

# Introduction

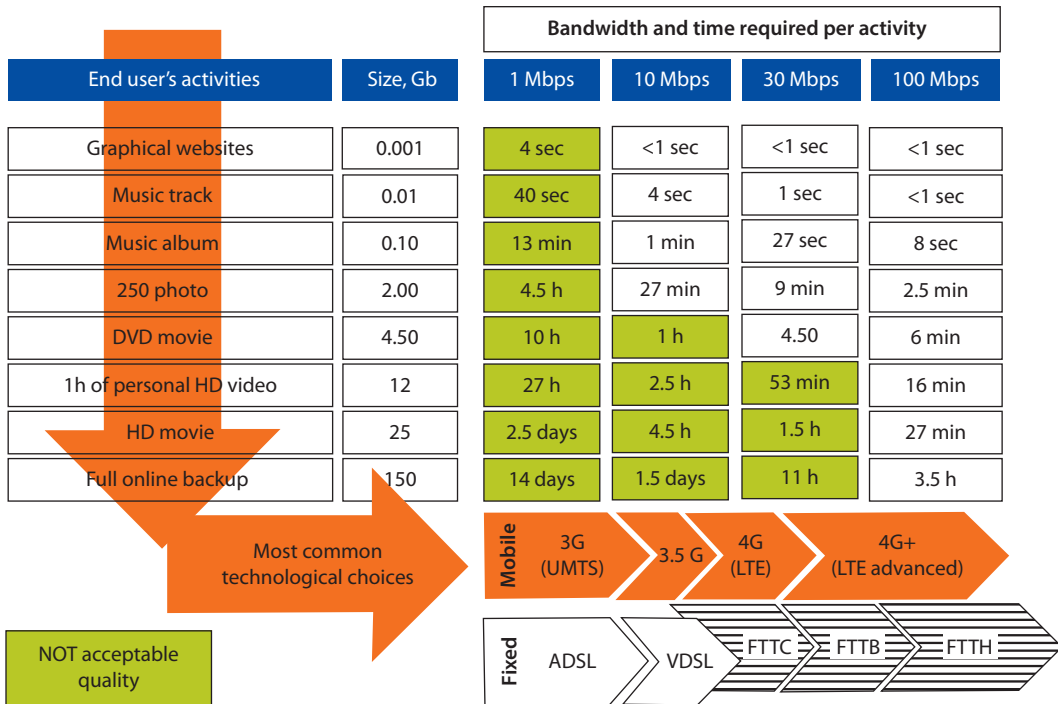
### Objective and Structure of the Study

Broadband generally refers to a telecommunications connection that is “always on,” as opposed to a “dial-up” connection via the public switched telephone network (PSTN) to activate an Internet connection, and with speed rates higher than the rates obtained with a dial-up modem. The commonly accepted definition of bandwidth rates for broadband, according to the International Telecommunication Union (ITU), is at least 256 kilobits per second (kbps). This definition of broadband (“always on,” download speed rates higher than 256 kbps) will be used throughout this study (ITU 2010, 2011).

There are indications that this definition may change over time. For instance, countries around the world have started to include in their national broadband plans an objective in terms of so-called fast broadband (FB) and/or ultra-fast broadband (UFB). Again, the definitions of FB and UFB vary according to the specific plan and country context. So far, no common definition has been established internationally. However, FB and UFB have to do with new and evolving high-speed technologies, such as fiber-optic cables, fourth generation of mobile telecommunications technology (4G), Worldwide Interoperability for Microwave Access (WiMax), and so on, and refer respectively to bandwidth rates typically of about 30 megabits per second (Mbps) and 100 Mbps and above.

Another varying factor is the type of consumer whose needs and usage of broadband Internet can differ and change over time. To satisfy increasing and diversified demand for services and applications, countries could use many fixed and mobile broadband technologies separately or in combination to potentially meet the various demands (see figure 1.1). The deployment of different technology options has implications in terms of network topography, network costs, speed, and quality available to the customer and, particularly important for the developing country context, consumer prices.<sup>1</sup> In addition, two technology trends have increased the number of possible wireless access network options. The first is the emergence of hybrid access models, for example fiber-to-the-cabinet (FTTC), combined with wireless access to reach the end user. The second requires innovation in consumer terminal equipment facilitating the last

