Market Opportunities in the Global Information and Communications Markets

A Background Paper for the Aspen Institute Project on International Digital Economy Accords (IDEA)

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Comments from IDEA Members Welcomed

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Contents:

Introduction

This paper explores the market access opportunities and challenges that intertwine the IDEA goals of promoting the "freedom to innovate" and the "freedom of privacy and property protection". As spelled out in the "Framework Paper" for the Aspen IDEA Project, we assume that the global information and communication technology (ICT) market is at an inflection point.[1] Technological trends in modularity (easier mixing and matching of specialized inputs due to common interfaces), the continuing "cheap revolution" in ICT building blocks (such as processing, storage and software), broadband, and convergence are slowing old growth opportunities and opening new ones while creating a new, more competitive market dynamic.

To succeed in this new environment, ICT firms are rolling out innovative products and business models that are tailored to fit the new market opportunities. They will need a policy environment that fosters innovation (including in business models) while safeguarding market access and legitimate public interest considerations.

This paper outlines the market opportunities created by the inflection point and the legacy policies that can hinder these opportunities. It describes principles that might begin the conversation about reforms, but does not advocate specific policy reforms.

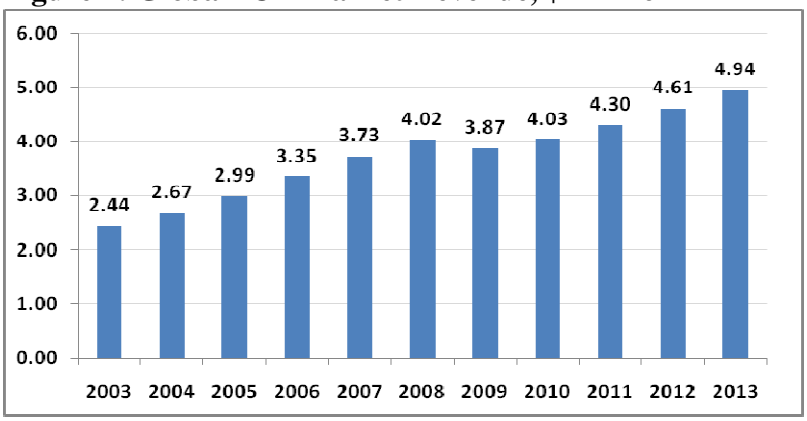
This paper begins with a brief overview of the world ICT market. (Appendices A-D have greater detail.) It then discusses three sets of market opportunities: converged and cross-border information services, applications, and integrated hardware (including cyber security and privacy); network development; and, growing hybrid content and ICT markets by improving IPR protection and content market flexibility.

The World ICT Market at a Glance: Climbing to $5 trillion and 20% of trade

ICT is important because it is a "general purpose technology" (like electric power) that transforms the rest of the economy and because it is a gigantic global market in its own right. We often forget precisely how big it is.

Global ICT market spending is expected to top $4 trillion in 2010, and global spending will likely approach $5 trillion by 2013.[2] (In contrast, the world auto market was approximately $3 trillion in 2007.) Although the service sectors (voice, data and video) remained positive last year, the global economic slowdown, particularly for ICT equipment, made 2009 a challenging year. However, the 2009 ICT market contraction was relatively mild compared to other economic sectors. A strong global rebound in the global ICT market is expected for 2010-2013, projected at a 6.3% compound annual rate.[3] Just as importantly, because the ICT market held up better than the rest of world trade in 2009; as a result, *in 2009 the ICT sector grew as a percentage of global trade, to over 20%*.[4]

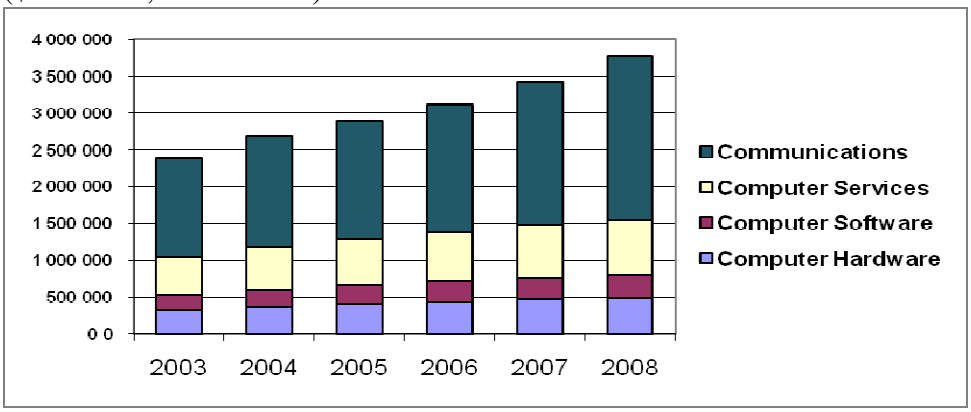
Figure 1: Global ICT Market Revenue, $ Trillion



Source: TIA 2010 ICT Market Review and Forecast

The communications sector continues to lead in global spending. In 2008, communications accounted for 59% of total spending, followed by computer services (19.5%), computer hardware (12.9%), and computer software (8.2%).[5]

Figure 2: Global ICT Spending by Market Segment, 2003-2008
($ Millions, 2008 Prices)



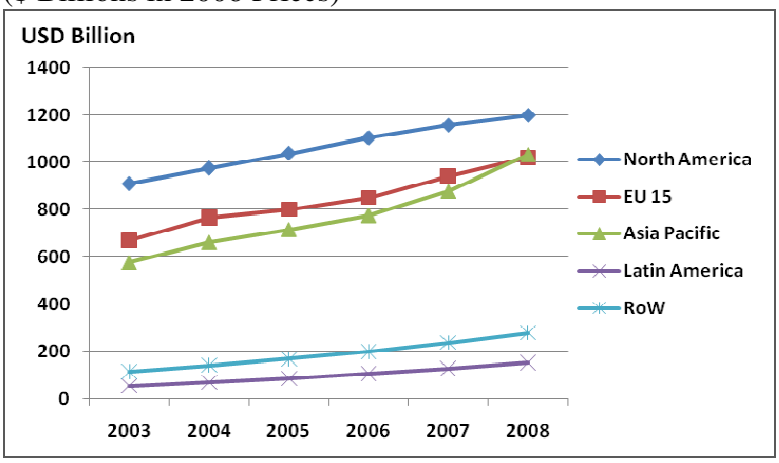
Source: OECD IT Outlook 2008, from WITSA data, based on research conducted by Global Insight, Inc.
Note: "Communications" includes public network equipment (switching, transmissions and mobile infrastructure), private network equipment (handsets and other end-user equipment) and telecom services.

The ICT market is broadening in scope as modularity, convergence and the cheap revolution in components and software expand ICT networks and applications into new sectors. The market is also broadening regionally. Although developed countries still dominate in ICT spending and R&D, the emerging markets are growing rapidly, and emerging market expansion is a key driver for growth. Between 2003 and 2008 the BRIC markets (Brazil, Russia, India and China) grew at 18.2% CAGR, and they will likely grow 8.9% in 2010, well above the global average.[6]

Regionally, North America, Western Europe and the Asia Pacific have the highest overall spending rates (89% of the global total in 2008).[7] Latin America, the Middle East and Africa account for less than 10% of the global total, but growth rates are accelerating in those regions.

Although MEA accounted for just 6% of global spending in 2009, the MEA will likely contribute 17% of net new global ICT expenditure between 2010 and 2012.[8]

Figure 3: Worldwide ICT Spending by Region, 2003-2008
($ Billions in 2008 Prices)



Source: OECD IT Outlook 2008, based on data provided by WITSA.

