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Wikinomics and the Era of Openness
European Innovation at a Crossroads

By Anthony D. Williams

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> 'We must welcome the future, remembering that soon it will be the past; and we must respect the past, remembering that it was once all that was humanly possible.'
> George Santayana

A paradigmatic, transformative shift in the way innovation takes place is unfolding around the globe.[1] Driven largely by the Internet and the collaborative communities it enables, this new era of innovation will change everything from the nature of science and invention to the evolution of societies and economies.[2] The primary difference between the old and new system can perhaps best be captured by a single concept of profound ramifications: openness.

This openness stands in stark contrast to the closed innovation systems of the past – systems that produced new products in remote, closed-off laboratories; systems in which intellectual property was never shared but fiercely guarded with the help of patents; systems which were built on incremental, even slow and predictable change. Today, even traditional "brick-and-mortar" industries are opening up their innovation processes, sometimes even sharing their intellectual property and releasing patents.[3] Consumers and users are no longer passive recipients of products that companies produce but are co-creators and valuable sources of intelligence and new ideas.[4] And the new speed of innovation is breathtaking, disrupting entire industries in minimum time and having global reach virtually overnight.

Europe is already an active contributor and enthusiastic participant in this new, open era of innovation, as this e-brief will show. European companies, educational institutions and government agencies alike are tapping into the ingenuity and brilliance of collaborative communities that include, but are not limited to, their immediate customers and users. In many ways, what we are

'New products and services can be developed by anyone, not only scientists.'

5.
Organisation for Economic Co-operation and Development, *2009 Interim Report on the OECD Innovation Strategy* (Paris: OECD, 2009).

6.
For a timely and inspiring call to action, see *Reinvent Europe Through Innovation: Recommendations by the Business Panel on Future Innovation Policy* (Brussels: European Commission, 2009).

witnessing is nothing short of the "democratisation" of innovation, empowering millions of people who hitherto had no means of connecting, networking and sharing their unique insights and knowledge. It holds huge potential for citizens, consumers, companies and governments alike, and it must be urgently recognised as a profound and lasting paradigm shift that effects not only the private sector but also society at large.

To be sure, while this new, open era of innovation is still very much a work in the making, it already holds important policy lessons, which will largely determine if Europe will gain and retain a leading position in this global transformation. Above all, most European policy makers continue to politically favour and financially foster closed innovation systems – reducing a multifaceted, complex phenomenon like innovation to a mere question of the percentage of gross domestic product spent on research or the number of scientists filing patents. There is little recognition that, while R&D spending is important, there is not a direct, causal relationship between research spending and innovation (look at Japan, which has the world's highest research expenditure and has been in the economic doldrums for over a decade); that new products and services can be developed by anyone, not only scientists; and that overly rigid, unequivocally strict intellectual property protection can sometimes actually harm the advancement of new products and services, rather than foster it.

The creative friction that emerges from the old and new models of innovation is healthy and constructive; it demonstrates that our systems are not static and that our dynamic and diverse societies move on, even when policy – and policy makers – lag behind. What will be of paramount importance now is laying a political and regulatory foundation that recognises the emergence of a new innovation model, which is already adding value and providing solutions, and whose potential has not even begun to be exhausted.[5] In many ways, we are on the cusp of a new age that will determine if Europe will continue to be at the vanguard of pushing intellectual, organisational and political boundaries, setting the stage for the next global wave of discovery and invention. The alternative is to rest on yesterday's laurels, defensively holding on to a system that may have produced results decades ago but is increasingly challenged by global actors who are, even now, often beating Europe not only on price but also on the brilliance of their ideas and the competence with which they are able to implement them.[6]

This e-brief will identify how an ethos of openness and new models of mass collaboration are driving four big institutional transformations. If Europe plays its cards right, these shifts can play a pivotal role in increasing Europe's influence in the world, in raising European competitiveness and in strengthening the European social model for years to come.

'With innovation systems that are increasingly built on openness, transparency and interconnectivity, a policy and regulatory system must follow suit.'

- In the economy, greater openness in innovation and science, combined with growing Internet penetration, will create more economic opportunity for European citizens and businesses that learn how to tap into global innovation webs.
- In education, new models of collaborative pedagogy and a global network for higher learning will ensure that every aspiring student in Europe has access to world-class educational resources that they can return to throughout their lifetime.
- In energy, an open-source grid will introduce new innovation to an outmoded sector and bring greater consumer awareness and a sense of community to making ordinary household and business decisions that can improve the world's fight against climate change.
- In government, greater openness will generate dramatically more productive and equitable services, bolster public trust and legitimacy, and unlock new possibilities to crowdsource solutions to local, national and global challenges.

The price Europe would pay for ignoring this economic and social development would be immeasurably high, both in terms of prosperity and societal cohesion but also with regard to its place and standing in the world. That is why it is high time to realise that with innovation systems that are increasingly built on openness, transparency and interconnectivity, a policy and regulatory system must follow suit. Anything short of a fundamental re-evaluation and re-positioning of European innovation policy will prove insufficient in sustaining Europe's economic and social models for coming decades and future generations.

Strengthening Europe's Innovation System
In 2008, Novartis, the Basel, Switzerland-based drug maker, did something almost unheard of in the high-stakes, highly competitive world of global drug manufacturers. After investing millions of dollars over three years to unlock the genetic basis of type 2 diabetes – a disease which poses one of the most common and costly public health challenges in the industrialised world, and offers potential windfalls to any company that can contain or remedy it – Novartis posted all of its raw research data on type 2 diabetes on the Internet. That data is now available for free to any outside scientist or company, including Novartis' competitors, at http://www.broadinstitute.org/diabetes.

Has the company lost its mind? Not necessarily. "These discoveries are but a first step," explains Mark Fishman, president of the Novartis Institute for BioMedical Research. "To translate this study's provocative identification of diabetes-related genes into the invention of new medicines will require a global effort."

'In the future, smart companies will manage portfolios of IP products like a mutual fund – with some IP available for free and other IP only available for a fee.'

7.
In January 2010, Andrew Witty, CEO of Britain-based GlaxoSmithKline, announced GSK would release the formula for 13,500 promising compounds that it had isolated in the effort to find a suitable vaccine against malaria. "The measures we have announced today are characterised by a determination to be more flexible, open and willing to learn," Mr. Witty explained at the launch. "We are working with world-class partners to find new business models to expand access to medicines and deliver unique solutions in all the communities where we work."

8.
In other cases, Novartis has shown it is more than prepared to be a fierce defender of traditional copyright protection on products that have already been commercialised. In 2006, Novartis sued the Indian government to remove a local law that allows companies to file new patents on slightly modified old patents for some drugs, leading to lower cost generics for the local market. Novartis lost the case in Indian courts and, after a global campaign in support of Indian companies manufacturing these slightly modified generics for local use, announced its decision not to appeal.

9.
Tapscott and Williams (2006).

Global effort, indeed.[7] By placing its data in the public domain, Novartis is actually being very smart; the company hopes to leverage the talents and insights of a global research community that stretches well beyond its 96,700 employees. In other words, the type 2 diabetes research Novartis has already conducted – aided by scientists at Lund University in Sweden and MIT in the USA – contains far more leads than any one lab could possibly follow up on alone. The company stands to benefit not by hoarding that early research behind a wall of patents and protection, but by opening up the data to the eyes of the world and inviting millions of researchers outside the company to join a global search for solutions.