**Figure 1.1 Broadband Consumer Needs and Technology Options**

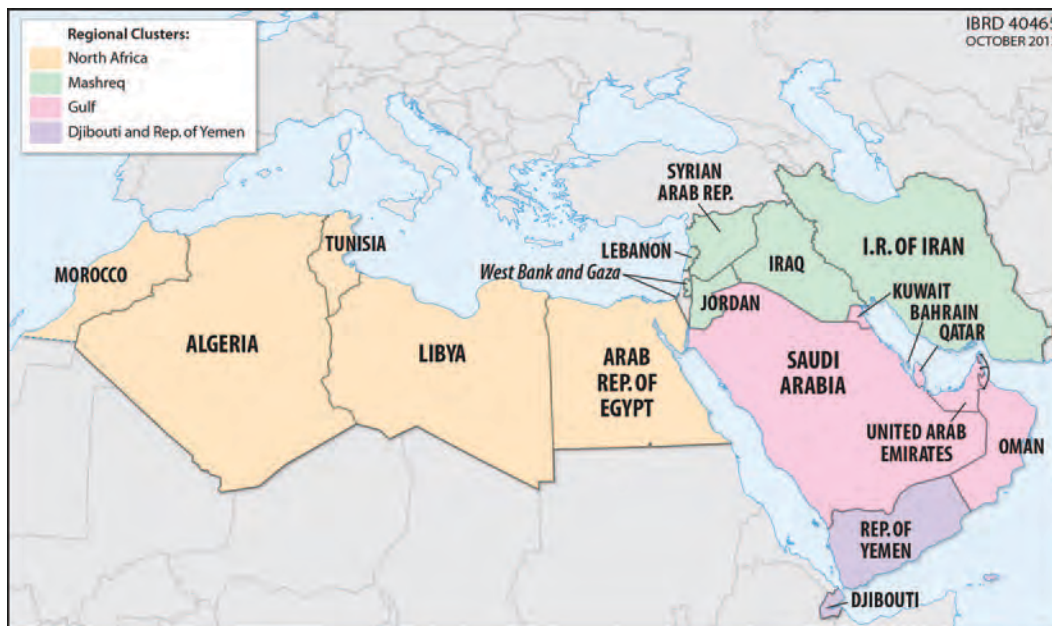


Source: Based on Booz & Company, February 2012.

Note: 3G = third generation of mobile telecommunications technology; 4G = fourth generation of mobile telecommunications technology; ADSL = asymmetric digital subscriber line; DVD = digital video disk; FTTB = fiber-to-the-building; FTTC = fiber-to-the-cabinet, fiber-to-the-curb; FTTH = fiber-to-the-home; Gb = gigabit; h = hour; HD = high definition; LTE = long-term evolution; Mbps = megabits per second; min = minute; sec = second; UMTS = Universal Mobile Telecommunications System; VDSL = very-high-bit-rate digital subscriber line.

mile connection. Broadband, through Wireless local area network products IEEE802.11 standards (Wi-Fi) or third generation of mobile telecommunications technology (3G) for example, can be made available through mobile phones, laptops, tablets, and other devices.

**Most countries in the Middle East and North Africa (MENA) have identified broadband as a critical input to broader efforts in nation building and the transition to a knowledge-based economy.** There is growing consensus that broadband Internet is a prerequisite for a modern economy and fosters sustainable economic development and job creation. Furthermore, it is strategic to the goals of enhancing job opportunities and reducing poverty in the region. The objective of this study is to assess the status of development of broadband in MENA, to identify key bottlenecks to broadband expansion, and to offer suggestions on how to accelerate investment and diffusion of broadband connectivity through supply-side measures. **The focus of this study is therefore on infrastructure-related actions, and measures to stimulate demand of broadband will therefore only be touched upon.**<sup>2</sup>

**Map 1.1 Economies in the MENA Region**

Source: World Bank.

For the purpose of this report, the MENA region comprises 19 countries, grouped in four subregional clusters (see map 1.1):

- **Five North African economies:** Algeria, the Arab Republic of Egypt, Libya, and Tunisia;
- **Six Mashreq economies:** the Islamic Republic of Iran, Iraq, Jordan, Lebanon, the Syrian Arab Republic, and the West Bank and Gaza;
- **Six Gulf economies:** Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates; and
- **Djibouti and the Republic of Yemen.**

The rest of this report is organized as follows. Chapter 1 presents the importance of broadband for economic and social development for MENA as well as how MENA compares internationally in terms of broadband. Chapter 2 examines in more detail the current state of broadband networks and constraining factors for broadband development. In chapter 3, the key challenges of broadband infrastructure deployment and development of competition in MENA countries are identified. Chapter 4 provides recommendations on what could be done to further accelerate the development of broadband infrastructure. Finally, case studies of the status of broadband policy and broadband development in selected MENA countries (Algeria, Egypt, Jordan, Libya, Morocco, and Tunisia) are presented in the appendix.