Market Opportunity #1: Converged and Cross-Border Information Services, Applications and Integrated Hardware

At the inflection point, modularity, convergence and network modernization are opening new markets for information services, applications, and integrated hardware.

First, convergence trends are creating new distribution channels for voice, data, and AV content and opening new growth opportunities for a wide range of market players. At the same time, the value propositions built around traditional markets are shifting rapidly.

- Convergence has allowed incumbent network operators to broaden their service offerings beyond traditional industry divides and open new revenue streams. For example, telecom operators can now offer higher-ARPU data and AV services that are critical contributors to operator revenue as well as voice and voice-related VAS. For example, in 2007 Verizon Wireless data revenue totaled $7.4 billion, one fifth of Verizon's total wireless revenue.[9]

- High-speed broadband offers a new alternative to traditional incumbent-controlled telecom and broadcasting networks that lowers the barriers to entry for voice and AV services. For example, Skype, Google, and other VoIP providers are shaking up the voice market; worldwide mobile VoIP revenue may grow from $100 million in 2009 to $30 billion in 2013.[10] On the broadcasting side, IPTV and Internet video providers are disrupting the traditional media market; global IPTV service revenue may reach $17.5 billion by year-end 2010 and $46 billion by 2014 (a compound annual growth rate of 27%).[11] At the same time, these innovations change the returns and business models for traditional voice and broadcast services.

Second, broadband penetration creates a new market for "cloud" services and applications. Instead of expensive in-house IT hardware and software, consumers can now use web-based application processing and storage services. In addition, network speeds are now fast enough that consumers can access these services in real time. Because pay-per-use services can eliminate large investments needed for traditional in-house IT infrastructure, new market entrants – especially SMEs – can get up and running faster and cheaper, which fuels innovation and development across the economy. This was a key to the successful launch of Salesforce.com.

- On the supply side, cloud innovations lower the barriers to entry across a wide variety of market sectors. In the software sector, cloud-based start-ups can avoid many of the high distribution and sales costs associated with traditional packaged software. Global revenues for cloud software (Software as a Service, or SaaS) totaled $13.1 billion in 2009, and could reach $40.5 billion by 2014 (a compound annual growth rate of 25.3%).[12] By 2012, over 75% of new software market entrants may distribute their products online.[13]

- Overall, cloud services offer huge growth potential: global enterprises may spend $112 billion on cloud services (including cloud software, platforms, and infrastructure) over the next five years.[14] At the same time, they are scrambling the identities of market competitors; Google is the largest carrier of Internet traffic, not a traditional telecom company.

Third, Internet broadband means that emerging services can easily cross national borders. Traditional geographic boundaries no longer limit service providers' access. This trend may provoke regulators to remove the regulatory barriers that divide regions into distinct national markets. For example, in September 2010 the European Parliament proposed European-wide royalty licenses for digital content.

Fourth, IP-enabled services and applications use common interfaces that enable mixing and matching. This flexibility opens niche opportunities for independent, web-based application service providers (ASPs). Larger commercial players are learning that the cultivation of these eco-systems is a key value proposition to consumers. Even companies relying on a walled garden model frequently offer significant opportunities to independent web-based services and application providers. For example, although Apple's platforms are proprietary, they still offer a wide range of opportunities for third-party developers.

Fifth, new applications and services are creating new markets for innovative hardware, and vice versa. The declining costs and time required for specialized integration of capabilities mean that radically new business models and applications are possible. For example, contrary to the conventional wisdom at the time of its introduction, the iPod made money on the hardware while commoditizing the value of its digital music content. The router market is integrating features for an expanding universe of service applications—like health services—into product and software designs.

Just as critically, ubiquitous information services are transforming markets for non-ICT goods. Carrier's climate systems partner with IBM's analytic services to produce continuous

reinterpretation of optimal building climate and energy management. New generations of tractors can switch from broad to narrow plow furrows because GPS systems allow precise plow lines to be exactly duplicated in the tractor's "second pass". Smart mobile medical technologies promise to be one of the biggest frontiers in health care.

Overall, these new service and application markets offer promising growth prospects, but the prospects are not guaranteed. Emerging applications and services are creating new policy dilemmas, and a misguided policy response could stifle innovation and competition. Some of the key challenges and possible policy solutions include:

(1) Regulating Converged Services and Applications: Convergence is creating confusion over how to regulate emerging services. Many new services (such as VoIP or IPTV) fall into a regulatory grey area between the telecom and broadcasting sectors (which are often heavily regulated) and the IT sector (which is largely unregulated). If national regulators apply legacy regulations from traditional telecom and broadcasting to emerging IP services, they will increase costs (for example, by imposing access fees or social obligations such as universal service), extend time to market and stifle innovation and growth. Converged services are becoming so ubiquitous that some degree of regulatory safeguards may be necessary. For example, if consumers use VoIP as a basic telephone service, VoIP providers may need to provide guaranteed access to emergency services such as enhanced 911 (E911).

(2) Addressing cyber security and privacy: Cloud applications and services are creating new cyber security and privacy concerns that will require new policies. Key concerns include security of national infrastructures, customer data security, and privacy. If national regulators respond with unique national rules and technical solutions, cross-border regulatory variation will reduce economies of scale, slow down innovation on technical solutions to these problems, and create the possibility of protectionism masked in cyber security rationales. For example, the European Data Protection Directive (directive 95/46/EC) protects consumer privacy by limiting cross-border data transfers: data cannot flow from one E.U. country into another country (E.U. or non-E.U.) unless the receiving country has an E.U.-approved data protection regime. Approval varies within the E.U. – some states have approval but others have not – so the directive inhibits data transmission not only across regions but also within the E.U. This complex approach to Internet privacy is creating trade barriers in cross-border ICT services. As a result, the E.U. is reportedly falling behind the U.S. in cloud services. In 2009 the U.S. share of the global cloud services market was 60% and E.U. share was just 26%.[15]

Similarly, national security measures may clash with the protection of key commercial assets. When India demands that Huawei reveal its source codes to Indian authorities to protect national security, it sets a precedent that would worry most OECD companies.

The goal is to provide appropriate privacy, service, and security guarantees without inhibiting cross-border data flow and efficient service architectures. More harmonization of international rules and industry norms could establish industry best practices in cloud applications and services. For example, in regard to consumer privacy some suggest that cloud providers can provide service-level agreements (SLAs) promising to notify consumers about privacy leaks, provide geographical information on where servers are located and facilitate easy exit (i.e., data transfer from one provider to another).

(3) Defining Legal Jurisdiction for Cross-Border Services and Applications: Cross-border services and applications are raising questions about legal jurisdiction and trade commitments. For example, in cloud computing, if a customer in one country stores data on a cloud server located in a different country, which government has the right to access that data? Whose privacy rules prevail? Some governments are responding to these concerns by stopping cross-border data flows or requiring local presence for information services. For example, Saudi Arabia is reportedly forcing RIM to install in-country BlackBerry encryption servers (instead of routing Saudi consumer traffic through RIM's Canadian servers). This required local presence could reduce economy of scale for service providers, curb innovative service infrastructures, and increase prices for consumers. Similarly, cross-border cooperation on identity theft is still in its infancy compared, for example, to drug enforcement.

Emerging cross-border services also face another issue. They fall into a trade commitment grey area; they are not fully spelled out in the current GATS, and national regulators may interpret this as leeway to inhibit market access. Alternatively, it gives trade negotiators the liberty to apply a broad interpretation of trade commitments. GATS could be expanded, clarified or re-interpreted to address this new array of emerging ICT services.

