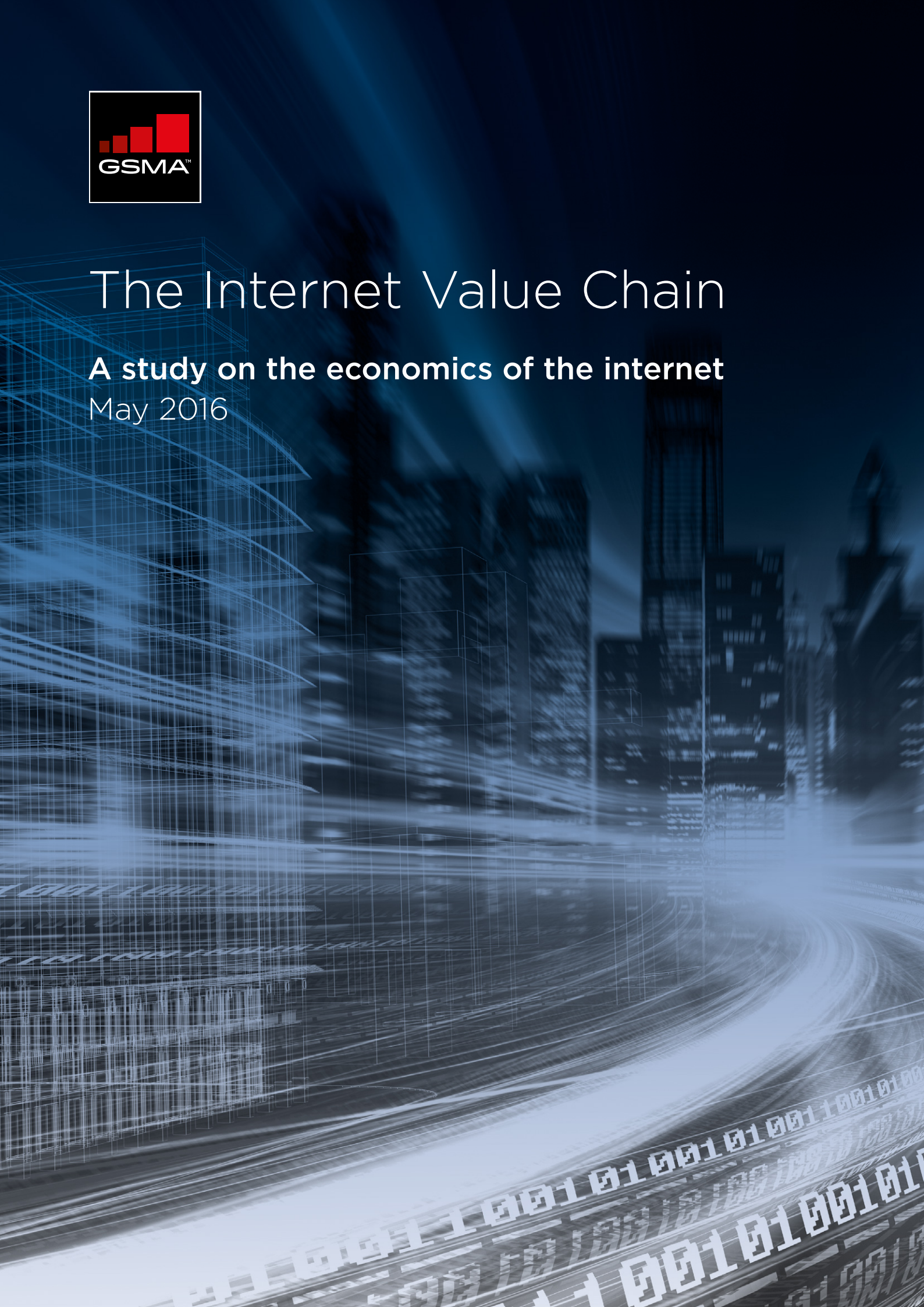

The Internet Value Chain

A study on the economics of the internet

May 2016

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

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The authors would like to thank Laura Peterzan and Olivier Ducloux for their contribution to this study.