## **Why Is Broadband Important for Economic and Social Development?**

There is growing consensus that broadband is an essential general purpose technology (GPT) that has pervasive productivity impact on multiple sectors of the economy (e.g., energy, water, industrial production, services, transport, and so on). Broadband has a similar impact on the transformation of the economy as previous GPTs had in the past, including the printing press, steam engines, and electricity. The Organisation for Economic Co-operation and Development (OECD) defines broadband as a GPT that, in combination with other technologies, can have a deeply rooted impact on economic activity (OECD 2008, 5–6). Broadband is today a powerful driver for sustainable economic growth,<sup>3</sup> job creation, and human skills development as well as, more generally, an enabler of democracy and social transformation.

### ***Sustainable Economic Growth***

Broadband infrastructure and services contribute directly to a country's productivity, competitiveness, and ability to attract foreign direct investment (FDI). Broadband can help countries in the region to diversify away from natural resource related sectors. This is particularly strategic for a region characterized by exports of primary commodities, mainly oil and gas, accounting for 76 percent of total exports during the period 2008–10.

Further, Thompson, Jr, and Garbacz (2008) indicate that availability of broadband services may have indirect benefits on economies, such as reducing inefficiency and improving productivity of other inputs. In a later study, these authors have shown that increased access to fixed broadband and mobile broadband in particular has greater impact on poorer countries. Nabli (2007) estimates that the share of MENA non-oil manufacturing exports as a percentage of world trade has fallen steadily since the 1960s, and is quite small compared to other regions of the world. He finds that a group of five Eastern European countries—the Czech Republic, Hungary, Poland, the Russian Federation, and Turkey, with a population similar to MENA's (about 270 million)—had non-oil exports five times higher than MENA's. Similarly, Indonesia, Malaysia, and Thailand had non-oil exports seven times bigger than MENA's. Four Latin American countries—Bolivia, Brazil, Chile, Mexico, and Brazil—had non-oil exports eight times greater than MENA's. MENA's exports-to-gross domestic product (GDP) ratio is about one-third of its potential, even though there has been some growth in recent years (Behar and Freund 2011). By contrast, Asian economies have progressively increased their global market shares, through the advancements in broadband infrastructure and other strengths in high-tech sectors, in conjunction with appropriate trade policy reforms.

Access to affordable and quality broadband service reduces transaction costs and allows flexible firm locations.<sup>4</sup> Countries in MENA have the ambition to be increasingly integrated with regional and global manufacturing and there is initial evidence that some of the countries have real potential to move up the value chain of global manufacturing (Diop and Ghali 2013). In addition, broadband allows for information technology (IT)-enabled service exports such as business

process outsourcing (BPO). Egypt was ranked the fourth most important destination for BPO by A.T. Kearney (2011). Other countries in the region have also successfully entered the global scene for BPO. As for global manufacturing, innovation in BPO is increasingly driven by IT, enabled by broadband.<sup>5</sup> A study of 27 developed and 66 developing countries found that a one percentage point increase in the number of Internet users is correlated with a boost in exports of 4.3 percentage points (Clarke and Wallsten 2006). Broadband also contributes to the competitiveness of the service sector, bringing positive spillover effects to less technology-intensive industries. The availability of high-speed, reliable, and reasonably priced Internet access is a key determinant in FDI decisions.<sup>6</sup>

### **Job Creation and Human Skills Development**

As witnessed in both developed and developing countries, broadband can be a key enabler of **job creation** (see table 1.1). Katz (2009) estimated that the implementation of the broadband plan in Germany would create one million jobs over the next 10 years and contribute substantially to Germany's GDP.<sup>7</sup> In the United States, it is estimated that broadband added 1.0–1.4 percentage points to the growth rate in the number of jobs during 1998 and 2002. Broadband helps allocate activities more efficiently between workers tackling complex, highly dynamic tasks and more traditional workers (Kim, Kelly, and Raja 2010). Broadband also expands the frontiers of traditional jobs, enabling new job and income opportunities, including information and communications technology (ICT)-based contracting, microwork and crowdsourcing, jobs in the virtual economy, and jobs related to the emerging app economy (Rossotto, Kuek, and Paradi-Guilford 2012). This is particularly pertinent to the MENA region, which is characterized by high unemployment, including among youth, women, and graduates.

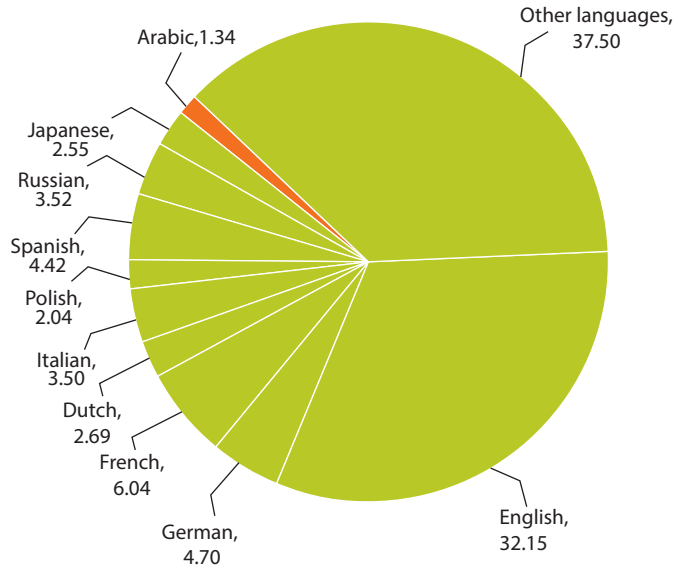
Broadband is also important for **human skills development**. Qiang and Rossotto (2009) point out the following:

*Individuals can acquire skills (increasing their marketability as workers) and develop social networks through broadband-enabled Web applications, facilitating peer-to-peer communities and their integration with the economy. Blogs (online diaries), wikis (Web sites where users can contribute and edit content), and the like have created new, decentralized, dynamic approaches for capturing and disseminating the knowledge needed for individuals to become better prepared for the knowledge economy. Furthermore, broadband can enhance a city's or a country's appeal to the "creative class" of knowledge workers and attract human capital amid intensifying global competition for talented workers.*

**Table 1.1 Examples of Broadband Employment Multipliers**

Study	Country	Direct	Indirect	Induced	Total
Crandall (2003)	United States	1	1.17	1.17	2.17
Katz and Suter (2009)	Switzerland	1	0.38	na	1.38
Atkinson (2009)	United States	1	1.47	1.13	3.6
Katz (2009)	United States	1	0.83	1.59	3.42

Source: Adapted from Katz 2009.

**Figure 1.2 Percentage of Wikipedia Articles per Language**

Source: Wikipedia ([http://meta.wikimedia.org/wiki/List\\_of\\_Wikipedias](http://meta.wikimedia.org/wiki/List_of_Wikipedias), accessed September 2013).

In addition, the digital content of languages is a primary source for knowledge to build a community capable of competing in the fields of science and technology on the global stage. Arabic digital content amounts to just 0.162 percent of the total digital content available online.<sup>8</sup> In addition to this international language gap, even inside the MENA region itself only 42 percent of all webpages are published in Arabic (Kelly and Rossotto 2012). Moreover, the number of websites hosted in the MENA region amounts to only 0.198 percent of the global total. To draw an even clearer picture, figure 1.2 indicates that only 1.34 percent of articles published in Wikipedia are in Arabic. This directly restricts access for a large number of individuals in the MENA region and limits their ability for online learning and knowledge sharing.

Broadband also enables “smart” infrastructure, including smart electricity grids and smart meters, and intelligent transport systems. Liebenau et al. (2009) identified broadband, smart electricity grids, and intelligent transport systems as the three key technological advances in infrastructure that would have the highest impact on job creation in the UK economy. According to Covassi de Encarnacao (2013), the 2010 Digital Agenda for Europe combines a bold approach for high-speed broadband deployment with a firm commitment to green ICT using ICT to increase energy efficiency. Broadband enables integrated machine-to-machine (M2M) platforms for cost optimization and smart grid and smart meter infrastructure. This infrastructure can greatly enhance the performance of the electricity grid, reduce peak load energy requirements, allow for better integration of renewable energy sources, and promote effective energy use (Nocentini, Gavazzi, and Pupillo 2013). Moreover, broadband enables big data

analytics for better traffic management systems and electricity use (Nocentini, Gavazzi, and Pupillo 2013). These applications are of strategic importance given MENA's focus on renewable energy generation and the need to better manage the electricity demand of industrial users. Broadband can be a powerful tool to tackle the climate change agenda in MENA.

### ***Democracy and Social Transformation***

Finally, broadband is an enabler of **democracy and social transformation**, as witnessed by the powerful role played by new and social media networking during the Arab Spring. Despite being a latecomer in the introduction of Internet services, the effects of enhanced connectivity in the Middle East have already transformed societies in the region to a large extent. With the recent uprisings taking place in a number of countries, the Internet has played a key role in advancing social inclusion, accountability, human rights, and civil engagement.

However, social media is not only a domain for the liberal youth. It also empowers different agendas across the civil society map. Three of the top five most followed Arab personalities on Twitter are religious preachers (MRD 2012). In this respect, the diffusion of the Internet in the Middle East and enhanced connectivity has created a virtual space in which young people are interacting on a variety of issue areas spanning a wide range of topics. With increased content in the Arabic language, broadband Internet could play an important role in preserving the cultures of the region.