It is worth noting that Novartis did not reveal everything. For example, the company did not disclose its own notes or commentary on the data, which it spent three years compiling. This means Novartis retains a substantial lead-time on other companies that attempt to exploit the data.[8]

But Novartis' decision to release its type 2 diabetes research to the world is a nice illustration of what my colleague Don Tapscott and I, writing in *Wikinomics: How Mass Collaboration Changes Everything*, call the five principles of Wikinomics.[9] These principles are changing the nature of competitiveness in today's global economy.

Openness
When it defines the boundaries of the enterprise, a company like Novartis should think not just about the 96,700 people it employs full-time, but about a broad array of individuals and partner organisations in industry, government, the non-profit sector and academia that can enrich the company's value proposition, wherever they may be in the world.

Collaboration
Successful 21st century companies will collaborate closely with other institutions in society to create more value than they could create by acting alone.

Sharing
Rather than keeping everything secret, companies are sharing some intellectual property in order to increase demand, foster relationships and stimulate progress in other areas where they will see profits. In the future, smart companies will manage portfolios of IP products like a mutual fund – with some IP available for free and other IP only available for a fee.

Integrity
In a wiki world, where information travels at light speed across the Internet and social networks, organisations must operate with the highest degree of integrity

'For Europeans, staying competitive will mean taking an ever greater part in this brave new world.'

and work harder to earn and maintain the trust of key stakeholders, including customers, employees, shareholders and the broader communities in which they operate.

Interdependence

Successful 21st century companies are already thinking and acting globally to bring new products to market in a highly integrated and interdependent economy.

In embracing these five principles – openness, collaboration, sharing, integrity and interdependence – companies like Novartis, BMW, IBM, LEGO and many others are becoming a new kind of business entity – a business entity that co-innovates with everyone, especially customers; shares resources that were previously closely guarded; harnesses the power of mass collaboration; and behaves not as a multi-national but as something new: a truly global firm.[10]

In the last 20 years, we have seen the emergence of China and India as economic titans, the collapse of the Soviet Union (the ultimate example of a closed innovation system), the first stage of the worldwide information technology revolution and the emergence of a truly global economy. Over the next 20 years, these developments should help restore world economic growth, raise living standards, and continue to deepen global interdependence. At the same time, they will profoundly shake up the status quo almost everywhere, generating enormous change and opportunity – politically, culturally, socially and economically.

For Europeans, staying competitive will mean taking an ever greater part in this brave new world. Companies, governments and even individuals themselves will need to harness the power of the web to take European ingenuity to more far-flung places. They will need to take advantage of a global market for European goods, and of the lower barriers to entry which widespread Internet use provides. But they will also want to tap into – and contribute to – a much larger global talent pool, where the world's resources will be available to all and sundry – as researchers, manufacturers, collaborators, customers, consumers and increasingly as a combination of all of the above.

To be sure, there is already no lack of opportunities to take part in this Web 2.0-enabled world – not just for companies, but for citizens as well. Indeed, if you are a retired, unemployed or aspiring scientist, you can join the InnoCentive Network, where 160,000 other "solvers" in 175 countries (including many across Europe) get paid for solving tough R&D problems presented by innovation-hungry companies like Alcatel-Lucent, Siemens and Unilever. Thanks to a whole

10.
Samuel J. Palmisano, "The Globally Integrated Entreprise," *Foreign Affairs,* May/June 2006.
Mr. Palmisano is chairman, CEO and president of IBM.

'Europe, in its modern 27-nation form, provides a natural laboratory for this kind of collaborative innovation.'

host of new, low-cost collaborative infrastructures – such as free Internet telephony, open-source software and global outsourcing – individuals and small businesses can harness world-class capabilities, access markets, and serve customers in ways that only large corporations could in the past.

More than is commonly understood, Europe, in its modern 27-nation form, provides a natural laboratory for this kind of collaborative innovation. From its inception as a common market and monetary union to its broad post-Lisbon Treaty incarnation, the EU is a glowing example of inter-state cooperation and the mitigation of individual and national self-interest in favour of the greater strategic good. The harmonisation of regulations and the free movement of people, products and services across borders provide the foundation for the next step – the free flow of ideas, knowledge and skills across those very same borders.

Today, Europe is flush with institutions charged with fostering innovation (e.g., Sitra in Finland, NESTA in the United Kingdom, Vinnova in Sweden and the Innovation Platform in the Netherlands), but the role of organisations like these is changing in an increasingly borderless economy. Domestic innovation agencies cannot contain innovation within national borders, nor should they try to. The future of innovation lies in collaboration across borders, cultures, companies, and disciplines. Countries that focus narrowly on national goals or turn inward will not succeed in the new era. In many ways, this is the promise the European Union holds for innovators across its 27 member states and beyond. And this is why it is so important that domestic innovation strategies be always firmly rooted in a European context, not to mention the need to finally draw up an ambitious, far-reaching innovation blueprint for the EU itself. If innovation agencies and ministries in the EU member states do not learn to collaborate across borders, they will not only limit their own potential but also risk becoming irrelevant to the domestic innovators and change agents they are supposed to serve. That is because smart entrepreneurs and successful firms know very well that if they fail to diversify their activities geographically and participate in global innovation webs, they will find themselves by-passed by competitors that are sharing, adapting, and updating knowledge to create value.

In this context, the old models of industrial planning are increasingly feeble – a bit like erecting a straw house to provide shelter from an oncoming hurricane. Rather, it makes more sense to focus resources on equipping citizens, entrepreneurs and companies both to lead and to plug into global innovation webs.

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Towards a New Paradigm of Open Innovation

To be sure, Europe has taken important initiatives to foster and stimulate this new economic model by opening up the scientific community, which is often the source for new innovations, for greater collaboration. In 2008, the European Commission launched its Open Access Pilot for Research Project. Under terms of the regulation, some €50 billion of publically funded research are to be made available on open access websites after an embargo of six to 12 months (see http://www.doaj.org, which lists open access journals worldwide, and http://www.opendoar.org, which offers a comprehensive repository of open access research, for two of the most important repositories). Still, the initiative only applies to 20% of research funded by the European Commission's Seventh Research Framework Programme (FP-7). But the European Commission has vowed to require that even more research be made publically accessible, if the pilot proves to be a success, under the next research framework programme, which will begin in 2014.[11]

Through initiatives like this, the Internet is no longer just a low-cost medium for disseminating scientific information; it is the new platform for doing science and conducting research. Thousands of scientific pioneers now rely less on "the paper" as the prime vehicle for scientific communication and more on tools such as blogs, wikis, and web-enabled databanks. Rather than wait a year or more to crank out a traditional publication, scientists use Twitter and other social media to share day-to-day findings and observations with a global network of peers. The number of co-authors on papers doubled or even tripled in certain fields in recent years, according to a study conducted by the Santa Fe Institute, a private, non-profit research institute.[12] A growing number of scientific papers have between 200 and 500 authors, and one study had an astonishing 1681 joint authors.

Over at the European Bioinformatics Institute (EBI), scientists are using web services to revolutionise the way they extract and interpret data from different sources, and to create entirely new data services. Today, an interested researcher can extract data hosted by the EBI to find out everything there is to know about a species, from its taxonomy and genetic sequence to its geographical distribution within Europe. As the world's stores of scientific data become increasingly networked, researchers will have the power to weave together all the latest data on that species from all of the world's biological databases with just a few clicks.

The power of collaborative science will only grow as open-access publishing goes beyond journals and research papers to include growing access to science's raw materials: massive databases filled with information about everything from genomics to species extinction. Ultimately, it is a matter of when and not if open access becomes the dominant paradigm. The walls dividing research institutions

'Open up access to all of the world's knowledge and we will help deepen and broaden the progress of science.'

are already crumbling, and open scientific networks are emerging in their place. It is not a stretch to predict that within a decade or less all of the world's scientific data and research will at last be available to every single researcher – gratis – without prejudice or burden. Like the newspapers, scientific publishers can either adapt to these new realities and develop a suitable business model, or risk irrelevance.