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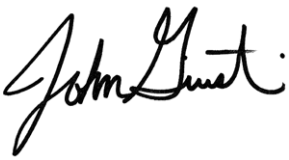
Foreword

The rapid growth of the internet economy is no surprise to those whose lives and professions depend upon it. Much of the research under this cover confirms what we know intuitively about this global phenomenon: that more people are coming online for the first time (633,000 people per day, on average, over the past five years), that more people are accessing the internet via smartphones and other mobile devices, and that the leading online service companies are already big and getting bigger. However, this work by A.T. Kearney goes well beyond the obvious, offering a wealth of insights about the commercial ecosystem that drives the internet.

The GSMA commissioned this research to construct a high-level view of the internet economy—the players, economic analysis of different segments and the competitive landscape. We sought a factual assessment, based on available data, of all of the links in the internet value chain to better understand the trends and dynamics.

We hope this study will be an interesting and useful input at a time when policymakers around the world are thinking about the digital ecosystem and its policy implications. Capturing a macro view of the entire internet value chain is no small feat, and we are grateful to A.T. Kearney for this thorough and highly readable report.



John Giusti
Chief Regulatory Officer
GSMA

Executive summary

This report builds on a paper published by A.T. Kearney in 2010, commissioned by Vodafone and entitled *Internet Value Chain Economics*. In that paper, the size of the overall internet value chain was assessed, as well as the market structure, economics, and financial performance of its respective segments. Since then the internet has evolved substantially, with many of the major players moving across the value chain, new players entering and quickly building strong positions, and some former leaders losing market position. The 'sharing economy' has been born, with the likes of Uber and Airbnb enrolling millions of users and disrupting entire industry segments. New hardware leaders have also emerged: for example, Xiaomi became the third largest smartphone maker in the world in 2015, just four years after it launched its first device. Connectivity providers have brought 4G LTE to approximately 670 million people already, while internet penetration has grown by 48 per cent since 2010, with an estimated 3.2 billion now online.

Today, the largest players in any given internet segment are able to deliver **higher returns and profit margins than in 2010,** thanks to network and scale effects.

There has been significant growth in the revenues flowing to nearly all segments. Our analysis shows that the total value of the internet value chain has almost trebled from $1.2 trillion in 2008 to almost $3.5 trillion in 2015, a compound annual growth rate of 16 per cent. This growth has been driven by three powerful factors. First, there has been a continuous increase in the number of people able to access the internet worldwide via fixed broadband and mobile networks, at ever greater speeds. Second, the declining cost of internet-capable devices, most notably smartphones, is making it more affordable to get online. Third, people are using the internet for a wider array of activities and for longer periods of time each day. Demand for online services continues to grow and, in the case of services that operate both online and offline, a greater proportion of transactions is moving online.

Beneath these macro trends we identify a number of important underlying trends:

- The proportion of revenues of online services generated via advertising (and thus free, or subsidised to some extent, from an end-user perspective) has grown to 29 per cent in 2015, yet the majority of revenues still come from direct customer payments, whether they are one-off purchases, subscriptions, or pay-as-you-go services.
- In almost all online services categories, the proportion of spend that is online versus its legacy or offline equivalent has increased.
- Within the connectivity segment, there is a strong shift towards the use of mobile networks, which now generate more revenue from internet-related services than fixed networks—although for many operators, the increase in internet-related revenues is failing to offset the decline in revenues for legacy services, primarily voice and short message services (SMS).

- Looking at the top 15 internet sites in the United States as an example (and judging by the number of unique visitors), there are only four sites that were not on the same list in 2009, suggesting less disruption and innovation than might be expected.

- We also see a growing trend for the leading internet companies to expand into multiple categories, usually via acquisition. Notable examples include Facebook buying WhatsApp, Instagram, and Oculus; Google buying Nest home automation systems; and Baidu acquiring television and advertising service providers.