(4) Reducing border barriers, protectionist technology policies, redundant testing and other barriers confronting equipment vendors. Many new and emerging services and applications depend on integrated hardware. For example, Apple services, such as iTunes, relied heavily on the innovations brought to market by the underlying Apple hardware. As ICT firms experiment with new business models, it is increasingly important to ensure that not only applications and services but also hardware can travel across international borders. The International Technology Agreement of 1997 greatly reduced border tariff barriers but on-going disputes on coverage on new products have created problems. At the same time, as is frequent with emerging markets as they move to upgrade technology capabilities, there are a variety of measures to encourage indigenous innovation and production that often block market access for foreign firms. The disputes about China's indigenous innovation policies exemplify these issues. In addition, in some markets, redundant testing requirements and other equipment barriers reduce speed to market and increase the costs of innovation, particularly for new entrants, and that can affect not only hardware but also services and applications. For example, Brazilian ICT laboratories must test all technology exports to Brazil, and the extra testing increases import costs and delays time to market. China's 'China Compulsory Certification' (CCC) regulations are another example, as are Russia's special import licenses/testing requirements for encryption technology.

Summary: Examples of Key Principles

- Use caution in imposing restrictive legacy regulations (from traditional telecom and broadcast markets) on IP-enabled services and applications. Seek intermediate steps to begin the adjustment to new realities—e.g., different rules for video on demand versus video by push (traditional broadcast) delivery.

- Use selective international rules and industry norms to help establish industry best practices in cloud applications and services even in the absence of full harmonization. Work to provide appropriate service and security guarantees, which may not be uniform across nations, without inhibiting cross-border data flow. Possible solutions include:
  - Agree that corporate data will be governed by regulations of firm's home country anywhere it operates.
  - Adopt a Safe Harbor approach: Agree that local infrastructure presence is not required, but cloud servers must functionally adhere to national privacy rules. But, do not bar trade (e.g., Korean restrictions on data export).

- Address commerce-restrictive technology mandates and preferences.
  Possible solutions:
  - Reinforce policies that oppose government mandates and support technology neutrality, including for security technologies.
  - Reinforce presumptive obligation to adopt global standards.
  - Reaffirm right of parties to use third party providers of security services and equipment

- Reinforce modular innovation by clarifying rules allowing consumer choice of service, standards, software, and device combinations on all "layers of the stack." For example, promote the right to offer new Internet-enabled services/standards/software: e.g., search/data-analytic and sensor/GPS networks tied to cloud computing and data storage services (energy efficiency services for commercial buildings).
  - Expand, clarify, reinforce, or re-interpret GATS to address this new array of emerging ICT services.
  - Apply non-discrimination rules to cover foreign suppliers for any new service accepted by national governments (by rule or by practice).

- Use new international commitments to legitimate and guide new domestic policy tools to bolster innovation goals. Possible solutions:

  - Speed up and lower the costs of innovation through commitments to multi-country, mutual recognition agreements (MRA) for networked information equipment—depart from bilateral mutual recognition.
    - Condition MRA eligibility upon commitments on "freedom to innovate" and "Internet freedom"?
  - Use industry norms and hybrid government-NGO organizations to facilitate the reconciliation of global commerce and public interest concerns. For example, international councils on network reliability, led by industry and NGOs, may facilitate transparent international approaches to bolstering security and certify the reliability of commercial technologies.
  - Develop agreed principles for regulators in regard to the exchange of traffic among networks that would permit risk premiums for accepting traffic from networks that did not meet network reliability standards.
  - Strengthen mutual law enforcement assistance agreements for cybercrimes, especially identity theft.

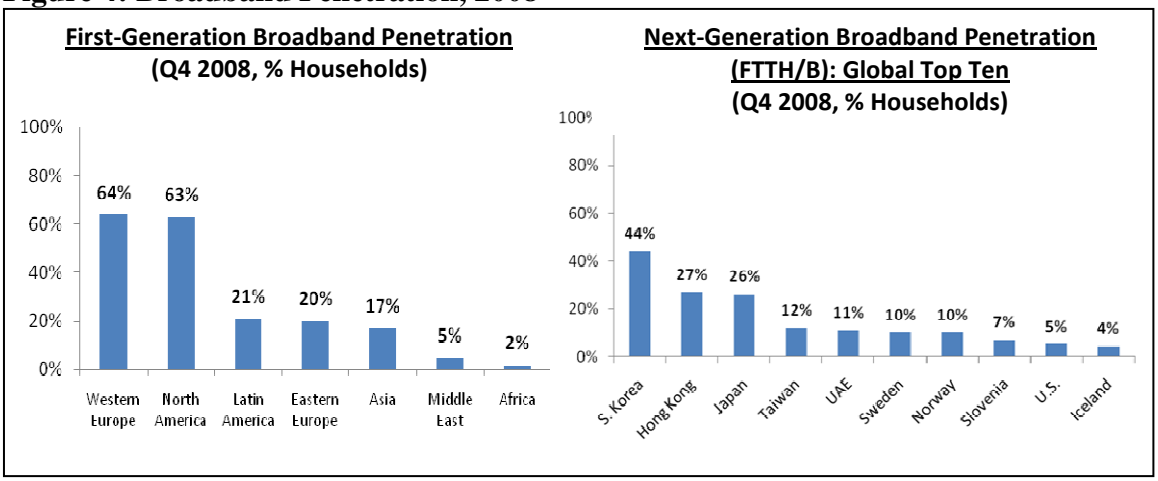
Market Opportunity #2: Reduce Existing Barriers to Network Development

The communications sector still dominates the ICT industry. It is a global market worth approximately US $2.33 trillion in 2010, or 58% of overall global ICT spending.[16] Wireless and broadband will drive strong sector growth for at least the next four years. Global wireless subscribers are expected to grow by 33% between 2010 and 2013 to reach 5.5 billion.[17]

Broadband expansion – fixed and/or mobile – will be critical for overall ICT market innovation. The current wave of new applications and services requires a minimum of basic first-generation broadband connectivity. For example, VoIP, video conferencing, IPTV and basic cloud applications and services require connection speeds in the 512 Kbps – 2 Mbps range. The next wave of new ICT applications and services will require higher-bandwidth (next-generation) connectivity. For example, telepresence, some forms of telemedicine, virtual laboratories, high definition video and grid computing will require connection speeds in the 20-100 Mbps range. Ubiquitous higher speed wireless is essential to many innovations.

Global broadband penetration still is relatively low: as of 2009, global penetration was 7% for fixed broadband and 9.7% for mobile.[18] Most developed countries already have surpassed 50% penetration for first-generation networks. However, even in the developed regions, next-generation (FTTH/B) penetration still is low: South Korea, Hong Kong and Japan are the only countries that surpass 20% penetration; U.S. penetration is 5%.

Figure 4: Broadband Penetration, 2008



Source: Booz and Co. Digital Highways (2009)[19]

Global broadband development will take two directions: by expanding traditional broadband to cover currently unconnected regions and by upgrading networks to NGN bandwidths. However, many network operators are hesitant to invest in further broadband rollouts, particularly next-generation network (NGN) rollouts, for two reasons. First, broadband networks require huge capital expenditures: approximately $100-$150 per customer for first-generation broadband and $300-$2500 per customer for fixed NGN.[20] Second, at the inflection point, business models are changing rapidly, and operators ponder whether they can recoup these

investment costs as they face increasing competition from application and service providers who may invest in IT and routers, but not transmission networks.