European government can hasten the transition by requiring all publicly funded research to be published in open-access journals. After all, science and commerce depend upon the ability to observe, learn from, and test the work of others. Without effective access to data and source materials, the scientific enterprise becomes impossible. Open up access to all of the world's knowledge, on the other hand, and we will help deepen and broaden the progress of science, giving everyone from knowledge-thirsty students and aspiring researchers to ingenious entrepreneurs the opportunity to tap new insights and contribute their own.

Towards a New Paradigm for Intellectual Property

The rise of open-access publishing raises a more general point. The time has come to fundamentally rethink the way Europe as a society fosters the creation and dissemination of knowledge and intellectual property. To be sure, competition through free enterprise and open markets will remain at the heart of a dynamic European economy, but Europe cannot rely on competition and the pursuit of short-term economic gain alone to promote innovation and economic well-being. Vibrant markets rest on robust common foundations: a shared infrastructure of rules, institutions, knowledge, standards, and technologies provided by a mix of public- and private-sector initiative.

Conventional wisdom says knowledge producers should control and protect proprietary resources and innovations – especially intellectual property – through patents, copyrights, and trademarks. According to this scenario, if someone infringes your IP, you get the lawyers out to do battle.

Walled gardens of content, proprietary databases, closed-source software – they all promise healthy returns for knowledge producers. But at the same time, they also restrict access to the essential tools of a knowledge-based economy. And worse, they shut out the real opportunities for customer-driven innovation and creativity that could spawn new business models and industries. When Helsinki-born Linus Torvalds first posted a fledgling version of Linux on an obscure software bulletin board, no one – apart from the most diehard open-source evangelists – would have predicted that open-source software would be much more than a short-lived hackers' experiment. And yet, within a few short years Linux became the largest software engineering project on the planet and

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spawned a multi-billion dollar ecosystem that upset the balance of power in the software industry. Today, Linux is used in everything from the smallest consumer electronics to the largest super computers. It helps run Germany's air traffic control systems. It also runs a number of nuclear power plants (whose names cannot be disclosed to protect their security). If you drive a BMW, chances are it is running Linux. And, at the time of writing, over 500 million users of set-top cable boxes, Tivos, Android phones and other home appliances use Linux, and over 1.5 billion people use it indirectly every day whenever they access Google, Yahoo or myriad other websites.

Today, a new economics of intellectual property is emerging. Increasingly and seemingly paradoxically, firms in electronics, biotechnology, and other fields find that maintaining and defending a strict proprietary system of intellectual property often cripples their ability to create value. Smart firms are treating intellectual property like a mutual fund – they manage a balanced portfolio of IP assets; some protected and some shared.

Indeed, a growing number of European business leaders seem to appreciate the value of a strong foundation of public knowledge as a platform for global competitiveness. Around the globe, companies now use cross-licensing and patent pools to lower transaction costs and remove friction in their business relationships. Industries ranging from consumer electronics to automobiles are embracing open standards and open-source software to enhance interoperability and encourage collaboration. Others, like Novartis, invest in a pre-competitive knowledge commons to boost the productivity of downstream product development. Still others prefer to help weave networks of university partners that will unleash a fertile stream of ideas and inventions that can blossom into new businesses. Regardless of which method – or combination of methods – firms choose, the result is usually the same: a more dynamic and prosperous innovation ecosystem.

But the fundamental basis of European competitiveness must go beyond firm-level strategies to encompass the broader incentive structure embedded in public policy. In today's economy, we need an intellectual property system that rewards invention and encourages openness – a system that fuels private enterprise and sustains the public domain. Against this backdrop – and with this objective in mind – one has to conclude that the existing intellectual property system is not working as well as it could.[13]

Finding the right balance between the public good and private enterprise is key to the long-term competitiveness of firms and economies. We have to be able to apply existing knowledge to generate new knowledge. At the same time, society

13.
Lawrence Lessig, *The Future of Ideas: The Fate of the Commons in a Connected World* (New York: Random House, 2001); Arti K. Rai and James Boyle, "Synthetic Biology: Caught Between Property Rights, the Public Domain, and the Commons," Duke Law School Faculty Scholarship Series. Paper 70, 2006.

'The growing wealth of "free content" on the web suggests that a growing number of knowledge producers will choose openness.'

must elicit the private investment needed to translate new knowledge into economic and technological innovations that contribute to everybody's social well-being.

Nothing illustrates the potential promise of infusing greater openness into the European knowledge economy than the worldwide efforts to build universally accessible digital libraries that encompass not just scientific papers and data, but virtually every intangible artefact ever created – an effort which the European Commission is driving forward with the flagship Europeana project. When fully assembled, such open-access libraries will provide unparalleled access to humanity's stock of knowledge. New science results that might have been available only to deep-pocketed subscribers will now be widely and freely available for education and research. Older resources that might otherwise have wallowed in dusty archives will be given new life and new audiences in digitised formats. Every book, film, song, photo and essay ever published will be sewn together into a universal library of knowledge and human culture. Perhaps at long last we will fulfil the true promise of the great Alexandrian library, but with a 21st century twist: assembling the sum of mankind's knowledge on the web and sharing it worldwide for the betterment of science, the arts, wealth, and the economy.[14]

In the future, the most promising IP regimes will allow knowledge producers to choose from a menu of digital use permissions that range from completely proprietary to completely open. The growing wealth of "free content" on the web suggests, however, that a growing number of knowledge producers will choose openness. As London-based science fiction writer Cory Doctorow aptly put it, "my problem isn't piracy, it's obscurity: the risk that one's work will get lost in the vast digital wilderness of content and voices."

In today's information-soaked environment, writers and content creators need to find ways to serendipitously enter into people's consciousness. Giving away content and building loyal relationships with readers are increasingly part of the arsenal that creators use in the battle for people's attention. For Mr. Doctorow, it turns out that giving away some of his work is the best way to boost demand for other work, not to mention creating demand for lucrative services like speaking tours and consulting.

For Europe to be at the vanguard of innovation in knowledge industries, leaders in business and government must embrace a wholesale change in attitudes about how best to promote the free flow of knowledge, culture and information across the EU's 27-member borders. Ultimately, openness will win in a world where writers and artists compete for recognition on an increasingly open, global

'Today, the traditional business models of encyclopedias, newspapers and record labels are in various stages of collapse.'

platform; where old knowledge will be perpetually used to create new insight in an unprecedentedly open, democratic way and where our citizens will use the tools to seek levels of personal development and expression that the world has only begun to contemplate and understand.

Reinventing Higher Learning

Encyclopedias, newspapers, and record labels have a lot in common. They are all in the business of producing content. They recruit, manage and compensate capable content producers. Their products are composed of atoms – books, papers, CDs, performers on stage – and are costly to create and distribute. Their products are proprietary and they take legal action against those who infringe their intellectual property. Because they create unique value, their customers pay them and they have revenue. Their business is possible because of scarcity – quality news, information, knowledge, learning and art are hard to come by.

Come to think of it, universities are a lot like this as well. But there is a big difference. Today the traditional business models of encyclopedias, newspapers and record labels are in various stages of collapse. The major producers and providers have all lost their monopolies on the creation and delivery of content. They were killed by a digital age that brought abundance, mass participation, the democratisation of production, the rise of new digital delivery channels, the infeasibility of old notions of intellectual property, and completely new business models all enabled by the Internet. The allegedly unassailable attributes of their age-old business models were erased faster than you can tap "delete" on your iPhone.

