

## ENABLING DIGITAL DEVELOPMENT

# How the internet promotes development

To understand how the internet and related digital technologies affect development, it is important to understand what they actually do. It turns out that old economics explains the new economy quite well. In 1937, Ronald Coase—who would receive the Nobel Prize in Economics in 1991—published “The Nature of the Firm,” which asked why firms exist.<sup>1</sup> Even though economics considers the market the most efficient way to organize economic activity, large companies tend to operate in a self-contained command-and-control environment. What Coase realized was that using the price mechanism incurred a number of additional costs, such as the effort of finding buyers or suppliers, and negotiating contracts and enforcing them. As long as the cost of making an exchange of an intermediate good or service in the market is larger than the profit from that exchange, it is rational for a firm to produce it in-house.

Most of these Coasian transaction costs stem from the costs of acquiring and sharing information. Many years later, the internet and other digital technologies have vastly reduced many of these costs, with major implications for market and nonmarket exchanges among businesses, people, and governments. This spotlight describes how the decline of these transaction costs affects economic development. But first, a working definition of the technologies covered in this Report.

While the *World Development Report 2016* is not about specific technologies, it generally covers the impacts of digital technologies and services that greatly facilitate the creation, storage, analysis, and sharing of data and information. The Report uses the terms “digital technologies,” “internet,” and sometimes “information and communication technologies (ICTs)” somewhat interchangeably. “Internet” emphasizes the

central importance of connectivity. Faster computers and cheaper storage are useful in their own right. But the reason that all of these technologies have had such a massive impact on almost all aspects of life is that these devices are linked so that information can be distributed and accessed effortlessly from anywhere.

## The internet promotes inclusion, efficiency, and innovation

Technology development has vastly reduced the cost and increased the speed of all the digital technologies that drive the internet—in some cases by more than 30 percent per year. This continues a long-term and accelerating decline in the cost of computing. William Nordhaus, in 2007, estimated that since the era of manual computing in the mid-19th century, the cost of a computation has dropped by a factor of between 1.7 trillion and 73 trillion.<sup>2</sup> The result has been a far lower cost of acquiring and using information, which in turn has lowered transaction costs—and often as a consequence, production costs.

By lowering the cost of these transactions, the internet affects economic development in three major, interrelated ways. One is that the internet can help overcome information problems. In some instances, a mutually beneficial transaction might not take place because the two parties simply had no way to find each other or acquire enough information to confidently proceed with the transaction; in such cases, the transaction costs are essentially infinitely high. The emergence of e-commerce platforms has made it much easier for small producers to find customers, and even for individuals who cannot use

traditional marketing tools like advertising or trade shows. Rural artisans in Morocco, some of whom are illiterate, have set up Anou, a web shop for their products that has attracted customers from all over the world.<sup>3</sup> The internet, by vastly lowering search and information costs, creates these markets. This has many benefits, but the most important, arguably, is that it fosters *inclusion*—in new and existing markets, in social interaction, or in government service delivery systems. Inclusion for the individual usually means expansion of a market by those on the other side of the transaction, such as a firm or a government that now serves more citizens.

Even when search costs are low, transactions often do not take place when one party to a transaction has much more information than the other. Take the example of extending credit to poor farmers. The high cost of gathering information about poor borrowers is a major deterrent to lending by banks.<sup>4</sup> The poor therefore need to rely on informal moneylenders who charge exorbitant interest rates. But many of the poor possess mobile phones. Companies such as Cignifi have developed methods to judge the creditworthiness of a potential borrower based on their mobile phone records. In Ghana, Cignifi worked with the World Savings and Retail Banking Institute to correlate savings behavior with mobile phone records.<sup>5</sup> The goal is to promote financial inclusion among the unbanked, by assessing the savings potential and creditworthiness of low-income households that own mobile phones but have no access to financial products.

There is a large literature on information problems and asymmetries by economists such as George Akerlof, Michael Spence, and Joseph Stiglitz, who jointly received the Nobel Prize in 2001. Akerlof was motivated to write his most famous paper, “The Market for Lemons,” published in 1970, by the fact that when buying a used car, the seller usually has much more information about the car’s quality than the buyer.<sup>6</sup> Today, internet sites such as Carfax in the United States let buyers research the history of a car online, including whether it has been in an accident, how many owners it has had, and whether it has complete service records.

The second mechanism is closest to the original Coasian concepts of transaction and coordination costs. Most transactions were already taking place before the digital revolution, but the internet has made them faster, cheaper, or more convenient. In other words, lower transaction costs raise the productivity of existing factors of production. The internet has brought numerous *efficiency* improvements to businesses that, while individually often not spectacular,

add up to enormous aggregate benefits. Better communication and information processing improves supply chain management and enterprise resource planning. Retailers now share point-of-sale data with vendors globally in real time, essentially shifting inventory management to their suppliers. Tracking, navigation, and scheduling software improve capacity utilization for logistics and transport companies. The delivery company UPS famously saves about 1 million gallons of gas each year by using routing technology that minimizes left turns, where vehicles are often held up by oncoming traffic. Estonia’s X-Road is an e-government system that offers nearly 3,000 services from 900 government and private sector agencies to the citizens online. The number of queries made through X-Road increased from half a million in 2003 to 340 million by 2014. As a result, each citizen saves about five working days per year, adding up to 7 million workdays overall.

