tirole points to issues of trust: for example, what role should platforms play as a licensing authority, ensuring that sellers are suitably qualified to deliver a service such as car transport; and what role should platforms play as suppliers of information and enforcement? There are also important fiscal questions arising from the uneasy continuum from untaxed exchange activities (home production, trade with family and friends, clubs, etc.) to commercial interactions.

Jean TIROLE is chairman of the Foundation Jean-Jacques Laffont-Toulouse School of Economics (TSE), and scientific director of the Institute for Industrial Economics (IDEI), University of Toulouse Capitole.

He is also affiliated with MIT, where he holds a visiting position, the Ecole des Hautes Etudes en Sciences Sociales (EHHESS), and with the Institute for Advanced Study in Toulouse (IAST), which he helped found in 2011.

He is the laureate of the 2014 Nemmers prize in economics and received the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in the same year.

These research results were presented at the *"The Future of Research in the Digital Society"* Colloquium Quai Branly Museum, June 26, 2015

SAVE THE DATE

January 6, 2016

The Future of Book Creation Workshop

(Toulouse)

January 7-8, 2016

Ninth Conference on The Economics of Intellectual Property Software and the Internet

(Toulouse)

June 17, 2016

Digital Forum

(Paris)

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