The market opportunities from network expansion are dramatic. More people are connected in new ways (fixed and multiple mobile connections for specialized uses per person) and the growth of the Internet of Things (e.g. machine to machine connectivity in sensor networks) require more network investment, huge growth in specialized mobile terminals, and multiple new services.

Policy reforms are needed to facilitate network investment and service applications while opening spectrum resources to support emerging technologies. Key focus areas include:

1. **Restrictions on Market Entry, Pricing, and Investment:** In the pre-inflection point era, the vertically-integrated network landscape guaranteed steady operator returns, and the industry's preferred business models and technology standards changed slowly. In the new market dynamic, technology is changing rapidly, competition is increasing and revenue models are increasingly fragmented. To respond to these changes, operators are experimenting with new business models and new technologies. While policies to assure competition remain essential, it is harder for regulators to predict what innovative combinations these experiments will produce.

First, open network competition is critical. Modularity and convergence are increasing cross-entry and substitution: at the facility layer, network incumbents are competing with cross-over providers from other sectors; at the service layer, incumbents are competing with modular application and service providers. In this market dynamic, continued regulatory limitations on market entry (which exist in many countries) require strong rationales. Competition will be critical for achieving national broadband deployment goals at prices that are acceptable to consumers, particularly in the emerging markets where limited competition and high costs currently make network services unaffordable for many.[21] For example, in many emerging markets, regulators artificially inflate international interconnection fees to protect their domestic operators from international competition and the associated downward pressures on prices. Similarly, the freedom to choose technologies and network architectures is an important feature of Internet networks and traffic management.

Second, as competition increases, pricing flexibility matters more. As competition and service modularity increase, there are benefits from operators having more flexibility to experiment with new pricing schemes, such as multi-sided platforms with different prices for upstream and downstream platform users. Pricing flexibility can also encourage network investment, particularly for the more costly NGN networks, because flexible pricing schemes will give operators new revenue options.

Third, foreign ownership restrictions inhibit competition. Many national regulators still view ICT networks as a public utility infrastructure, and they impose foreign ownership restrictions for security reasons (or to protect domestic incumbents) – some regulators impose explicit FDI caps, others impose regulatory requirements that significantly raise operational risks for the foreign firm. However, even when facilities are owned and operated by domestic incumbents, foreign firms still play a large role by providing equipment, services and

applications. In this environment, FDI restrictions may harm critical goals – such as facilitating network modernization (with technology transfer) and funding new market entrants – without providing measurable service or security benefits.

2. **Improved Rules on Spectrum Resources:** In the pre-inflection point era, centralized spectrum allocation and government-mandated technical standards were the norm; regulators used these command and control systems to limit interference, but technological flexibility and more efficient uses of spectrum are imperative to enable ubiquitous mobile broadband and the new applications and hardware associated with it.

New networks and services will require more spectrum and more flexible use of spectrum. One principle might be to embrace advocacy of a spectrum "property rights" regime that will allow those license holders to lease, swap or sell spectrum among incumbents and new market entrants. For example, the FCC initiated domestic spectrum trading in 2003; the following year Britain's Ofcom followed suit. A complementary principle might be to seek more support for unlicensed (non-interfering) spectrum to facilitate innovation and to lower market entry barriers for niche products. For example, when the FCC opened unlicensed spectrum, it also opened the market space for Wi-Fi.

As innovation on network equipment and mobile terminals proceeds and the scale economies of both markets keep growing, the costs to the slower, less flexible innovation tied to technology specific licenses increases. Welfare losses also rise if a country is cut off from globally accepted standards. Technology neutrality and commitments to globally approved technology standards are examples of principles that might address these issues.

Efficient cross-border networks are also critical for low cost global networking. This may require changes in international spectrum commitments that could improve economies of scale and encourage cross-border services. For example, the European Union is making progress on regional (cross-national) spectrum management, and the US could potentially pursue a similar regional agreement with Canada and Mexico. If initial regional spectrum agreements are effective, the next step could be broader international commitments, perhaps through the WTO.

3. **Expand Access to Critical Network Resources:** In an increasingly modular market dynamic, the identity of network operators is changing. For example, voice competition depends on open access to numbering resources –geographic telephone numbers and number portability are critical for competitive VoIP services. However, some national regulators do not grant VoIP providers the same numbering resources allocated to traditional basic telecom providers. Such discrimination inhibits VoIP service development and market competition. Similarly, terrestrial landing points for undersea fiber optic cables are often sharply limited by seafloor terrains. Therefore, "landing stations" often are quasi-monopolistic resources. Whether numbers or access to landing stations, non-discrimination principles are important tools for public policy.

Summary: Examples of Key Principles

- Legacy policies can hinder network competition, innovation and investment. When competition is strong, regulators should allow market forces to determine market entry, pricing, and investment. Where intervention is needed, regulators should use a "light hand" to avoid locking out innovative new technologies and business models.

- Market flexibility and technological neutrality should be the cornerstones of spectrum policy. Measures enhancing these policies could be advanced through the WTO.

- Scarce network resources (e.g. numbers and landing stations) may require regulation to assure non-discriminatory access to promote competition in services.

- Regulatory intervention should encourage freedom of network architectures and technological experimentation, including freedom to use globally recognized technologies instead of national standards.

- International policies should encourage more flexible national and cross-national spectrum markets and networks.

Market Opportunity #3: Growing Hybrid Content and ITC Markets by Reinforcing IPR and Content Market Flexibility

Modularity and broadband expansion are opening new market opportunities for digital content, thereby spurring both hardware and service innovations. The iPhone and iPad symbolize the explosive interaction of hardware and social networking with media and information services. Online advertising fuels many of the new service revenue models. *In 2007, global revenue for the digital content market (gaming, video, music, and advertising) reached approximately $43 billion, and could surpass $180 billion by 2015.*[22]

Online advertising is the largest contributor to overall digital media revenue. Global online advertising revenue is expected to reach $103 billion by 2015 and U.S. revenue will likely account for almost half of the global total.[23]

Today, digital content consumption is accessed mainly from PC's and other IT devices connected to broadband Internet networks. Online markets for digital gaming, video, music, and advertising all are growing at double-digit rates. Handset innovations and expanding mobile bandwidths are improving user mobile media experiences, so the contribution of mobile revenues should continue to grow significantly. For example, mobile video revenues in the U.S. market are expected to more than double from $548 million in 2010 (23.9 million users) to $1.3 billion in 2014 (56.7 million users).[24]

Table 1: Digital Content Market Size and Growth, 2007 or Latest Available Year

	Computer and Video Games	Film and Video	Music	Advertising
Global Revenues (Offline + Online)	$37.5 billion	$84 billion	$30 billion	$445 billion
Market Growth (Offline + Online)	19% (2006-07)	4% (2006-07)	–6% (2006-07)	5% (2006-07)
Global Online Revenues	$6.5 billion Most new games are Internet-enabled	Marginal	$4.7 billion	$31 billion
Online Market Growth	28% (2006-07)	>100% (2006-07)	27% (2006-07)	28%(2006-07)
Share of Online in Total	17%	Marginal (< 1% in most markets)	16%	7.5%

Source: OECD IT Outlook 2008

But, even as digital modularity and broadband expansion opens new opportunities in the white market, these same trends are raising new challenges for rights-holders by facilitating counterfeit production and distribution in the black market. Some estimate that the commercial value of pirated software totaled $51.4 billion in 2009.[25]

Non-discriminatory access to a wide variety of content distribution channels is growing in importance as content providers experiment with new business models that leverage speed to market, value-added specials, and other incentives to counter the losses from IP theft. For example, due to foreign investment restrictions in the Chinese television sector, Disney cannot launch a Disney TV channel in China, limiting its ability to generate additional revenue streams in a market where rampant counterfeiting significantly erodes their white market revenue from DVD sales. Similarly, if market access barriers inhibit cross-border software as a service (SaaS), those barriers will limit the software sector's ability to leverage cloud computing as an alternative to the packaged software business (where piracy is eroding global market share).