For many internet-based businesses or services, fixed up-front costs can be high, but once the online platform is in place, each additional customer, user, or transaction incurs very little extra cost. The marginal transaction cost essentially drops to zero because what previously involved routine human labor can now be fully automated. This has led to enormous *innovation*—the third mechanism—that is typically associated with the “new economy.” These dynamics have important implications related to the nature of the scale economies that make this innovation possible, the new business models (and competition problems) this has spawned, and the unprecedented scope for customization of services.

The cost structure of many internet businesses gives rise to various types of scale economies.<sup>7</sup> Supply-side scale economies, where costs drop with an increasing number of transactions, favor the emergence of natural monopolies. Water or electric utilities operate in similar environments. Because entry costs are also high, such sectors tend to be regulated. Many internet-based markets—such as web searches, mobile payments, or online bookstores—are also dominated by a few firms. At least initially, entry costs are low and such websites can scale up extremely quickly, even with relatively few resources. Facebook reached half a billion users with just 500 engineers.<sup>8</sup> Walmart had to build 276 stores before reaching US\$1 billion in sales; Amazon needed just six warehouses to reach US\$3 billion in 2003.<sup>9</sup> For many of these firms, the product they sell is also purely digital, such as digital music (Spotify in Sweden), e-books (Amazon in the United States), or online news and data.<sup>10</sup> Others sell highly automated brokerage or matchmaking services for travel, jobs,

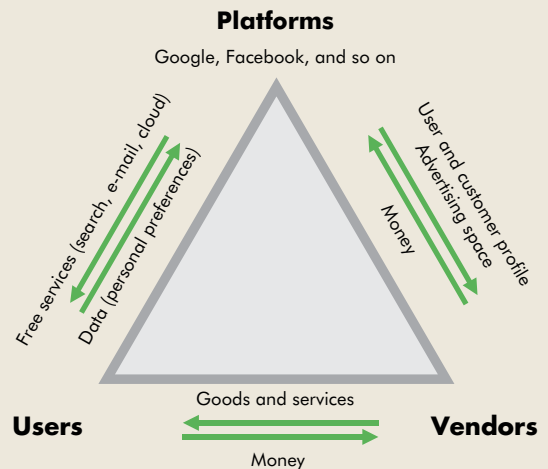
merchandise, or ride sharing. Many of these business models have been replicated by firms in developing countries. But even there, in many of these markets, a high degree of concentration has occurred in the last 10 years. While in the early 2000s internet traffic was distributed across thousands of companies, today just 30 companies account for over half of peak internet traffic in the United States—much of this is due to the explosion of video content.<sup>11</sup>

Scale economies also exist on the demand side. For many services, the more people use it, the more valuable it becomes to its users and the more new users it attracts. Social media sites or digital payment systems like M-Pesa in Kenya are examples. With supply-side scale economies, average cost drops with scale. With demand-side scale economies, average revenue or utility rises with scale. These network externalities benefit users, but can also create lock-in effects; to switch to a different social media platform imposes very little actual cost on the user, but would require collective action by a large number of interconnected users to maintain the same level of utility.<sup>12</sup>

Ultralow marginal transaction costs have powered new business models. Many of these are web services operating platform markets or two-sided markets. The platform owner has two different customers, typically the user of the service and an advertiser who wants to reach the user. Rather than charging both, it makes sense to provide the service for free and increase the user base (at very little cost), which makes the other side of the market more lucrative. A classic 2003 paper by Jean-Charles Rochet and Jean Tirole shows that two-sided markets exist in many industries.<sup>13</sup> But the economics of the internet have led to a particularly effective grand bargain between platform owners, users, and advertisers (figure S1.1). This model raises difficult questions about competition policy. Because platforms often do not charge for a service, they do not actually exert monopoly power over users. But they could do so over vendors buying advertising space. Just four companies—Google, Facebook, Baidu, and Alibaba—now account for half of all digital advertising revenue. And, dominant platforms could exert monopsony power (because there is a single or are just a few buyers). For instance, book publishers depend on Amazon for a crucial share of their total sales.

Because most processes can be automated, there is tremendous scope for customization of services. Most online behavior is automatically monitored—sometimes anonymously, sometimes not. The massive data volumes collected by internet platforms have created a whole new branch of economics—nano-economics—which studies individual, computer-

**Figure S1.1** Internet users trade personal data for useful services



Source: Based on Kurbalija 2015.

mediated transactions.<sup>14</sup> The main benefit to the user is that services can be tailored to individual needs and preferences—although at the cost of giving up privacy. For the seller, it allows more targeted advertising and even price discrimination, when automated systems can analyze user behavior to determine willingness to pay and offer different prices to different users.