Does a similar fate await the university? Despite certain surface similarities, evidence would indicate that universities are indeed different. For starters, university enrolment throughout the world – including Europe – is at an all time high, indicating that more and more people continue to see value in traditional modes of learning. What's more, the wage premia which employers will pay for a university graduate continues to rise despite the growth in supply of qualified graduates – a sign that the market value of qualified workers is rising faster than our institutions' ability to create them.[15] The competition to get into the most prestigious universities has never been fiercer and campuses across the continent are thriving thanks to the wave of young, tech-savvy learners flowing through their halls and classrooms.

But this does not mean that universities cannot do more to harness the power of collaborative innovation to improve learning, increase opportunity and raise the competitive level of the European workforce. Take eTwinning, Europe's hugely

15.
OECD, *Education at a Glance 2009* (Paris: OECD, 2009).

'The crème of the crop of a generation is beginning to boycott the basic model of pedagogy.'

16.
For more about this exciting programme, visit eTwinning's YouTube Channel.

17.
Claire Callender and Jonathan Jackson, "Does the Fear of Debt Deter Students from Higher Education?" *Journal of Social Policy* (2005), 34:4:509-540 Cambridge University Press.

18.
Mark C. Taylor, "End the University as We Know It," *The New York Times,* 29 April 2009. Ibid.. "Useful Devils," EDUCAUSE Review, Vol. 35, No. 4 (July/August 2000). Barbara Leigh Smith and Jean T. MacGregor, "What is Collaborative Learning?" in Goodsell et. al (eds.), Collaborative Learning: *A Sourcebook for Higher Education (Washington DC: EDRS 1992).*

successful education project that forms part of the Comenius programme.[16] With over 55,000 users now taking part in the project, eTwinning allows students from across Europe to share resources and exchange ideas in a secure, online environment. Available in 23 languages, the collaboration platform offers students the benefits of learning across cultures and teaching methods and, most important, allows for the creation of strong ties across the 27 member states. To date, over 5,300 collaborative projects have been set up and in excess of 40,000 teachers have signed up to share ideas and course plans with their peers.

Despite innovations like eTwinning, many students complain about the quality and type of education they receive. For starters, higher education has become very costly. European survey results indicate that nearly two-thirds of young people who decide not to study at higher education institutions cite concerns over cost and the accruement of debt as the main reason (although education in Europe remains much cheaper then in the United States).[17] And there are other, more subtle indicators of discontent. Many students and faculty alike are refusing to pay for academic periodicals and are file swapping like it's 1999. For many of the smartest students, it has become fashionable to try to get an A without having gone to any lectures – meaning the crème of the crop of a generation is beginning to boycott the basic model of pedagogy.

Ironically, in an age of unprecedentedly high enrolment, there is evidence that universities are losing their iron grip on higher learning, as the Internet inexorably becomes the dominant infrastructure for knowledge – both as a container and as a global platform for knowledge exchange between people. At the same time, a new economy and a new generation of digital natives require a much different model of higher education – a model that will build upon the enormous opportunities for learning and knowledge sharing which modern communication technologies have made possible.

To be sure, academic literature is rife with proposals for change.[18] Some go so far as to say the web enables distance learning and the elimination of campuses. Others argue that we need more technology in higher education or that colleges should be opened up and made free to all. There are renewed calls to abolish tenure, and even to replace traditional departments with a new set of problem-focused disciplines. The trouble with most of these ideas is that they do not address the fundamental problems with the university or show a way forward.

In fact, change is required in two vast and interwoven domains that permeate the deep structures and operating model of the university. The first is the value created for the main customers of the university, i.e. students. The second is the model of production for how that value is created. First, we need to build on the

'Workers and managers must learn, adapt and perform like never before.'

old industrial model of pedagogy (how learning is accomplished), supplementing it with a new model based on collaborative learning. Second, we need an entirely new modus operandi for how the subject matter, course materials, texts, written and spoken word and other media (the content of higher education) are created.

In the old model, education was about absorbing content and being able to recall it on exams. The teacher was essentially a broadcaster: the transmitter of information to an inert audience in a one-way, linear fashion. In today's world, and for today's students, this model of learning is anachronistic, if not obsolete. Yesterday you graduated and you were set for life – only needing to "keep up" a bit with ongoing developments after you enter your professional life. Today when you graduate you are set for, say, 15 minutes. Indeed, if you took a technical course in your first year of studies, half of what you learned may even be obsolete by the time you reach your fourth year. Of course you still need a knowledge base, and you cannot Google your way through every activity and conversation. But what counts more is your capacity to learn lifelong, to think, research, find information, analyse, synthesise, contextualise and critically evaluate; to apply research to solving problems; to collaborate and communicate.

This is particularly important for students and employers who compete in a global economy. Labour markets are now global and given networked business models, knowledge workers face competition in real time. Workers and managers must learn, adapt and perform like never before.

The answer for educational establishments is not simply to expand online distance learning offerings – though this would help. Nor is it about students being able to access lectures by some of the world's leading professors from free online sites like Academic Earth – though this practice has proven popular and useful with both professors and students. Rather, with today's technology, it is now possible to embrace new collaborative and social models of learning that change the actual pedagogy in more fundamental ways.

In a 2008 article, John Seely Brown and Richard P. Adler argue persuasively that "our understanding of content is socially constructed through conversations about that content and through grounded interactions, especially with others, around problems or actions."[19] The implication is that we need to focus less on what we are learning and more on how we are learning. They argue that "instead of starting from the Cartesian premise of 'I think, therefore I am,' the social view of learning says, 'We participate, therefore we are.'" In other words, the real learning begins when students leave the lecture hall and start discussing and internalising what was just said.

19.
John Seely Brown and Richard P. Adler, "Minds on Fire: Open Education, the Long Tail, and Learning 2.0" EDUCAUSE Review, vol. 43, no. 1 (January/February 2008).

'The increasing pervasiveness of social media, especially among today's youth, provides powerful new tools and environments for collaborative learning.'

20.
In the Netherlands, the Dutch Ministry of Education has created an online platform for teachers to create and share educational material. See Wikiwise.

21.
Charles M. Vest, "Open Content and the Emerging Global Meta-University," EDUCAUSE Review, Vol. 41, No. 3, May/June 2006.

22.
Readers of the online edition of this e-brief can find more information on the Bologna process, which seeks to make the content and quality of academic degrees in different countries more readily comparable across European borders, by clicking here.

The increasing pervasiveness of social media, especially among today's youth, provides powerful new tools and environments for collaborative learning – everything from wikis to virtual worlds like Second Life.[20] However, the Web enables social learning in other ways as well. For example, interactive computer-based courseware can lessen the weekly lecture burden on professors and free up time to collaborate directly with students. If this group collaboration is centred around solving real research problems, then chances are this type of interaction will be valued by professors, too.

Put simply, the digital world, which has trained young minds to inquire and collaborate, is challenging not only the lecture-driven teaching traditions of the university, but also the very notion of a walled-in institution that excludes a large pool of potential beneficiaries. Why not allow a brilliant secondary school student to take university-level math without abandoning the social life of his high school? Why not encourage a foreign student majoring in math to take a high school English course?