Counterfeiting also plagues the equipment side and limits the market value from content-hardware integration, particularly in emerging markets. Counterfeit handsets and IT equipment often come pre-loaded with malware, pose safety hazards (e.g., from exploding batteries and excessive RF emissions in mobile handsets), and have a higher rate of technical failure compared to the branded versions. Counterfeit equipment endangers consumers' data privacy and security, and reduces consumer access to integrated services and content. For example, Chinese counterfeiters churn out *shanzhai* versions of the iPhone, iPod, and iPad that do not use the Apple iOS and therefore cannot access the Apple storefront thereby reducing market access for digital music, video, and games sold on the Apple platform. (The iPad clone reportedly runs on pirated Windows 7.)

In sum, although digital migration is creating a wave of new growth opportunities, it also raises new challenges. New solutions are needed to reduce copyright infringement and other challenges associated with the migration to digital content. Key focus areas include:

Legacy Licensing and Royalty Regimes

AV licensing regimes have not adjusted to facilitate global distribution over ICT networks, limiting the available avenues for legal content distribution. For example, current rigid licensing and royalty regimes raise transaction costs for alternative distribution channels (i.e., digital distribution over the Internet from content provider to consumer, or exchange among third parties). In general, AV content distribution rights are difficult to obtain and are divided along national boundaries. As a result, distributors face high transaction costs, especially for cross-border distribution. High transaction costs often limit legal distribution and/or raise end user costs above consumers' accepted price points, thus limiting market demand. Policy changes and new industry supported capabilities may be needed to allow markets to find more efficient transaction models that also protect IP rights.[26]

Privacy Concerns related to Behavioral Targeted Advertising

Online advertising is essential to new ICT revenue models but it raises new privacy concerns because behavioral targeting may gather personal information without ex ante consumer consent. New principles and standards may be needed to clarify the distinction between public and private consumer data. For example, Canada's Interactive Advertising Bureau (IAB) – an industry-led forum that establishes national best practices for behavioral advertising – proposes a range of best practices including notifying consumers when they visit a website that uses behavioral targeted advertising and providing clear directions for opting out by adjusting browser preferences.[27] These IAB best practices apply to general consumer information such as browsing history; Canada's Personal Information Protection and Electronic Documents Act (PIPEDA) already bans advertisers from collecting consumers' personally-identifiable information (PII) without explicit ex ante consent.

New Institutions and Norms for Digital Copyright Policing

International agreements on best practices and rules for addressing copyright infringement over digital networks are desirable to allow global intermediaries to reconcile varying national expectations. Since many of these products – particularly software and digital media content – are distributed over Internet networks, ISPs and other Internet intermediaries may need to be involved in an enforcement role. However, maintaining a clear distinction between digital content and network transmission is needed: some form of safe harbor could help balance efforts to protect IPR while facilitating international distribution.

If ISP's carry enforcement responsibilities, the OECD seems to be agreeing that those responsibilities should be ex post, not ex ante. ISPs should not be required to police the content transmitted over their networks (e.g., Google in Italy), but they might respond to complaints of copyright infringement ("notice and takedown"). There is a major debate over how to frame rules that force ISPs to disconnect repeat copyright infringers (e.g. "three strikes" provisions). More broadly, the policy challenge is how to protect IP more vigorously without inadvertently incenting business models that do not adapt in a timely fashion to the modular digital environment.

New Ways to Address the Increase in Counterfeit ICT Equipment

As ICT products become more modular, black market producers will create counterfeit versions that look and feel like the originals and interoperate with other layers of the ICT stack. Many counterfeit products are so sophisticated that consumers may not realize that they are buying counterfeits. For example, even the U.S. military is struggling to identify and remove counterfeit IT components from the defense supply chain. As counterfeit equipment grows more sophisticated and pervasive, new measures are needed to help consumers differentiate between the branded and counterfeit versions and avoid the security threats associated with the latter.

Summary: Key Principles

Many of the principles that are critical for fostering these opportunities have been reviewed previously. These principles focus especially on services and public interest obligations.

- Create a more effective "white market" for digital products to compete against the growing "black market." Possible solutions include:
  - Affirm freedom to distribute digital products coupled with respect for IPR (e.g., Disney in China).
  - Do not quibble on the definition of digital goods and services: Seek regulatory or trade commitments that all methods of delivery (e.g., downloaded software and e-books) will be treated equivalently and that national treatment will be granted on all forms of domestic liberalization for digital content.

- Establish new privacy rules that ensure that online advertising does not undercut consumer privacy. Examples:
  - Improve transparency and establish minimum regulatory safeguards; avoid restrictive intervention.
  - Embrace best practices, such as Canada's PIPEDA which stipulates the types of consent that advertisers must obtain before gathering and sharing consumers' personal information.

- Move toward harmonized international agreements on the best ways to address copyright infringement over digital networks.
  - Maintain a clear distinction between digital content and traffic. Do not impose ex ante legal liability on network operators and intermediaries.
  - Strike a balance between protecting IPR and facilitating distribution of ICT products. Look to existing best practices: the U.S. Digital Millennium Copyright Act safe harbor regime and Canada's notice forwarding regime.

- Make certain that the views of emerging market countries are considered and addressed when negotiating international copyright enforcement agreements.

Data Appendices A Through D

Appendix A: ICT Market Overview

Table A1: Total OECD ICT Spending, 2003-2008
($ Millions in 2008 Prices)

	2004	2005	2006	2007	2008
Australia	38 499	41 619	45 781	53 825	60 099
Austria	16 828	17 978	18 748	20 802	22 833
Belgium	21 303	22 117	23 355	26 201	28 891
Canada	63 547	70 848	77 657	84 863	92 136
Czech Republic	8 343	9 516	10 692	12 401	14 503
Denmark	14 269	14 989	16 345	18 203	19 972
Finland	10 661	10 562	11 285	12 604	13 777
France	122 630	127 851	135 526	147 174	159 188
Germany	169 313	176 329	185 550	205 648	222 860
Greece	13 573	13 716	14 859	16 917	19 077
Hungary	6 341	6 752	7 119	8 212	9 108
Iceland	..	..	..	..	..
Ireland	11 339	12 403	13 512	15 279	16 937
Italy	101 063	103 701	109 674	122 125	132 955
Japan	304 749	310 019	308 133	313 737	350 470
Korea	51 018	56 661	62 392	68 517	73 144
Luxembourg	..	..	..	..	..
Mexico	27 195	30 878	36 151	40 910	45 880
Netherlands	40 671	42 575	46 028	50 534	54 977
New Zealand	5 976	6 466	6 552	7 760	8 449
Norway	12 399	14 053	15 150	17 219	19 464
Poland	14 773	16 594	20 238	25 190	32 081
Portugal	10 883	10 963	11 532	12 649	13 990
Slovak Republic	2 746	3 167	3 552	4 515	5 476
Spain	56 971	62 599	69 457	78 838	88 258
Sweden	23 567	24 443	26 026	28 918	31 695
Switzerland	29 101	30 050	31 861	34 069	37 522
Turkey	21 266	25 849	29 354	36 067	43 907
United Kingdom	151 811	161 085	169 174	186 873	194 107
United States	884 063	936 894	988 859	1 030 754	1 061 394
OECD Total	2 234 895	2 360 681	2 494 562	2 680 804	2 873 150
World	**2 677 348**	**2 884 260**	**3 112 670**	**3 433 397**	**3 786 380**