Social networking tools have the potential to enhance citizen engagement in the region, promote social inclusion, and create opportunities for employment, entrepreneurial activities, and social development. However, the penetration of social networking in the MENA region, although rapidly growing, is still low in comparison to other regions in the world. Governments in the MENA region are faced with a historic opportunity to leverage social media to better advance various development agendas for their increasingly youthful societies. According to a white paper released by the Dubai School of Government and the online job-hunting site Bayt.com, 71 percent of Arabs use the Internet as an alternative to traditional communication (Alshaer and Salem 2013). Young people between 15 and 29 years of age make up 75 percent of Facebook users (Dubai School of Government 2011) in the Arab region that total 46,422,540, in addition to 2.17 million Twitter users, 80 percent of whom spend more than an hour each day updating their social networking channel.<sup>9</sup>

### **How Does MENA Compare in Terms of Broadband?**

Looking again at the 11 countries considered by Nabli (2007) in the section above as an example of good trade performance compared to the countries in MENA, both low price of international communications and higher broadband penetration seem to have enabled their good performance, in conjunction with appropriate trade policy reforms (see table 1.2). The average price of international communications in the sample of countries with strong export

**Table 1.2 Overview of Broadband in MENA**

<i>Economy</i>	<i>SkypeOut rate (USc/min)</i>	<i>Fixed broadband penetration (% of households)</i>	<i>Mobile broadband penetration (3G + 4G) (% of population)</i>	<i>Population, 2011 (millions)</i>
Russian Federation	5.2	38.60	45.59	143.00
Turkey	3.7	39.30	54.66	73.64
Hungary	2.3	57.60	30.73	9.97
Czech Republic	2.3	52.50	36.17	10.50
Poland	2.3	41.30	43.17	38.53
Bolivia	12.3	3.20	9.19	10.09
Brazil	2.8	29.90	32.25	196.70
Chile	2.3	45.30	28.26	17.27
Mexico	2.3	47.10	22.65	112.30
Indonesia	4.4	4.70	19.25	242.30
Malaysia	2.3	43.70	69.16	28.86
Thailand	6.5	20.70	14.53	69.52
Simple Average, Countries in Nabli (2007)	4.06	35.33	33.8	
Weighted Average Countries in Nabli (2007)	3.89	28.29	31.52	
Morocco	25.9	10.90	10.14	32.27
Algeria	17.5	18.10	0	35.98
Tunisia	39.5	23.40	5.10	10.67
Libya	30.2	8.60	23.35	6.42
Egypt, Arab Rep.	15.2	14.10	56.37	82.54
Lebanon	12.6	29.60	26.65	4.26
Syrian Arab Republic	39	3.60	4.33	20.82
West Bank and Gaza	25	25.10	0	4.00
Jordan	20.8	25.40	52.69	6.18
Iran, Islamic Rep.	13.4	12.00	0.05	74.80
Iraq	39	6.70	0.49	32.96
Oman	18.9	25.70	56.95	2.85
Saudi Arabia	18.8	51.70	55.89	28.08
Yemen, Rep.	21	2.40	1.82	24.80
Djibouti	39	10.30	2.22	0.9
Bahrain	25.5	88.90	74.24	1.32
United Arab Emirates	27.5	69.40	69.23	7.89
Qatar	39	66.40	64.44	1.87
Kuwait	13.2	32.10	67.78	2.82
MENA, Simple Average	25.32	27.60	30.09	
MENA, Weighted Average	21.54	17.1	22.2	

*Sources:* Skype, <http://www.skype.com>; World Bank analysis based on data from TeleGeography's GlobalComms Database <http://www.telegeography.com>, December 2012, data retrieved August 2013.

*Note:* 3G = third generation of mobile communications technology; 4G = fourth generation of mobile communications technology; MENA = Middle East and North Africa; USc/min = US cents per minute.



performance outside of MENA is about one-sixth of the average price of international communications in MENA, as measured by average SkypeOut rates.<sup>10</sup> Two countries in the same geographic region illustrate the point—the price of international communications in Turkey is less than one-tenth of the price of international communications in Tunisia. The average Skypeout rate in the non-MENA countries of the sample is 4.06 US cents per minute, compared with 25.32 US cents per minute in the MENA region.

Comparing broadband penetration levels also shows a marked difference between the countries identified as good trade performers on a global scale and the countries in MENA. The average penetration in the global comparators as defined by Nabli (2007) is 35.33 percent for fixed broadband (measured as a percentage of households) and 33.80 percent for mobile broadband (measured as a percentage of population), compared with an average in MENA of 27.60 percent for fixed broadband and 30.09 percent for mobile broadband. However, the difference between global comparators and MENA countries is higher if we exclude from MENA the high-income countries in the Gulf. SkypeOut rates, in addition to being a key benchmark for international communications prices, are also a good indicator of the development of broadband. Developed broadband markets will have low SkypeOut rates, owing to the ease of Voice over Internet Protocol (VoIP) bypass (taking into account other factors that may also have an impact, such as VoIP regulations).

