Unlocking the potential for innovation offered by ICTs

Information and communications technologies are already inspiring innovation, but governments need to address the obstacles to access that remain

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What is the potential impact of the diffusion of information and communications technologies (ICTs) on innovation in the global economy? At first view, the question seems simple. Some of the major consequences are reduced cost, time and effort associated with communicating across great distances. The faster and less costly the spread of potentially economically consequential ideas and new knowledge, the faster the pace of innovation, especially in those parts of the world previously cut off from information flows. The questions are only: what barriers to the flow of information and ideas continue to exist, and how might they be attenuated for the benefit of all?

Removing barriers

Not all information and ideas spread via ICTs will result in innovative activity. A good percentage will be for entertainment primarily, to be passively consumed, possibly to the detriment of creative activity and innovation. Also, not everyone who can benefit from the flow of ideas has access to them via ICTs. This lack of access requires addressing the so-called 'digital divide'. A deeper, and related, question is on the ability of people to absorb the information and ideas that are likely to foster innovation. A likely prerequisite is a long history of investment in the development of human capital – for example, through education and training. Moreover, there is the question of what types of innovation will be required in the coming decades, as opposed to where the biggest 'bang for the buck' might be on the supply side.

One of the main barriers is cultural. Linguistic barriers are especially important, since most significant information and ideas are transmitted via text that may be not just in different languages, but in different alphabets and character sets. One of the most important innovations in ICTs – attributable to IBM's desire to sell into the vast Chinese market – was the ability to display most of the world's character sets in standardised formats. However, in providing inexpensive and accurate translation to ease the flow of information, there is still a long way to go.

Much of the knowledge that is important for innovation is tacit. To learn key aspects of how to use and further develop the technology, people need to communicate face to face. Conversion of tacit knowledge into explicit or codified knowledge occurs at a certain point when the technology is maturing. This process is accelerated to some extent when innovators attempt to establish their intellectual property rights (IPRs) by applying for patents and copyrights.

Many national-level indicators of ICT access are strongly correlated with, for example, gross domestic product per capita

The global sharing of patent and copyright applications and final decisions via ICTs is already significant in reducing barriers to information flows. However, licensing fees, and other restrictions on use, are increasing. While there is a global interest in promoting innovation by enforcing IPRs, IPR regimes may need to be reformed to prevent them from institutionalising undesirable barriers to innovation.

One such example is the controversy over patenting parts of the human genome by firms owned by Craig Venter. Similarly, the recent debate on the Stop Online Piracy Act (SOPA) and the Protect Intellectual Property Act (PIPA) in the United States focused on whether IPRs had gone too far in protecting the interests of rights holders while harming those of people engaged in legitimate creative activity, even perhaps creating opportunities for censorship and other restrictions on free speech. The demonstrations against SOPA/PIPA in the United States triggered demonstrations against the Anti-Counterfeiting Trade Agreement (ACTA) in Europe, where the same issue is an integral part of domestic and European politics.

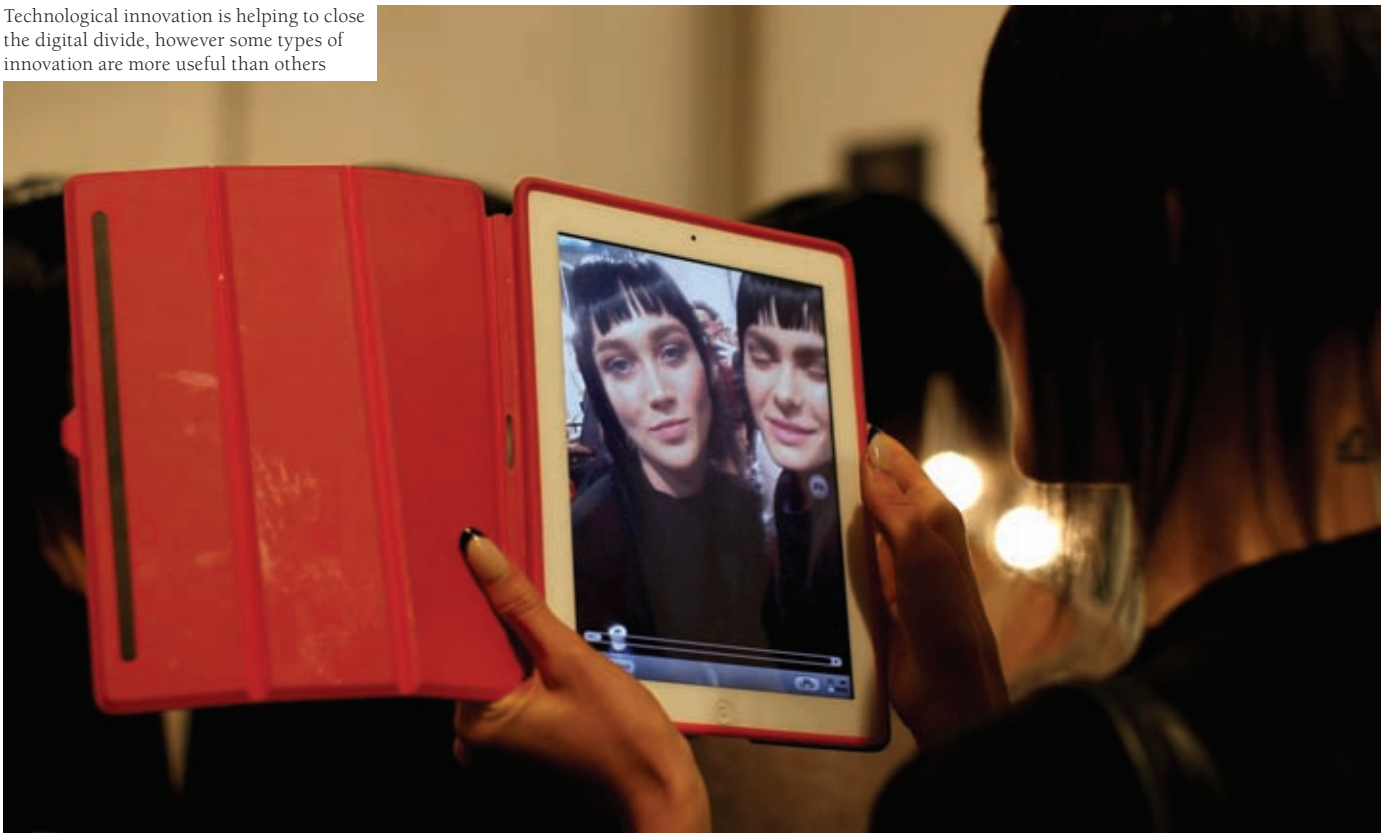
Infotainment versus innovation?