MIT President Emeritus Charles M. Vest has suggested that with the growing open-access movement we are seeing the early emergence of a meta-university – a transcendent, accessible, empowering, dynamic, communally constructed framework of open materials and platforms on which much of higher education worldwide can be constructed or enhanced.[21] In this new model, the web will provide the communication infrastructure, and a global open-access library of course materials will provide much of the knowledge and information infrastructure. Mr. Vest argues that a noble and global endeavour of this scale would speed the propagation of high quality education and scholarship and give teachers and students everywhere the ability to access and share teaching materials, scholarly publications, scientific works in progress, including webcasts of real-time science experiments.

A network of world-class universities, freedom of movement, and high rates of Internet penetration make Europe an ideal place to launch a new global network for higher learning. Imagine if each student was offered a custom learning experience from, say, a dozen universities. S/he enrols in their primary college and is assigned a "knowledge facilitator" who works with the student to customise a learning experience, journey and outcomes. The collective syllabi of the world is their menu for higher education. They might enrol in their home school of Leuven and register to take a behavioural psychology course from Utrecht and medieval history from Cambridge. The Bologna process, which aims to harmonise academic standards and remove barriers to the mobility of students and teachers across the EU, is a step towards this vision.[22]

'New models of collaborative education can help bring greater efficiency and creativity to the efforts to help school leavers and ageing employees update their skills.'

The opportunity is not simply to mix and match courses, but to recast the relationships among faculty and students. Faculty should strive to create a context whereby students from around the world can participate in online discussions, fora and wikis, to discover, learn and produce knowledge as a community of learners that are engaged directly in addressing some of Europe's (and the world's) most pressing problems.

Such open platforms could provide a means to address the needs of all learners, not just twenty-somethings. For Europe to be truly competitive in today's fast-moving fields of research and innovation, a significant proportion of the EU's populace will require dramatic retraining and retooling to begin and/or continue their working lives in a modern, dynamic and technology-focused environment. The cost of building new continuing education programmes from scratch could be prohibitively high, but new models of collaborative education can help bring greater efficiency and creativity to the efforts to help school leavers and ageing employees update their skills.[23]

In the final analysis, 21st century education should be more like a network than an ivory tower. While improving the Industrial Age model of education will not be easy, doing so is arguably crucial for the survival of the university. If students turn away from a traditional university education, this will erode the value of the credentials that universities award, along with the position of these institutions as centres of learning and research and as campuses where young people get a chance to "grow up." Policy makers, educators and university administrators alike will need to embrace a new ethos of openness, sharing and collaboration. There is no time for delay. The stability of Europe's proud and distinguished model of pedagogy and the ability of Europe's workforce to excel in an increasingly competitive global economy depend on it.

How Openness Will Drive Europe's Green-Energy Revolution

Today, Europe is at the forefront of a new green-energy revolution – one that will fundamentally transform the ubiquitous but largely invisible infrastructure that powers every home appliance, every medical device, every light source, and virtually every industrial process, from agriculture to construction. And this new energy revolution could not come a moment too soon. We know now that the huge leaps in population and economic growth enjoyed over the past two centuries have come at a considerable environmental cost. Not only have we virtually exhausted the equivalent of an ancient geological endowment fund, our voracious appetite for dirty and unsustainable fossil fuels is irrevocably altering the climate with potentially devastating implications for decades and even centuries to come. Indeed, if we continue on a business-as-usual path with respect to fossil-fuel usage, we will make the most tragic and unforgivable

23.
Paul Hofheinz, *EU 2020: Why Skills are Key for Europe's Future* (Brussels: The Lisbon Council, 2009).

'It is time to acknowledge our responsibility for the environment. But it is also a time of great opportunity for nations that choose to lead the way towards a new green-energy paradigm.'

of mistakes: extinguishing life on Earth as we know it and sabotaging the hopes and aspirations of future generations.

It is time to acknowledge our responsibility for the environment. But it is also a time of great opportunity for nations that choose to lead the way towards a new green-energy paradigm. European leaders seem to appreciate this more than most. The European Union's 20-20-20 target (20% reduction in CO_2 emissions, 20% improvement in energy efficiency and a 20% share for renewable energy in overall energy use, all by 2020) is ambitious by international standards and much progress has already been made to date. Government subsidies and incentives for renewable energy and green-friendly investment policies, for example, have proven to be successful in countries such as Germany, Denmark and Spain where wind and solar energy have come to represent respectable shares of total energy usage.

But Europe will need to embrace much more profound changes if it is truly serious about ending its dangerous addiction to fossil fuels and building a new green-energy economy that can sustain human civilisation for centuries to come. The assumption underlying much conventional wisdom is that politicians and other powerful interests can "manage" the transition to a low-carbon economy from Brussels and the national capitals. It is true that centrally managed taxes, credits and public-private partnerships will provide important levers for steering society towards low-carbon solutions. But most cutting-edge work on new energy technologies is already occurring at the fringe of today's well-established energy and electricity markets, not at its core, dominated by the incumbent energy and utility companies. And there is a reason. It is because the incumbents most often do not have the answers and neither are they particularly motivated to find them, irrespective what incentives governments offer.

The missing and largely overlooked ingredient in most of the climate change-fighting policy recommendations to date is the need for a new, more agile way to marshal and fully exploit the collective ingenuity of citizens and businesses – something which Web 2.0 can offer in abundance. We need an approach that relies less on central control and more on a self-organising critical mass of people and organisations working in all sectors to initiate small experiments and social innovations that, under the right conditions, can mushroom into pervasive changes in societal behaviour. Put simply, Europe needs a new model of reindustrialisation that taps into Europe's decentralised sources of knowledge and capability – an approach built on a platform of openness that mobilises not just large utility companies, but a whole ecosystem of small-scale generators and household producers.

'The most important development would be the arrival of a truly smart grid for electricity.'

Web 2.0 and the open-source movement could well provide the key. In particular, Internet-based platforms for innovation that could unite networks of the willing and committed, allowing new ideas, relationships and partnerships to surface and providing new ways to analyse and understand how our collective actions translate into new energy solutions and concrete reductions in greenhouse gases would be very useful. Such platforms could include distributed business laboratories where social entrepreneurs can launch experiments, build communities and attract funding for their ventures; social networks where peers can challenge each other to take actions that reduce emissions and measure their collective progress over time; a "green technology commons" where industries can share intellectual property and other assets that, once widely adopted, would hasten the transition to a low-carbon economy; tools for turning raw data into reliable and usable information, allowing everyone from investors to regulators to ordinary citizens to monitor the progress of communities, nations, and corporations towards carbon neutrality; and an open source-based smart energy grid that enables global innovation in the production, distribution and consumption of energy.

A case in point is Germany-based Verivox, one of Europe's largest independent consumer portals for energy and telecommunications products and services. The website enables German consumers to compare available electricity tariffs with just a few clicks and switch directly to their best-suited supplier. The goal is to facilitate price transparency within chosen markets by offering the most comprehensive, independent and trustworthy information. Consumers can then make informed decisions affecting their daily finances without spending too much time researching topics they may not fully understand. The Verivox databases are updated daily by dedicated research teams working in several cities worldwide. Data is primarily based on the meticulous analysis of thousands of suppliers' online offers. The Verivox database currently encompasses approximately 16,800 energy tariffs from over 940 electricity and 770 gas suppliers for Germany alone, in addition to 2,350 telecommunications tariffs from more than 380 providers.

Perhaps the most important development, though, would be the arrival of a truly smart grid for electricity. A smart grid would leverage the Internet's connective tissue to weave millions, and eventually billions, of household appliances, substations and power generators around the planet into an intelligent and programmable network. This same system would allow utilities to monitor and control their networks more effectively and make new business models and dynamic pricing schedules possible for the first time. We could increasingly rely on technology that is smart enough to save us money automatically. For example, armed with more information about tariffs, the dishwasher would wait for the price to fall below a certain level before switching on or the air

'Leadership does not come from companies that dominated the old industrial era, but from a new generation of companies that understands the age of networked intelligence.'