- In terms of economic performance, the largest players in any given segment are able to deliver higher returns and profit margins, benefiting from the inherent network and scale effects of the internet. However, we also see convergence across categories in terms of financial performance, with all of them delivering returns on capital in the range of 5 to 25 per cent. This represents a narrower range than in 2008, and the number of outliers has also decreased. In fact only gambling, gaming, and the new wearables categories have ROCEs of more than 20 per cent.

- The stock market valuations of online services companies have risen as a result, delivering a compound annual growth rate of 45 per cent since 2009, versus 6 to 22 per cent for the other segments and 15 per cent for the S&P 500.

Our updated analysis shows that while the internet has continued to grow strongly in terms of absolute size, there has been less change and disruption than might have been expected. Innovation and technical development still proceed at pace, as has been happening in the computing, software, and network equipment sectors for decades. Yet from an economic perspective, the internet is showing signs of an industry maturing after an initial period of dramatic growth. The leading players have established strong positions within their respective segments, and the new developments in product and service model innovations are as much defensive plays to further cement these positions as they are genuine disruption. As players such as Google, Facebook, and Baidu expand into adjacent segments, their rationale is based on leveraging scale and on integrating services and features into their core products and platforms. Facebook's purchase of WhatsApp for $22 billion was not justified by traditional valuation multiples but rather in terms of enhancing the Facebook platform and arguably removing a potential substitute. The fact that ROCE has declined in certain segments for the majority of players is also a sign of an industry where competition is leading to a stabilisation of returns, whose absolute level is likely linked to the barriers to entry and degree of genuine competition they face from online and offline firms.

This report's focus is primarily to describe and explain the development of the internet value chain. The implications for industry participants and for policymakers are profound but too varied to discuss in a single paper. There are three general conclusions that we would consider valid for most corporate or policy contexts:

1. It is no longer appropriate to develop corporate strategies, or to assess policy situations, with a narrow focus on a single segment of the value chain. The interdependencies between segments, as well as between online and offline versions of products and services, are too powerful. Decisions based on a narrow view could be seriously flawed, either for a company that may miss broader competitive threats, or for a regulator misjudging the true nature of competitive dynamics.

2. While the internet has empowered tremendous change, it is no longer the case that it is always creating growth. The deflationary impact on some segments of the economy is substantial. It is likely that the global impact is a positive one of boosted productivity, but at a national or sector level there can be overall losses. The consequences of this are not yet fully discernible. We may be seeing short-term disruption that will unlock widespread wealth creation in the long term. Ongoing scrutiny is warranted, for while one sector being eroded by a modernising technology is generally considered progress, multiple sectors being eroded simultaneously can require countermeasures in economic and social policy.

3. The first years of the internet saw the creation of many new companies and the inevitable filtering to a smaller number of truly successful companies. At the present time, the strong concentration of returns and the inflows of capital to those few market leaders enable them to expand rapidly and grow even stronger by acquiring the next generation of innovators. This is an area where more debate on aspects of competition policy would be helpful. In the corporate world, it implies that an incremental response to internet value chain disruption is riskier than some executives and shareholders may choose to believe. New competitors may arrive more quickly and with more scale than anticipated.

We would like to thank the GSMA and its members for contributing to our understanding of the internet value chain as we prepared this paper, but should emphasise that it is an independent paper that does not necessarily represent the views of anyone but the authors. We are convinced that the themes discussed in this report will remain highly relevant throughout the next five years of the internet value chain's evolution and will have far-reaching implications for all sectors of the global economy.