Nevertheless, according to Bilbao-Osorio, Dutta, and Lanvin (2013), MENA “boasts one of the most diverse performances in the world” when it comes to the ICT sector. *The Global Information Technology Report 2013* states that several Gulf Cooperation Council states during 2012 have sharply improved their overall performance (Qatar, the United Arab Emirates, and Saudi Arabia) and have continued their investments to make ICTs one of the key national industries that attempt to diversify and transform their economies. On the other hand, several North African (Algeria and Morocco) and Levant (the Islamic Republic of Iran) countries have either fallen—or stagnated, in the best cases—in their efforts to leverage ICTs as part of their economic and social transformation process toward more knowledge-intensive activities and open societies.

## Notes

1. For a thorough discussion of broadband definitions and technology options, see Kelly and Rossotto 2012.
2. A good mix of supply- and demand-side measures is crucial to the rapid development of broadband, as the case of the Republic of Korea shows. A forthcoming World Bank publication will focus on demand-side policies.
3. It has been estimated that a 10 percent rise in the market penetration of broadband services in developing countries increases the gross domestic product (GDP) by 1.38 percent on average (Kim, Kelly, and Raja 2010). A good number of researchers corroborate this finding, with different estimates of the actual impact of broadband development on economic growth. Nonetheless, the positive impact of broadband on economic

growth is confirmed by several empirical studies, taking into account a different set of data and countries. These include studies that find a positive impact of broadband on economic growth in Organisation for Economic Co-operation and Development (OECD) countries (among others, Atif, Endres, and Macdonald 2012; and Czernich et al. 2011), in the United States (among others, Holt and Jamison 2009; and Lehr et al. 2006), and in developing economies (among others, Katz 2009; and ITU 2012b).

4. Voice and data broadband communications enable faster service delivery and reduce unnecessary travel time. Broadband drives competitiveness in manufacturing through IT-enabled supply chains. For example, broadband enables outsourcing and, as such, is a key determinant of domestic competitiveness. McKinsey Global Institute (2012) estimates that 80 percent of the production of a 787 Dreamliner is outsourced to contractors linked to Boeing through a complex supply chain enabled by information technology (IT). IT-enabled supply chains are essential to the modern automotive and chemicals industry. In this respect, broadband powers most relevant innovations in the production processes likely to shape the future of manufacturing. These innovations include digital modeling, simulation and visualization, big data analytics, social and collaborative technologies increasingly used in design and production processes, and just-in-time supply.
5. *Computer Weekly* estimates that “technologies such as cloud computing, business analytics software, social media software, and process innovation software are being used within business process outsourcing (BPO) to enable them to lower costs and be more effective” (Flinders 2012).
6. An econometric study targeting Arab and other emerging economies found a strong correlation between the development of broadband in a competitive environment and foreign direct investment (FDI) in the region (Badran 2012).
7. Broadband creates jobs in four ways: (a) direct job creation related to civil works and network installation; (b) indirect job creation, generated by businesses selling goods to those directly involved in network installation; (c) induced job creation, through additional employment induced by household spending based on income earned from direct and indirect effect; and (d) transformational job creation, through jobs in new businesses as well as business innovation and innovative working practices enabled by broadband adoption (Min and Rossotto 2012).
8. Measured by surveying the amount of Arabic content in the sites of generic Top Level Domain (gTLD) (ITU 2012a).
9. Various sources: Facebook figure is from 6 September 2012; Twitter is from June 2012; State of Search is based on interview with Lee Mancini, chief executive officer of Sekari Dubai (a digital search engine optimization company), Madar Research & Development (MRD 2012).
10. Skype (now part of Microsoft) is a software application that allows users to make voice calls over the Internet. SkypeOut is Skype terminology for making calls to standard phone lines.

## References

- Alshaer, Sara, and Fadi Salem. 2013. *The Arab World Online: Trends in Internet Usage in the Arab Region*. Dubai: Dubai School of Government. [http://img.b8cdn.com/images/uploads/article\\_docs/dsg-gip\\_bayt\\_report\\_final\\_16822\\_EN.pdf](http://img.b8cdn.com/images/uploads/article_docs/dsg-gip_bayt_report_final_16822_EN.pdf).