24.
Smart Metering in Western Europe, 6th Edition. (Gothenburg: Berg Insight, 2009).

25.
Marie Hattar, vice-president of marketing at Cisco, quoted in "Cisco: Smart Grid Will Eclipse Size of Internet," *CNET News*, 18 May 2009.

conditioner would turn itself down when the price goes up. A system like this could also accommodate consumer preferences for clean sources of energy, perhaps even allowing households to select their desired supply mix.

In many ways, the argument for a smart grid based on open source parallels the argument for an open Internet. The old power grid is analogous to broadcast media with its bias towards centralised, one-way, one-to-many, one-size-fits-all communication. The new grid is akin to the Internet with its capacity for decentralised, many-to-many, customisable, and interactive communications. Just as open standards and "edge intelligence" helped unleash unparalleled creativity on the Internet, a similar ethos of openness will ensure the new energy grid becomes a platform for a vast array of new energy services, not just a computerised pipeline for delivering cleaner electricity. It could integrate new sources of renewable power into the grid, including the power that homeowners, businesses and buildings generate themselves. The opportunity for new product and service innovation is great, as is the potential for creating hundreds of thousands of new high-skill jobs across the continent.

To date, only a small percentage of homes in Europe have been equipped with smart meters. However, that number is expected to grow to 100 million by 2014, and cover 80% of European homes by 2020.[24] In a recent announcement, Cisco Systems estimated that by the time it all gets built out, the worldwide smart grid will be 1,000 times larger than today's Internet.[25]

Typically leadership does not come from companies that dominated the old industrial era of energy, but from a new generation of companies that understands the age of networked intelligence. "There is enormous potential to take near real-time usage data to create contests, build applications and enable social networking," says Niki Fenwick of Google, a company very much in the vanguard of seeking technology-based solutions to the problem of climate change. Like many other tech players, Google is pushing for open standards for the smart grid so that the data streaming from millions and eventually billions of smart devices can be aggregated on a single platform. Treating the grid like an open platform would allow software developers to build applications to help you conserve energy the same way developers build apps for the iPhone. A straightforward application could include a service that analyses a household's electricity usage data, identifies inefficient appliances or practices in the home, and offers tips on how to reduce energy or provides special discounts on efficient appliances or electronic equipment. Once the grid carries information like this based on open standards, it becomes subject to all of the rich possibilities for innovation, collaboration and wealth creation that the Internet has fostered in other sectors of the economy.

'The potential for creating hundreds of thousands of new high-skilled jobs across the continent is great.'

Already, homes across Europe – in cities such as Manchester, Birmingham, Bristol, Ruse and Cluj – have been equipped with advanced smart meters and sensor networks that track energy usage, efficiency and overall household emissions to generate a real-time carbon footprint. However, the real action will start in 2010, when each household in the Manchester project will be assigned a "personal carbon allowance" and participate in a household emissions trading market, the first of its kind. The carbon allowance will set a cap on household emissions and create a marketplace where households buy and sell quotas, according to their carbon budgets. Each adult citizen would be assigned a carbon allowance that would determine how much carbon dioxide they can emit driving, flying and keeping their homes. Emitters who exceeded their quota would buy additional allowances from people who have allowances to spare because they emit less.

Policy makers in the United Kingdom have been contemplating whether such household emissions trading schemes could set the stage for the introduction of a comprehensive nation-wide "cap and trade" system that would apply to individuals, and not just to businesses. Exploratory research by the UK Department of Energy and Climate Change found that 71% of low-income families would, in effect, get paid for having lower than average emissions. Applied to Europe as a whole, personal carbon markets could provide an innovative means to stimulate job creation and green innovation, particularly in lower income European countries, which would stand to be net gainers under a continent-wide scheme.

Such proposals are not without potential pitfalls. Critics complain that such a complex system of wealth transfer between millions of individuals would be expensive and could be undone by blunder-prone computer systems. Privacy advocates worry that the need to track each citizen's individual consumption decisions would provide the government and unlawful entities with new ways to snoop on individuals. Perhaps surprisingly, there are sceptics among environmentalists, too. While few green campaigners dispute the need for individuals to take greater responsibility for cutting emissions, they also are extremely wary of proposals that would put added burdens on citizens, particularly at a time when governments and industries could do a lot more to switch to clean, renewable forms of energy.

But the mere fact that neighbourhood trading schemes and personal carbon allowances are being debated is a sign that the efforts underway to make our infrastructure more intelligent and interactive could pay large dividends. It is easier to remain aloof about climate change, for example, when the connections between our actions and the climate seem vague and hard

'Market forces alone cannot meet the needs of today's citizens. But neither can the old Industrial Age models of government.'

26.
Economist Intelligence Unit, "World Electricity: The Smart Grid Era," *The Economist,* 05 June 2009.

27.
The Climate Group, *SMART 2020: Enabling the Low Carbon Economy in the Information Age* (London: The Climate Group, 2008).

to measure. But it becomes harder to simply ignore one's personal responsibility when the smart meter on your wall not only shows you your real-time carbon footprint, but also compares your score to the neighbourhood average and offers you tips on how to improve.

Studies have found that when people are made aware of how much power they are using, they reduce their use by about 7%.[26] With added incentives, people curtail their electricity use during peaks in demand by 15% or more. The Climate Group estimates that the application of digital technologies to enable smart grids and smart buildings has the potential to avert 3.71 gigatons of CO_2 equivalent global emissions by 2020, delivering some $464 billion in global energy cost savings to businesses, taxpayers and consumers.[27]

The bottom line is, within a few years, the drive to make all things "smarter" by connecting electrified objects to the Internet will result in a flood of new data that can be aggregated and analysed, providing a powerful engine for energy dashboards and trading platforms that help households and businesses optimise their consumption. And while the focus is on energy and climate change today, there are equivalent opportunities in other sectors, including water, waste management and transportation.

In the face of climate change and diminishing stocks of fossil fuels, the world can go one of two routes. One path leads to escalating prices, energy shortages, environmental catastrophe and increasing conflict between the great powers. The other path leads to growth, global cooperation and an abundant supply of clean power delivered through a smart energy grid that enables consumers to become active and informed managers of their energy consumption. The choice is ours to make.

The Future of Governance and Democracy in Europe

Revitalising Europe's innovation system will help ensure that European citizens and businesses can remain at the forefront of today's knowledge-intensive industries. Modernising education will ensure that the incoming wave of workers is equipped with an evergreen reservoir of skills and knowledge that will make them competitive in an increasingly global market for talent. And the shift to a new green energy paradigm will shore up Europe's energy security and help fight global climate change, while launching a rich array of new products and services and creating countless new jobs in the process. The question now is whether Europe has sufficiently transparent, agile and innovative structures of government and democracy to manage itself for continued success in these increasingly complex and challenging times.

'Even with the rise of the Internet, governments on balance have not used the transformative power of collaboration to reform their own internal processes.'

To be sure, market forces alone cannot meet the needs of today's citizens. But neither can the old Industrial Age models of government. Ageing demographics, rising deficits, and a plethora of planetary challenges demand much greater transparency, participation and ingenuity than has been the norm in European institutions. Indeed, if Europe's politicians and public servants are to ensure their relevance and authority going forward, they must move quickly to meet rising expectations for openness, accountability, effectiveness and efficiency.