OECD Share	**83%**	**82%**	**80%**	**78%**	**76%**
North America	974 805 (36%)	1 038 621 (36%)	1 102 667 (35%)	1 156 527 (34%)	1 199 410 (32%)
Latin America	70 138 (3%)	88 320 (3%)	107 259 (3%)	129 730 (4%)	153 122 (4%)
Western Europe	827 646 (31%)	871 265 (30%)	927 436 (30%)	1 030 121 (30%)	1 120 410 (30%)
Eastern Europe	71 959 (3%)	84 820 (3%)	102 903 (3%)	127 514 (4%)	152 398 (4%)
Asia-Pacific	661 739 (25%)	716 174 (25%)	775 377 (25%)	877 776 (25%)	1 032 376 (27%)
RoW	71 060 (3%)	85 060 (3%)	97 028 (3%)	111 729 (3%)	128 665 (3%)
Computer Hardware	369 112	405 586	436 999	465 706	489 886
Computer Software	228 525	252 827	275 174	295 812	311 083
Computer Services	585 452	631 032	674 446	711 678	739 252
Communications	1 494 259	1 594 816	1 726 051	1 960 201	2 246 159

Source: OECD Information Technology Outlook 2008, based on data provided by WITSA.

Table A2: Emerging Economy ICT Spending by Segment, 2003-2008 ($ Millions in 2008 Prices)

	2004	**2005**	**2006**	**2007**	**2008**
IT HARDWARE					
Emerging Market Total:	**39,781**	**47,325**	**54,478**	**62,267**	**69,055**
China (%)	18,605 (47%)	22,023 (47%)	25,027 (46%)	29,355 (47%)	33,014 (48%)
Hong Kong, China	1,669	1,749	1,947	2,005	2,099
Chinese Taipei	2,612	2,770	2,911	3,032	3,160
India	5,189	6,334	7,760	9,273	10,460
Russian Federation	4,467	5,552	6,497	7,317	8,092
Brazil	5,319	6,629	7,770	8,531	9,231
South Africa	1,920	2,268	2,566	2,754	2,999
SOFTWARE					
Emerging Market Total:	**11,882**	**15,570**	**19,050**	**22,620**	**25,807**
China (%)	5,542 (47%)	7,878 (51%)	9,937 (52%)	12,315 (54%)	14,376 (56%)
Hong Kong, China	355	380	430	444	463
Chinese Taipei	839	912	981	1,029	1,072
India	1,066	1,351	1,664	1,988	2,239
Russian Federation	1,520	1,905	2,306	2,701	3,063
Brazil	1,436	1,776	2,089	2,300	2,510
South Africa	1,124	1,368	1,643	1,843	2,084
IT SERVICES					
Emerging Market Total:	**24,100**	**30,842**	**37,645**	**44,352**	**50,245**

China (%)	9,814 (41%)	13,657 (44%)	17,266 (46%)	21,347 (48%)	24,783 (49%)
Hong Kong, China	757	790	891	912	945
Chinese Taipei	1,527	1,605	1,706	1,777	1,833
India	3,777	4,328	5,065	5,855	6,391
Russian Federation	2,102	2,725	3,387	4,034	4,634
Brazil	3,988	5,111	6,120	6,826	7,554
South Africa	2,135	2,626	3,210	3,601	4,105
COMMUNICATIONS Emerging Market Total:	**220,222**	**258,982**	**300,964**	**378,480**	**487,450**
China (%)	116,149 (53%)	128,901 (50%)	153,606 (51%)	191,337 (51%)	255,022 (52%)
Hong Kong, China	5,869	5,830	6,249	6,435	7,009
Chinese Taipei	14,582	14,886	14,860	15,542	17,063
India	21,976	30,301	32,648	48,531	65,514
Russian Federation	19,648	23,568	29,934	39,094	47,690
Brazil	29,689	38,846	46,001	58,289	73,695
South Africa	12,309	16,650	17,666	19,252	21,457
TOTAL ICT Emerging Market Total:	**295,983**	**352,719**	**412,136**	**507,719**	**632,554**
China (%)	150,110 (51%)	172,459 (49%)	205,836 (50%)	254,353 (50%)	327,194 (52%)
Hong Kong, China	8,650	8,750	9,516	9,796	10,516
Chinese Taipei	19,560	20,174	20,457	21,380	23,128
India	32,008	42,314	47,138	65,648	84,604
Russian Federation	27,736	33,749	42,124	53,146	63,478
Brazil	40,432	52,362	61,980	75,946	92,990
South Africa	17,487	22,911	25,085	27,450	30,644

Source: OECD Information Technology Outlook 2008, based on data provided by WITSA.
Note: Data for 2008 are forecast.

Appendix B: Trade in ICT Goods

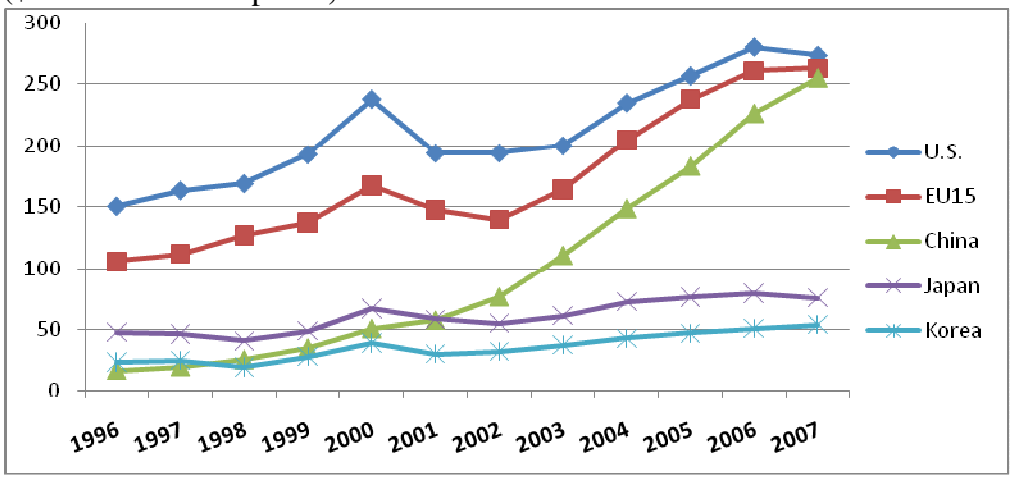
Tradable ICT goods include computer equipment, electronic components, communication equipment, AV equipment, and software. (OECD 2008 definition)

The United States is the biggest importer of ICT goods ($273 billion in 2007), followed by the EU 15 ($263 billion), China ($255 billion), Japan ($76 billion) and Korea ($54 billion).

China is the biggest exporter ($356 billion in 2007), followed by the EU 15 ($176 billion), the U.S. ($165 billion), Japan ($112 billion) and Korea ($97 billion).