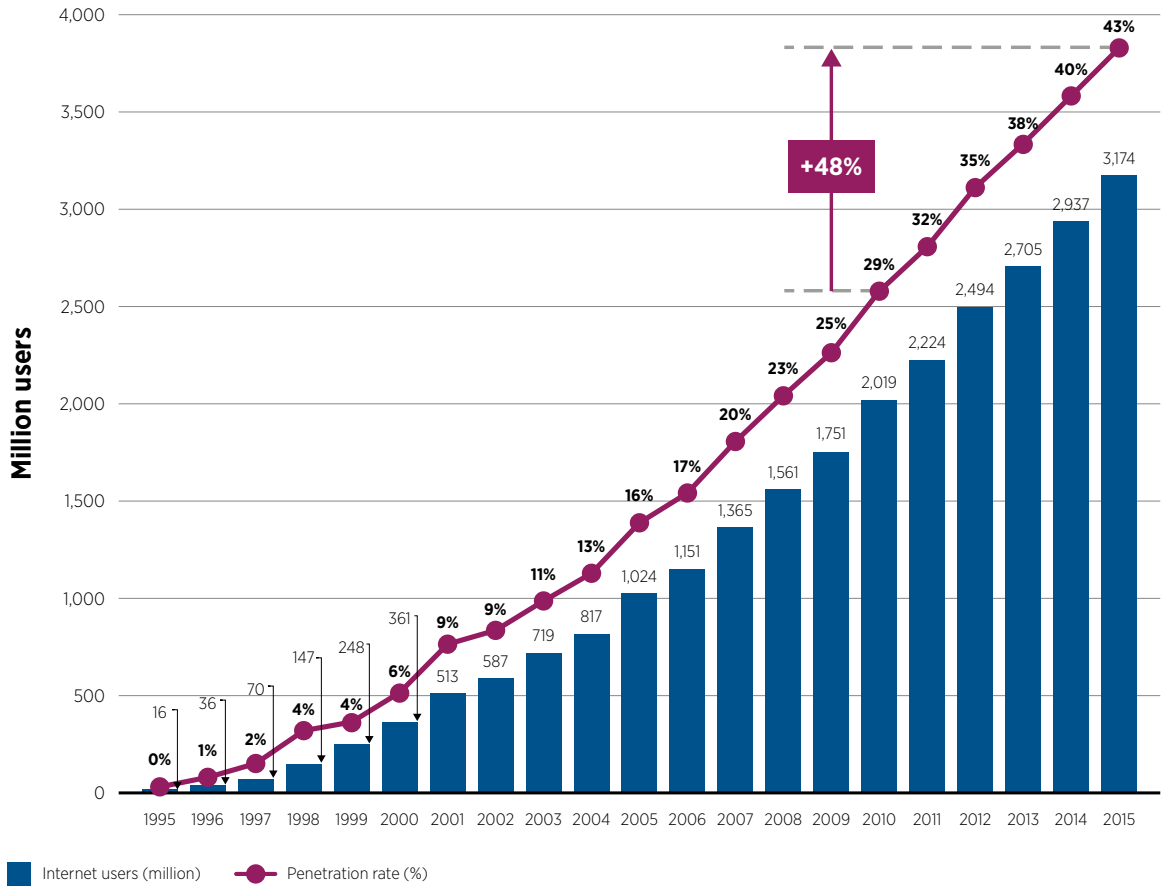
Introduction

The public internet is 25 years old. In that time it has evolved from 'surfing the World Wide Web' to a complex ecosystem of content and services, hosted on approximately 80 million servers and delivered through an intricate network of cables, mobile networks, and satellites. As almost half of the people on the planet get online, the endless drive to innovate leads to a continuous evolution of new uses for the internet—from booking a room in a stranger's house, to live-broadcasting an event to the world from your smartphone, to remotely monitoring a sleeping child. Simultaneously abstract yet pervasive in our everyday lives, it is unsurprising that debates about the internet continue to escalate, including about how much individuals should be able to protect their personal details, to what extent people should be able to filter out unwanted content, and how the internet should be funded.

A combination of availability and affordability of internet connectivity, content and services, and devices has led to an increasingly connected world (see figure 1). By the end of 2015, 3.2 billion people globally—43 per cent of the world's population—were estimated to be online. This is nearly 1.2 billion people more than when the last internet value chain paper was written in 2010. In other words, since then an average of 633,000 people have gone online for the first time every day over the past five years.

Figure 1

Global internet users and penetration rate



Sources: International Telecommunication Union, GSMA; A.T. Kearney analysis

With these significant changes in mind, the GSMA asked A.T. Kearney to update the previous internet value chain study, including the competitive and economic analysis of the value chain's various components, to make it relevant for today's internet economy. Similarly to the original paper, this report is intended to provide the framework and information for the ongoing debate without recommending specific actions.