There is ample evidence that e-commerce sites vary prices based on users' estimated location, browsing history, and even the type of device they use for access.<sup>15</sup> Information can flow both ways, since many commercial websites provide feedback mechanisms that help the provider improve the product, but also allow the customer to assess the quality of a product or service. Businesses use such tools extensively, but the public sector has been slow to adapt them for better service delivery.

Finally, in many, if not most, transactions, more than one of the three mechanisms may be at work. For example, transactions on internet platforms typically involve all three. While the platform running a fully automated service is the main innovation, one side of the transaction often involves a provider of a service, such as an informal driver working through a ride sharing platform or a freelance worker in a remote location. For them, it will often be a case of inclusion in an otherwise inaccessible market transaction. The customer at the other end of the transaction experiences increased efficiency. A service that was typically available through another channel is now more convenient, faster, or cheaper. Figure S1.1.1 in box S1.1 presents a graphic representation of the three mechanisms.

### Box S1.1 Three ways in which the internet promotes development

Figure S1.1.1 provides a simple graphic representation of the effect of falling transaction costs. Imagine all transactions in an economy arranged by the transaction costs they impose, from most costly on the left to least costly on the right. The upper curve shows these costs before the introduction of the internet. With the internet, many such costs drop, and three things can happen. On the left, there were some transactions for which the cost was so high in the pre-internet era, that there was essentially no market—the transactions did not take place. Making these transactions possible promotes inclusion as well as market expansion.

For example, women with small children or persons with disabilities have sometimes been unable to engage in work outside the home, but can now engage in telework.<sup>a</sup> Many poor or disadvantaged populations will now receive public services because governments can use digital IDs to verify their eligibility.<sup>b</sup> And skilled workers and small firms in poor countries can trade their services in global markets, where they can earn higher returns. These are all examples where the internet, by overcoming information problems, contributes to greater inclusion.

In the middle of the figure, the internet lowers the cost of existing transactions—that is, those occurring even before the advent of the internet. This raises the efficiency of a vast range of activities. Purchasing goods, executing bank transactions, searching for a home or a job, paying taxes, or renewing a driver’s license generally used to require a trip to a shop or office, but can now be done with a click or a tap. Similarly, the internet has reduced costs for businesses when connecting and negotiating with buyers or suppliers, finding workers through job-matching services, and monitoring contract fulfillment or employee performance. Many of the same benefits extend to governments, as well. These individually unspectacular efficiency gains may, in the aggregate, represent the lion’s share of benefits from the internet.

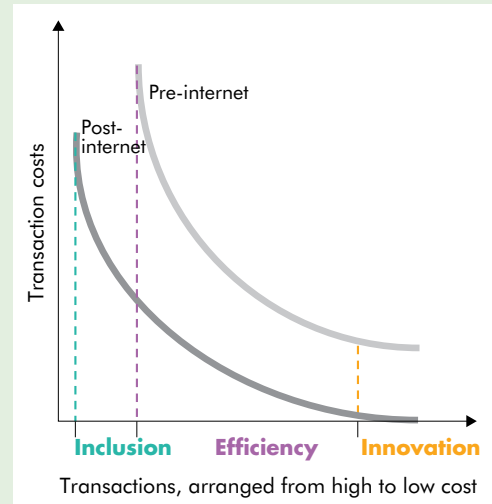
Source: WDR 2016 team.

a. Melhem, Morrell, and Tandon 2009.

b. Gelb and Clark 2013.

c. Varian and Farrell 2004.

### Figure SB1.1.1 A graphic representation of how the internet promotes development



Source: WDR 2016 team.

The most dramatic impact of the internet is on the right-hand side of the figure. For many internet-based businesses or services, fixed up-front costs can be high, but once the online platform is in place, each additional customer, user, or transaction incurs very little extra cost. In many cases, the marginal transaction cost is essentially zero because what previously involved routine human labor can now be fully automated. For purely digital products, such as e-books, the marginal production cost is also close to zero. This cost structure gives rise to various types of scale economies, often reinforced by network effects, where the more users a system has, the more useful it becomes.<sup>c</sup> Most of the so-called “new economy” firms are in this space.

## Notes

1. Coase 1937.
2. Nordhaus 2007.
3. <http://www.theanou.com>.
4. Banerjee and Duflo 2011.
5. Cignifi and WSBI 2014.
6. Akerlof 1970.
7. Shapiro and Varian 1999; Varian and Farrell 2004.
8. Levin 2011.
9. Ellison and Ellison 2005.
10. Shapiro and Varian 1999.
11. Congressional testimony of Craig Labowitz, chief scientist of the software company, Arbor, quoted in [http://www.wired.com/2014/06/net\\_neutrality\\_missing/](http://www.wired.com/2014/06/net_neutrality_missing/).

12. Switching costs are far higher when replacing a widely used software package, since it will require a lot of retraining and associated investments, such as enterprise resource planning or operating systems.
13. Rochet and Tirole 2003.
14. Varian 2014; Varian and Farrell 2004.
15. Pasquale 2015.

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