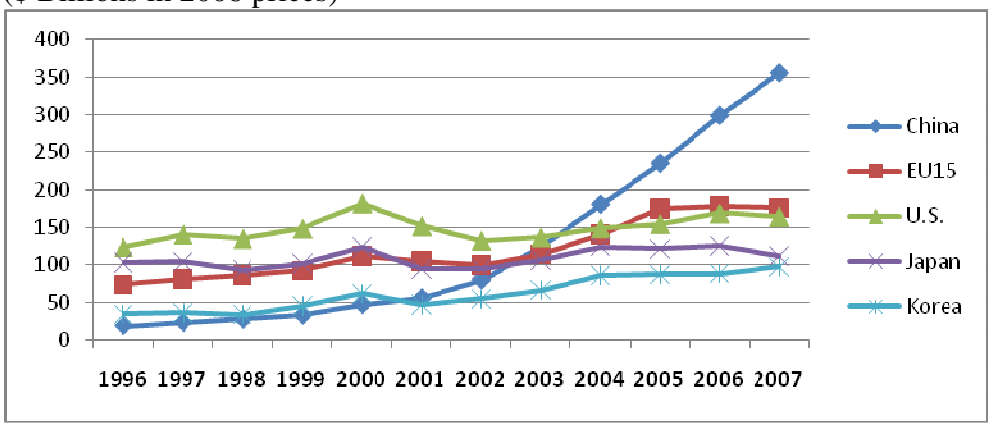
Non-OECD markets are steadily growing as ICT goods importers and exporters.

Figure B1: Top Importers of ICT Goods, 1996-2007
($ Billions in 2008 prices)



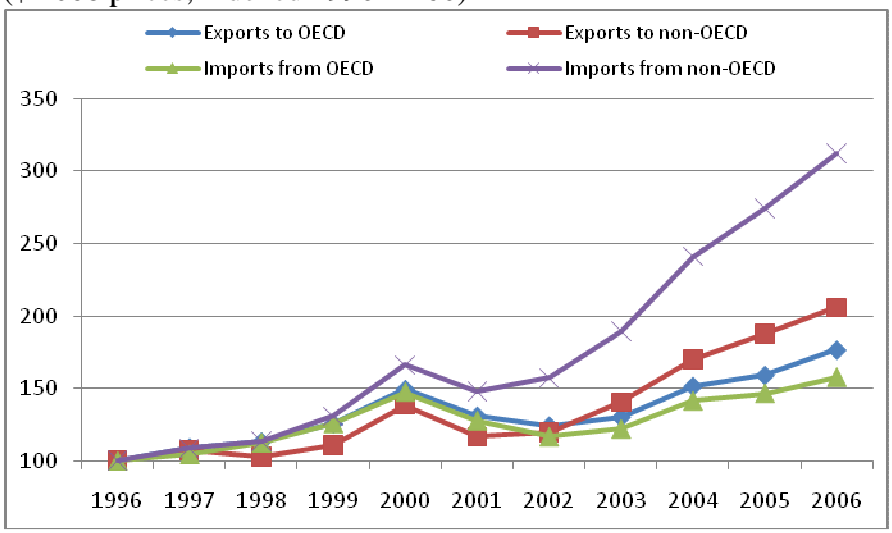
Source: OECD IT Outlook 2008.

Figure B2: Top Exporters of ICT Goods, 1996-2007
($ Billions in 2008 prices)



Source: OECD IT Outlook 2008.

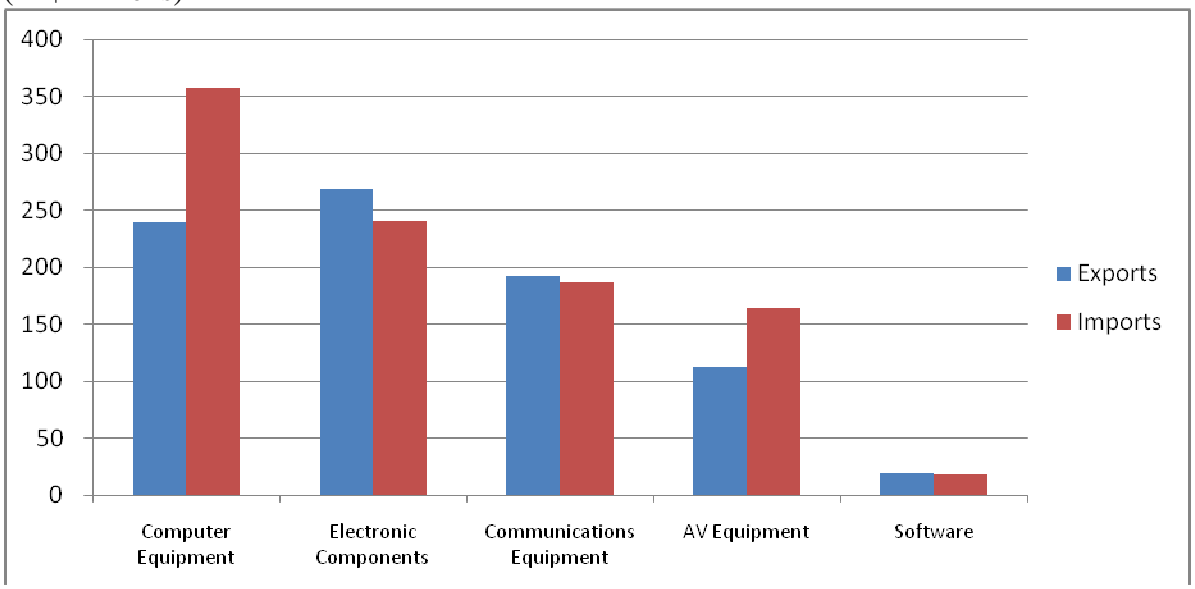
Figure B3: Direction of OECD ICT goods trade, 1996-2006
($ 2008 prices, indexed 1996 = 100)



Source: OECD IT Outlook 2008.

Within the OECD, computer equipment dominates ICT goods trade (30% of the 2006 total trade in ICT goods), followed by electronic components (26%), communication equipment (21%), AV equipment (15%) and software (2%).

Figure B4: OECD Trade in ICT Goods, 2006
(In $ Billions)



Source: Compiled from data in the OECD IT Outlook 2008.

Appendix C: Trade in ICT Services

Tradable ICT Services include (1) Computer and information services (databases, data processing, hardware consultancy, software implementation, maintenance and repair of computers and peripheral equipment) and (2) Telecommunication services (transmission of sounds, images or other information via telephone, telex, telegram, cable, radio or television, satellite, electronic mail, facsimile, etc., including network communications, teleconferences and support services). Some datasets also include post and courier services. (OECD 2008 definition)

Within the OECD, trade in ICT services increased at about 13% per year from 1996 (total $70 billion) to 2006 (total $235 billion). These figures include post and courier services in communications services. [Table 4]

In computer and information services, India was the largest exporter in 2006 ($29 billion), followed by Ireland ($20.7 billion), the U.K. ($11.9 billion), the U.S. ($10.1 billion) and Germany ($9.4 billion). The U.S. was the largest importer of computer and information services in 2006 ($11 billion), followed by Germany ($9 billion), the U.K. ($4.9 billion) and the Netherlands ($3.7 billion).

In communication services, the U.K. was the largest exporter in 2006 ($7.8 billion), followed by the U.S. ($6.6 billion), Germany ($4.3 billion), the Netherlands ($4 billion) and France ($3.7 billion). The U.K. is also the largest importer ($7.3 billion), followed by Germany ($6.1 billion) and the U.S. ($5.2 billion).