- Atif, Syed Muhammad, James Endres, and James Macdonald. 2012. *Broadband Infrastructure and Economic Growth: A Panel Data Analysis of OECD Countries*. Munich Personal RePEc Archive. [http://mpra.ub.uni-muenchen.de/42177/1/MPRAPaper\\_42177.pdf](http://mpra.ub.uni-muenchen.de/42177/1/MPRAPaper_42177.pdf)
- Atkinson, Robert, Daniel Castro, and Stephen Ezell. 2009. *The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America*. Washington, DC: The Information Technology and Innovation Foundation.
- A.T. Kearney. 2011. *Offshoring Opportunities amid Economic Turbulence*. Chicago, IL: A.T. Kearney. <https://www.atkearney.com/documents/10192/f062cfd8-ee98-4312-ae4f-0439afc10880>.
- Badran, Mona Farid. 2012. "The Impact of Broadband Infrastructure on Economic Growth in Some Arab and Emerging Countries." *Topics in Middle Eastern and African Economies* 14 (September): 278–320. <http://www.luc.edu/orgs/meea/volume14/PDFS/the%20impact%20of%20BB%20on%20economic%20growth,%20MEEA.pdf>.
- Behar, Alberto, and Caroline Freund. 2011. "The Trade Performance of the Middle East and North Africa." Middle East and North Africa Working Paper Series 53, Office of the Chief Economist, World Bank, Washington, DC. <http://siteresources.worldbank.org/INTMENA/Resources/WP53.pdf>.
- Bilbao-Osorio, Beñat, Soumitra Dutta, and Bruno Lanvin, eds. 2013. *The Global Information Technology Report 2013: Growth and Jobs in a Hyperconnected World*. Geneva: World Economic Forum and INSEAD. [http://www3.weforum.org/docs/WEF\\_GITR\\_Report\\_2013.pdf](http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf).
- Clarke, George, and Scott Wallsten. 2006. "Has the Internet Increased Trade? Evidence from Industrial and Developing Countries." *Economic Inquiry* 44 (3): 465–84.
- Covassi de Encarnacao, Beatrice. 2013. "A Smart Future? The EU Digital Agenda between Broadband, the Grid and Energy Efficiency." In *Broadband Networks, Smart Grids and Climate Change*, edited by Eli M. Noam, Lorenzo M. Pupillo, and Johann J. Kranz, 135–56. New York: Springer.
- Czernich, Nina, Oliver Falck, Tobias Kretschmer, and Ludger Woessmann. 2011. "Broadband Infrastructure and Economic Growth." *The Economic Journal* 121 (552): 505–32.
- Diop, Ndiame, and Sofiane Ghali. 2013. "Are Jordan and Tunisia's Exports Becoming More Technologically Sophisticated? Analysis Using Highly Disaggregated Export Databases." Middle East and North Africa Working Paper Series 54, Office of the Chief Economist, World Bank, Washington, DC. <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/0,,contentMDK:23109513~pagePK:146736~piPK:146830~theSitePK:256299,00.html>.
- Dubai School of Government. 2011. *Arab Social Media Report*. Dubai: Dubai School of Government. <http://www.ArabSocialMediaReport.com>.
- Flinders, Karl. 2012. "Inside Outsourcing: How is Technology Changing BPO." *Computer Weekly*, June 18. <http://www.computerweekly.com/blogs/inside-outsourcing/2012/06/how-is-technology-changing-bpo.html>.
- Holt, Lynne W., and Mark A. Jamison. 2009. "Broadband and Contributions to Economic Growth: Lessons from the U.S. Experience." *Telecommunications Policy* 33 (10–11): 575–81.