A growing percentage of the traffic carried by the internet, both nationally and internationally, is content shared digitally for the purpose of entertainment and social networking. This includes iTunes audio and video files, YouTube videos, Facebook updates, Twitter tweets and a growing BitTorrent traffic, along with people playing massively multi-user online role-playing games (MMORPGs). While this traffic may make users happy and allow them to make new friendships online, and while there may be some resulting stimulus to the invention of new technologies, it is likely to be somewhat at odds with the flow of information that encourages innovation.

The owners of the infrastructure over which the traffic flows have a clear stake in monetising all traffic, and therefore may like seeing infotainment flows crowd out other traffic because they can charge premium prices for it. The various debates about net neutrality reflect the concerns of the user communities that infrastructure owners will prioritise traffic that they can monetise over other flows. For example, Korea Telecom recently restricted traffic created by cable television and internet services associated with 'Smart TVs' sold by Samsung, hoping that Samsung would contribute to the cost of upgrading Korean infrastructure by sharing revenues with Korea Telecom.

While more than two billion people currently use the internet, in many parts of the world computer and internet access is nonexistent, or connections are too slow and

Smartphones have brought access to information and entertainment on the move, with new services developing at a rapid rate



Technological innovation is helping to close the digital divide, however some types of innovation are more useful than others

intermittent to permit access to valuable and timely information. The digital divide is the latest manifestation of the income and wealth inequalities that existed prior to the diffusion of ICTs. Many national-level indicators of access are correlated with, for example, gross domestic product per capita. The G8's efforts of the past decade to understand the global digital divide – for example, through the work of the Digital Opportunities Taskforce – have shown how difficult it is to bridge the divide in the short term.

Opportunities through innovation

One form of innovation likely to help is the wider use of alternative energy (especially solar and wind power) to ensure that power grids can power information devices reliably. Internet-based educational technologies, such as those created by the Khan Academy, can be applied to reducing the expense of providing high-quality education in the developing world. Inexpensive terminals – scaled-down versions of laptops and tablets – can be made available to schoolchildren. But, in the end, a precondition for success is the commitment to providing basic educational services in the form of teachers and well-equipped schools.

The world certainly needs more innovation, but some types are more useful than others. The current and future market for films will produce more innovations in three-dimensional, higher-resolution images such as enhanced – and virtual reality – technologies. While that innovation will preserve jobs and revenues in a small corner of the world economy, it may have little impact on the rest of it. Innovation in ICTs in general has only recently paid big dividends in the form of higher productivity and growth rates in the advanced industrialised countries. Questions remain. In the near and mid-term future, which areas of science and technology will produce the best return on investments of public revenues in basic research and development (R&D)? While the diffusion of ICTs has changed how science is carried out and technologies are created and commercialised, what areas of innovation in science and technology will generate growth in employment, income and overall welfare?

Other than ICTs, there are growing clusters of innovation in biotechnology, nanotechnology, alternative energy and environmental technology. It is unclear which, if any, of these areas will generate the kind of growth that followed the diffusion of ICTs – or how the diffusion of ICTs can be harnessed to enhance innovation in other areas. So the approach to funding basic R&D that is likely to prevail in most advanced industrialised countries is the one created by Vannevar Bush during and after the Second World War, which involves scientists and engineers competing for research grants and using peer review to assess the quality of grant applications.

Investment in research

Applied R&D is another matter. Major differences in national approaches to funding this type of work will persist, with developmental or catch-up states – such as China – using industrial policies to prioritise areas for public investment.

Private investment will continue to play a major role in inventing and commercialising applied technologies. ICTs may contribute to facilitating new ventures, especially those too small to be of interest to venture capitalists or angel investors, including new services such as Kickstarter.com that connect investors with entrepreneurs for small-scale investments.

Room for international aggreement

To sum up, the diffusion of ICTs can be harnessed to promote innovation. This is already happening. There remain important barriers to access that should be incrementally removed if the political will can be garnered to do so. Some are deeply embedded and likely to resist short-term policy changes, but others – such as better energy grids and diffusion of ICT-based education technologies in the developing world – will be more amenable to short-term improvements.

Governmental policies to promote the diffusion of infotainment services can waste valuable time and resources. That can be left to the market – as long as governments properly monitor their own IPRs and net neutrality policies. Bridging the global digital divide remains a legitimate concern for all governments for the long term.

Differences will remain in national philosophies on priorities for public funding in applied R&D, including funding ICT technologies for innovation outside the ICT cluster. Nonetheless, there is room for international agreements on new technologies, such as alternative energy, that are necessary for solving international problems. ■