Information regarding subsequent chart:
Source: OECD IT Outlook 2008, using data from OECD Statistics on International Trade in Services, Volume I, detailed tables by Service Category, Sept. 2008.
Note: Communication services include telecommunications, postal and courier services. Computer and information services include IT and subscription services

Table C1: Trade in ICT services, 1996-2006
($ millions in 2008 prices)

	Communications		*Computer & Information*		*Communications*		*Computer & Information*	
	Exports 1996	*Imports 1996*	*Exports 1996*	*Imports 1996*	*Exports 2006*	*Imports 2006*	*Exports 2006*	*Imports 2006*
Australia	752	843	167	173	641	657	1 049	922
Austria	338	362	84	171	1 350	1 096	1 501	1 059
Belgium	..	..	..	..	2 039	1 596	2 848	1 979
Canada	1 282	1 243	788	529	2 302	1 955	4 033	2 020
Czech Republic	77	63	28	22	436	453	885	538
Denmark	..	..	..	..	801	763	1 216	1 491
Finland	155	194	888	615	432	544	1 488	1 126
France	582	417	509	482	3 698	2 076	1 936	1 966
Germany	2 025	2 692	1 602	2 379	4 318	6 146	9 385	8 947
Greece	71	78	362	55	385	359	203	254
Hungary	42	24	93	58	389	411	485	543
Iceland	23	24	17	2	12	46	89	17
Ireland	86	254	105	306	515	945	20 682	656
Italy	536	944	207	590	3 159	4 585	873	1 699
Japan	1 378	1 869	1 223	2 443	436	733	966	3 126
Korea	643	706	6	76	466	778	240	773
Luxembourg	..	..	..	..	1 363	1 340	2 210	668
Mexico	846	..	..	..	466	107	..	..
Netherlands	648	668	638	651	4 002	3 487	3 902	3 746
New Zealand	..	..	29	58	..	195	184	270
Norway	216	172	122	149	388	299	1 239	1 200
Poland	315	203	28	135	385	456	409	584
Portugal	275	168	40	110	679	471	186	300
Slovak Republic	20	19	8	16	255	98	170	200
Spain	642	443	1 279	976	1 411	2 239	3 961	2 094
Sweden	166	127	121	119	1 602	1 754	3 567	2 245
Switzerland	516	727	..	..	1 101	802	..	..
Turkey	0	74	..	..	416	296	11	14
United Kingdom	1 652	2 094	1 705	518	7 835	7 304	11 949	4 889
United States	3 543	8 792	2 775	422	6 578	5 163	10 096	11 092
OECD	**..**	**..**	**14 296**	**12 839**	**..**	**47 151**	**85 764**	**54 418**
Emerging economies								
Brazil	227	91	4	112	205	102	102	2 005
China	315	134	..	..	738	764	2 958	1 739
India	..	..	..	..	2 191	899	29 186	2 199
Indonesia	278	187	..	..	1 103	571	118	596
Russian Federation	563	365	..	..	803	917	632	613
South Africa	86	126	..	..	305	246	129	127

Appendix D: The Growth of the Digital Media and Ad Market

Gaming

In August 2010, according to Avista Partners, the global public company market cap for online gaming reached $23.4 billion (22% market share) and $8.2 billion for mobile gaming (7.8% market share).[28] A variety of factors combined to drive consumer uptake in online and mobile gaming: network bandwidths are expanding for both fixed and mobile networks, data costs are falling, and handsets are becoming more advanced (improving the mobile gaming experience). In addition, integrated platforms and application stores are lowering market entry barriers for game developers, increasing market competition, and creating new incentives to innovate. As a result new games at favorable price points are flooding on to the market.

For example, the Apple platform and application store is fueling interest in mobile gaming. Since Apple launched the iPhone App Store in July 2008, developers sold more than 30,000 iOS games. As a result, the Apple OS gaming platform (including the iPhone and iPod touch) expanded its share of the total gaming market (offline and online) from 1% ($110 million) in 2008 to 5% ($495 million) in 2009.[29]

Video (Films and Television Programming)

From 2008 to 2009 U.S. consumer spending on digital video increased 36.5% from $214 to $292 million.[30] The digital retail (Electronic Sell Thru or EST) and digital rental (video-on-demand or VoD) markets could grow at compound annual growth rates of 18.5% (retail) and 31% (rental) over the 2010-2014 period.[31] If so, they would reach a combined market total of $944 million by 2014. This growth is poaching market share from traditional distribution chains. For example, according to data from PWC, the digital migration reduced entertainment DVD sales by 5.9% in 2009.[32]

As in the gaming and music sectors, the Apple platform is a strong market player. Apple was the largest U.S. online movie provider in 2009 (63% of the market), followed by Microsoft (20%), Sony (8%), Amazon (6%), and Sonic Solutions (3%).[33]

Music

The global digital music market could reach $32.5 billion in 2014.[34] According to IFPI, approximately 20% of recorded music sales were to digital platforms in 2009, up from 15% in 2007, thereby driving new service models.[35] Cloud-based mobile music provider MOG offers subscription music services to iPhone and Android mobile devices for $10 per month.

Advertising

As consumers migrate to digital gaming, video, and music, the advertisers follow. According to the Interactive Advertising Bureau (IAB), U.S. online advertising revenues reached

$23 billion in 2008.[36] Google is the clear U.S. market leader with ad revenue of $6.6 billion in 2008 (28% market share), followed by Yahoo at $3.3 billion (14% market share), and MSN at $1.8 billion (8% market share).[37]

Online advertising offers a competitive advantage over traditional print and TV ads because websites can monitor consumer behavior and target specific viewing markets based on their browsing history. Websites can also use pay-per-click pricing models to link ad fees to actual ad performance, and that creates significant cost savings for advertisers.

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[13] Ibid. IDC also predicts that by 2014, approximately 34% of all new business software purchases will be via SaaS, and SaaS delivery will constitute about 14.5% of worldwide software spending across all primary markets.
[14] Gartner predicts that worldwide cloud service revenue will grow from $58.6 billion in 2009 to $68.3 billion in 2010 (a 16.6 increase) and reach $148.8 billion in 2014. "Gartner Says Worldwide Cloud Services Market to Surpass $68 Billion in 2010," Gartner Press Release, June 22, 2010, available at: http://www.gartner.com/it/page.jsp?id=1389313.
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[20] Ibid. In contrast, narrowband capital expenditures are just $20-$50 per customer.
[21] Broadband access fees are particularly high in the Middle East and Africa. In 2008, MEA access fees averaged US $54/month. In contrast, the U.S. average was $39/month, and the Asia Pacific average was just $17/month. *TIA 2009 ICT Market Review and Forecast,* MEA Market Preview available at: http://www.tiaonline.org/images/mrf/Chapter5_2009MRF_preview.pdf.
[22] 2015 estimate is an extrapolation based on these global forecasts: Magna Global: $103 billion online advertising sector by 2015; IE Market Research: $32.5 billion digital music sector by 2014; eMarketer: $1.3 billion mobile video sector by 2014; In-Stat: $4.5 billion online video sector by 2012; Pyramid Research: $18 billion mobile gaming sector by 2014; Strategy Analytics: $24 billion online gaming sector by 2013.
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[25] "Seventh Annual BSA/IDC Global Software Piracy Study: 2009," May 2010, Business Software Alliance (BSA), available at: http://portal.bsa.org/globalpiracy2009/studies/globalpiracystudy2009.pdf
[26] A related issue is that convenience makes it much easier to convince consumers to pay for digital media content. In the online media markets, usage limitations (e.g., the inability to play downloaded films and video on multiple devices) may push consumers toward lower-return singles purchases: music singles instead of albums, and video-on-demand instead of download-to-own. Some analysts question whether DRM systems will meet the consumer challenge.
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