- ITU (International Telecommunication Union). 2010. *Core ICT Indicators 2010*. Geneva, Switzerland: Partnership on Measuring ICT4D, ITU. [http://www.itu.int/dms\\_pub/itu-d/opb/ind/D-IND-ICT\\_CORE-2010-PDF-E.pdf](http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICT_CORE-2010-PDF-E.pdf).
- . 2011. *Telecommunication Indicators Handbook*. Geneva, Switzerland: ITU. [http://www.itu.int/dms\\_pub/itu-d/opb/ind/D-IND-ITC\\_IND\\_HBK-2011-PDF-E.pdf](http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-PDF-E.pdf).
- . 2012a. "Digital Arabic Content." Background paper. Connect Arab Summit. [http://www.itu.int/net/ITU-D/CDS/gq/generic/asp-reference/gq\\_file\\_download.aspx?FileID=711](http://www.itu.int/net/ITU-D/CDS/gq/generic/asp-reference/gq_file_download.aspx?FileID=711).
- . 2012b. *The Impact of Broadband on the Economy: Research to Date and Policy Issues*. Geneva, Switzerland: ITU. [http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports\\_Impact-of-Broadband-on-the-Economy.pdf](http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf).
- Katz, Raul L. 2009. *La Contribución de las tecnologías de la información y las comunicaciones al desarrollo económico: Propuestas de América Latina a los retos económicos actuales*. Madrid: Ariel.
- Katz, Raul L., and Stephan Suter. 2009. "Estimating the Economic Impact of the Broadband Stimulus Plan." Columbia Institute for Tele-Information Working Paper. [www.elinoam.com/raulkatz/Dr\\_Raul\\_Katz\\_-\\_BB\\_Stimulus\\_Working\\_Paper.pdf](http://www.elinoam.com/raulkatz/Dr_Raul_Katz_-_BB_Stimulus_Working_Paper.pdf).
- Kelly, Tim, and Carlo Maria Rossotto. 2012. *Broadband Strategies Handbook*. Washington, DC: World Bank. [http://infodev.org/infodev-files/resource/InfodevDocuments\\_1118.pdf](http://infodev.org/infodev-files/resource/InfodevDocuments_1118.pdf).
- Kim, Yongsoo, Tim Kelly, and Siddhartha Raja. 2010. *Building Broadband: Strategies and Policies for the Developing World*. Washington, DC: Global Information and Communication Technologies (GICT) Department, World Bank. [http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Building\\_broadband.pdf](http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Building_broadband.pdf).
- Lehr, William H., Carlos A. Osorio, Sharon E. Gillett, and Marvin A. Sirbu. 2006. "Measuring Broadband's Economic Impacts." Paper presented at the 33rd Research Conference on Communication, Information and Internet Policy (TPRC), Arlington, VA, September 23–25.
- Liebenau, Jonathan, Robert Atkinson, Patrik Kärrberg, Daniel Castro, and Stephen Ezell. 2009. *The UK's Digital Road to Recovery*. London: LSE Enterprise; Washington, DC: The Information Technology and Innovation Foundation. <http://www.itif.org/files/digitalrecovery.pdf>.
- McKinsey Global Institute. 2012. *Manufacturing the Future: The Next Era of Global Growth and Innovation*. San Francisco: McKinsey Global Institute. [http://www.mckinsey.com/~media/mckinsey/dotcom/insights%20and%20pubs/mgi/research/productivity%20competitiveness%20and%20growth/the%20future%20of%20manufacturing/mgi%20manufacturing%20the%20future\\_full%20report\\_nov%202012.ashx](http://www.mckinsey.com/~media/mckinsey/dotcom/insights%20and%20pubs/mgi/research/productivity%20competitiveness%20and%20growth/the%20future%20of%20manufacturing/mgi%20manufacturing%20the%20future_full%20report_nov%202012.ashx).
- Min, Wonki, and Carlo Maria Rossotto. 2012. "Broadband and Job Creation: Policies Promoting Broadband Deployment and Use Will Enable Sustainable ICT-Based Job Creation." ICT Policy Note 1, World Bank, Washington, DC. <http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/2012-02-ICTPolicyNotes.pdf>.
- MRD (Madar Research & Development). 2012. *Arab ICT Use and Social Networks Adoption Report*. Dubai: MRD. <http://www.kacst.edu.sa/en/about/publications/Other%20Publications/Arab%20ICT%20Use%20Report%202012.pdf>.

- Nabli, Mustapha Kamel. 2007. *Breaking the Barriers to Higher Economic Growth: Better Governance and Deeper Reforms in the Middle East and North Africa Region*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/bitstream/handle/10986/6914/439690PUB0Box310only109780821374153.pdf?sequence=1>.
- Nocentini, Stefano, Roberto Gavazzi, and Lorenzo Maria Pupillo. 2013. "Broadband, ICT and Smart Grids: A Win-Win Approach." In *Broadband Networks, Smart Grids and Climate Change*, edited by Eli M. Noam, Lorenzo Maria Pupillo, and Johann J. Kranz, 135–56. New York: Springer.
- OECD (Organisation for Economic Co-operation and Development). 2008. *Broadband and the Economy*. Ministerial background report OECD, Paris. DSTI/ICCP/IE(2007)3/FINAL. Paris: OECD.
- Qiang, Christine Zhen-Wei, Carlo Maria Rossotto, and Kaoru Kimura. 2009. "Economic Impact of Broadband." In *Information and Communications for Development 2009: Extending Reach and Increasing Impact*. Paris: World Bank. [http://siteresources.worldbank.org/EXTIC4D/Resources/IC4D\\_Broadband\\_35\\_50.pdf](http://siteresources.worldbank.org/EXTIC4D/Resources/IC4D_Broadband_35_50.pdf).
- Rossotto, Carlo, Siou Chew Kuek, and Cecilia Paradi-Guilford. 2012. "New Frontiers and Opportunities in Work: ICT is Dramatically Reshaping the Global Job Market." ICT Policy Note 3, World Bank, Washington, DC. [http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/1221302\\_NewFrontier\\_PolicyNote\\_LowRes.pdf](http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/1221302_NewFrontier_PolicyNote_LowRes.pdf).
- Thompson, Jr, Herbert G., and Christopher Garbacz. 2008. "Broadband Impacts on State GDP: Direct and Indirect Impacts." Paper presented at International Telecommunication Society 17th Biennial Conference, Montréal, June 24–27. <http://www.canavents.com/its2008/abstracts/62.pdf>.