The good news is that just as new waves of innovation are washing over the private sector, opportunities to harness new models of collaboration and innovation are arriving at the doorstep of governments everywhere. Indeed, if mass collaboration is changing how enterprises innovate, orchestrate capability and engage their stakeholders, why cannot the public sector seize networked business models to cut across departmental silos, improve policy outcomes, reduce costs, and increase public value? No one is arguing that it will be easy. And it is true that there are often more penalties than incentives for innovative behaviour in the public sector. Nevertheless, there is also a growing appreciation that deep change must occur, and the pressure for innovation goes well beyond taxpayers' desires for better and cost-efficient government.

Despite being a decade into the 21st century, the unfortunate reality is that most governments still reflect Industrial Age organisational thinking, based on the same command-and-control model as Industrial Age enterprises. After all, bureaucracy and the industrial economy rose hand in hand. The economy needed roads, sewers, electrification, railways and a sophisticated military. As government got bigger, and the revenue of government increased, it became necessary to build more elaborate procedures, structures and controls, all run by new layers of professional managers. These bureaucracies operated like individual "stovepipes" – with information only flowing vertically and rarely between departments.

Despite numerous attempts, very little has changed in the past half century. Even with the rise of the Internet, governments on balance have not used the transformative power of collaboration to reform their own internal processes. In other words, even the most irresistible force of our times is struggling to dislodge the immovable mass of government bureaucracy. Too many government organisations are still largely locked into old structures and outmoded ways of working.

But the times, they may be a-changin'. In recent years, a number of governments in Europe and around the world have embraced "citizen-centric" approaches to service delivery and begun to emphasise inter-agency collaboration.

'When enough people can collect, re-use and distribute public sector information, people organise around it in new ways, creating new enterprises and new communities.'

Some governments have even extended new roles to citizens, community-based organisations and private businesses in a bid to leverage untapped sources of innovation, harness new competencies and lower costs. The reality is that today's citizens can self-organise to do many of the things that governments do today, only they often do them better. In education, thousands of students with Asperger's Syndrome can form a self-help group using Facebook.[28] In TheStudentRoom, a United Kingdom-based network where high school and university students share academic and social knowledge, users have posted eight million blogs about issues such as homework and university applications. Parenting websites like Netmums operate as an online community, with 275,000 users providing advice to prospective and current parents. In the consumer field, MoneySavingExpert.com now has 2.5 million unique users per month with many sharing information on the latest money-saving tips and tricks.

Some governments have recognised the power of Internet-enabled collaboration and social networks and now seek to tap their potential. The Government of Catalonia's e-Catalunya platform enables citizens to create virtual communities where residents can work together with their elected representatives to solve local problems using blogs, social networking, and wikis. The genius of e-Catalunya is that the government is becoming a stronger part of the social ecosystem that binds individuals, communities, and businesses – not by absorbing new responsibilities or building additional layers of bureaucracy, but through its willingness to open up formerly closed processes to broader input and innovation.

In the United Kingdom, initiatives such as FixMyStreet.com enable residents to submit concerns about safety, vandalism or other local issues directly to their municipal council. Set up by a non-profit called mySociety, the site is part of a larger trend as public agencies across Europe build online innovation spaces where the general public and staff can co-create information-based public services, much the way companies such as Amazon.com, flickr and Apple enable third-party developers to build extensions to their software platforms.[29] Tom Steinberg, the founder of mySociety, sees this as the beginning of a sea change in the way governments create value for citizens: "When enough people can collect, re-use and distribute public sector information, people organise around it in new ways, creating new enterprises and new communities. In the past, only large companies, government or universities were able to re-use and recombine information. Now, virtually anyone with an Internet connection can mix and 'mash' data to design new ways of solving old problems."

All of this, in turn, raises new questions about government and its changing roles and form in the future. Could societies "open source" government much the way

'Partly in response to observing unmet social needs, there has been a steady rise of organisations engaging in social innovation.'

thousands of dispersed Linux programmers converge on the Internet to develop one of the world's leading computer operating systems? Would large-scale, web-enabled consultations improve political decision-making or channel greater ingenuity and urgency into efforts to solve global challenges like terrorism and climate change? What about the provision of public services; could public agencies use ongoing collaboration with citizens, civil society and the private sector to deliver better services at lower cost?

While Industrial Age government was based on monopoly power, and structured around rigid hierarchies, today's governments need to distribute power broadly and leverage innovation, knowledge and value from the private sector and civil society. In other words, government becomes a platform for social innovation. It provides resources, sets rules and mediates disputes, but allows citizens, non-profits and the private sector to share in the heavy lifting.

Partly in response to observing unmet social needs, there has been a steady rise of organisations engaging in social innovation. These organisations are broadly speaking entrepreneurial, non-profit and grassroots-based – and of course Internet-savvy and fond of social networking and collaborative tools. One of the world's premier social innovation networks is located in Europe, the London-based SIX Social Innovation Exchange.

Arguably, there is a new kind of public sector organisation emerging – one that opens its doors to the world; co-innovates with everyone, especially citizens; shares resources that were previously closely guarded; harnesses the power of mass collaboration; and behaves not as an isolated department or jurisdiction, but as something new: a truly integrated organisation. Today, it requires a bit of imagination, but perhaps it is only as fantastic as the current version of government would seem to a feudal prince from the Middle Ages. Or perhaps it is just as improbable as a European Union would have sounded to an early 20th century European.

Many of these advances are based on the premise of using technology and transparency to enable and empower citizens to collaborate with government in delivering important social goods. The European Environment Agency (EEA)'s Eye on Earth portal is a case in point. The interactive mapping platform provides Europe's citizens with real-time information about environmental quality (including air and water quality readings) from the 32 member countries of the EEA. Users can browse the visual imaging interfaces and drill down for detailed, neighbourhood-level data about ozone levels, nitrogen dioxide, particle matter, and carbon emissions. The site also features social networking applications and discussion fora where citizens

'Networks are increasingly beating institutions at their own game.'

can stimulate debate on what that data means or help raise awareness of environmental problems in their communities. Citizens can even contribute their own data and observations about the environment around them, including first-hand experiences of climate change or potential explanations for environmental degradation in specific areas.

There are benefits for policy makers, too. Jacqueline McGlade, executive director of the EEA, notes that projects like Eye on Earth allow both pan-European and national agencies to make policy decisions based on a much more accurate and up-to-date picture of the environment issues in question. "We can now bring complex strands of information together into a single, simple-to-use and easy-to-understand application," she says. "As more people understand what is happening in their area, more will contribute to solving environmental problems."

Europe is flush with similar examples of citizens taking on larger roles in their communities and demanding greater ownership of their government and democracy. In the Netherlands, the cities of Apeldoorn, Helmond and Tilburg are using virtual worlds to engage citizens in the planning and development of local development projects. Interested citizens can learn about recent developments and voice their opinions on issues ranging from aesthetics to traffic congestion and pedestrian safety at http://www.virtueelnl.nl. In the case of Tilburg, they can vote directly on a selection of virtual mock-ups for a new central marketplace in their city.

Further to the East, there are promising signs of citizen-driven innovation as well. When Estonians regained independence from the former Soviet Union in 1991, they not only acquired new political freedoms, they inherited a mass of rubbish – thousands and thousands of tons of it scattered across illegal dumping sites around the country. When concerned citizens decided that the time had come to clean it up, they turned not to the government, but to tens of thousands of their peers.

Using a combination of global positioning systems and GoogleMaps, two entrepreneurs (Skype guru Ahti Heinla and Microlink and Delfi founder Rainer Nolvak) enlisted volunteers to plot the location of over 10,000 illegal dumpsites, including detailed descriptions and photos. That, in itself, was ambitious. Phase II of the clean-up initiative was, by their own admission, rather outrageous: clean upwards of 80% of the illegal sites in one day, using mass collaboration. So, on 03 May 2008, more than 50,000 people scoured fields, streets, forests and riverbanks across the country, picking up everything from tractor batteries to paint tins. Much of this junk was ferried to central dumps, often in the vehicles of volunteers.

'To remain relevant, governments will need to be agile, open and fluent in the ways and means of collaboration.'

If 50,000 Estonians can cleanup their 45,228 square kilometre country in one day, what else could they do? As Tiina Urm, a spokesperson for the initiative put it this way: "It is not really about the rubbish. It is about changing people's mindsets. Next year it might be something else."

The experiences in Estonia and elsewhere suggest that networks are increasingly beating institutions at their own game. Forming and reforming around social issues, economic production, even national defence and terrorism, these networks have become gathering points of knowledge that can convert into rapid action. Governments can either get with the programme or risk becoming largely irrelevant in the eyes of a growing population of digital citizens. Indeed, governments that at one time played the primary role in defining the roles and responsibilities for citizenship are finding that citizens are turning to online communities and networks to marshal resources and launch solutions. Governments may be key players or not. To remain relevant, governments will need to be agile, open and fluent in the ways and means of collaboration. They will need to find new and modern ways to remain effective in solving pressing public problems, starting with the core business of delivering public services and building a reinvigorated, more participatory system of European democracy.

As we step into the future, Europe's leaders will face challenges that are arguably greater than anything their predecessors have encountered. Sustaining societies and economies in the face of climate change, oil and water shortages, demographic shifts, and national security threats will test the resolve and ingenuity of those who wish to participate in the public good. In each of these issue areas, governments face a reality in which they are increasingly dependent for authority on a network of powers and counter-influences of which they are just a part. Whether streamlining government service delivery or resolving complex global issues, governments are either actively seeking – or can no longer resist – broader participation from citizens and a diverse array of other stakeholders. Just as modern multinational corporations source ideas, parts and materials from a vast external network of customers, researchers and suppliers, governments must hone their capacity to integrate skills and knowledge from multiple participants to meet expectations for a more responsive, resourceful, efficient and accountable form of governance. It is a journey that has only just begun.

The first wave of digitally-enabled "e-government" strategies delivered some important benefits. It made government information and services more accessible to citizens while creating administrative and operational efficiencies. But too many of these initiatives simply paved the cow paths –

Wikinomics and the Era of openness

'Government will either play an active and positive role in its own transformation, or change will happen to it.'

that is, they focused on automating existing processes and moving existing government services online. This next wave of innovation presents an historic occasion to fundamentally redesign how government operates, how and what the public sector provides, and ultimately, how governments interact and engage with their citizens. Digital citizens increasingly expect to be partners in governance, not bystanders. It is time governments at all levels abandon their monopoly over the policy process in favour of participatory models that invite input – and ownership – at all stages of development, from problem definition and analysis, to identifying strategic options and making decisions. This goes far beyond the Internet consultations that for instance the European Commission occasionally conducts, or the blog of a government official. Instead, it is a process of opening up processes that have hitherto been closed and making governance and government more transparent, more accountable and more understandable.

European leaders can and must rise to these challenges. Government will either play an active and positive role in its own transformation, or change will happen to it. The transformation process is at the same time exhilarating and painful, but the price of inaction would be even worse: a lost opportunity for government to redefine its role in society and help launch a new era of participatory European governance.

A Wikinomics Agenda for European Success
Increasingly, the five principles of Wikinomics we discussed at the outset – openness, collaboration, sharing, integrity and interdependence – define how 21st century nations, citizens and corporations interact with one another and compete together in global markets. This is very different from the hierarchical, closed, secretive, and insular approach to innovation and wealth creation that dominated the previous century.

If Europe is serious about becoming an "Innovation Union" as the new European Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, so aptly called for in her confirmation hearing at the European Parliament, then Europe must not only be able to talk innovation, but do innovation. This requires that every stakeholder involved – not only companies but also institutions of higher learning and governments themselves – have to muster the courage to reinvent themselves, using technology and collaboration as an enabler, a catalyst and a driver of change with the ultimate goal to provide better outcomes for citizens and users. This is not about tinkering at the edges; this is about devising, living and experiencing a new model of innovation that is fit for the 21st century.

'Every individual now has a role to play in the economy and every company has a choice – commoditise or get connected.'

As in the past, winning organisations and societies will be those that tap the torrent of human knowledge and translate it into new and useful applications. The difference today is that organisational values, skills, tools, processes, and architectures of the ebbing command-and-control economy are not simply outdated; they are handicaps in the value-creation process. In an age where mass collaboration can reshape an industry overnight, the old hierarchical ways of organising work and innovation do not afford the level of agility, creativity, and connectivity that companies require to remain competitive in today's environment. Every individual now has a role to play in the economy and every company has a choice – commoditise or get connected.

Changes of this magnitude have occurred before. In fact, human societies have always been punctuated by periods of great change that not only cause people to think and behave differently, but also give rise to new social orders and institutions. In many instances, these changes are driven by disruptive technologies – such as the printing press, the automobile and the telephone – that penetrate societies and fundamentally change their culture and economy. Today's Internet – which is really an inter-networked constellation of disruptive technologies – is the most robust platform for facilitating and accelerating new creative disruptions yet. People, knowledge, objects, devices and intelligent agents are converging in many-to-many networks where new innovations and social trends spread with viral intensity. Organisations that have scrambled to come up with responses to new phenomena like Napster, free Internet telephony or the blogosphere should expect much more of the same – at an increasing rate – in the future.

Previous technology-driven revolutions, like the electrification of industry, took the better part of a century to unfold.[30] Today the escalating scope and scale of the resources applied to innovation means that change will unfold more quickly. Though we are still just beginning a profound economic and institutional adjustment, incumbents (both nations and enterprises) should not expect a grace period. The old, hardwired "plan and push" mentality is rapidly giving way to a new, dynamic "engage and co-create" economy. A hyper-competitive global economy is reshaping enterprises, and political and legal shifts loom.

As Europe confronts this changing reality, it must above all ensure that its citizens and businesses can continue to be innovative. The speed and scope of change are intensifying. And the "who, where, what, how and why" of innovation are in flux, across geography and economic sectors.

For individuals and small businesses this is an exciting new era – an era where they can participate in production and add value to large-scale economic systems

30.
Paul David and Gavin Wright, "General Purpose Technologies and Surges in Productivity: Historical Reflections on the Future of the ICT Revolution," *The Economic Future in Historical Perspective, Vol. 13* (Oxford: Oxford University Press, 2003).

'To succeed in this new world, it will not be enough – indeed it will be counterproductive – simply to intensify current stimuli, policies, management strategies and curricular approaches.'

in ways that were previously impossible. For large companies, new models of mass collaboration provide myriad ways to harness external knowledge, resources, and talent for greater success and growth. For society as a whole, we can utilise the explosion of knowledge, collaboration, and business innovation to lead richer, fuller lives and spur economic development for all.

European decision makers should take heed. This is no time to rest on Europe's laurels. Whenever such a shift occurs, there are always realignments of competitive advantage and new measures of success and value. To succeed in this new world, it will not be enough – indeed, it will be counterproductive – simply to intensify current stimuli, policies, management strategies and curricular approaches. Remaining innovative requires Europe to understand both the shifts and the new strategy agenda that follows. Europe must "collaborate or perish" – across borders, cultures, disciplines, and firms, and increasingly with masses of people at one time.