Although the scope of the paper is global, inevitably the majority of the examples presented and company financials used for the analysis are from the biggest markets, namely the United States, Western Europe, and China. There will inevitably be national differences that are out of our scope. Full details of the methodology used are included in the appendix.

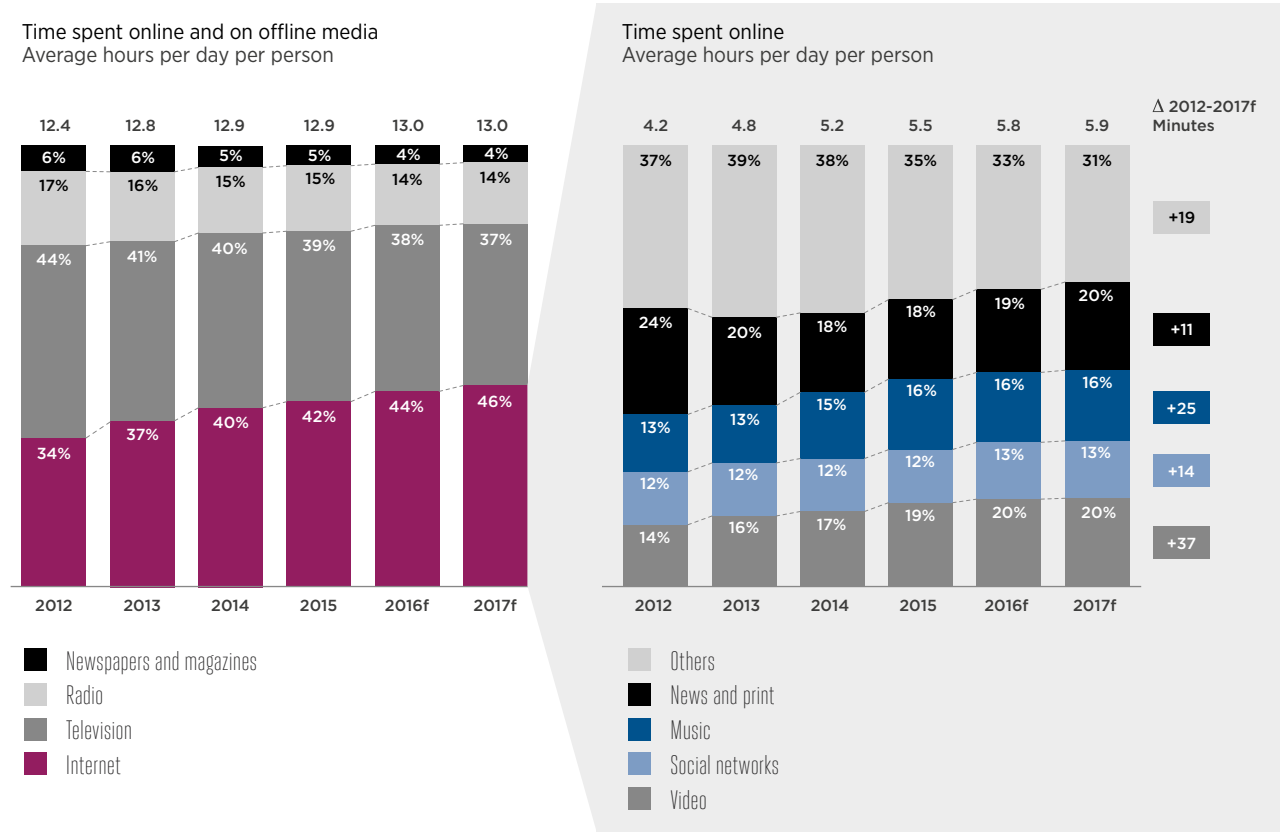
Internet value chain

The shift to online

As we consider the competitive health of the internet value chain, we should recognise that it competes to some extent with legacy products and services. It is clearly winning this competition on almost all fronts (see figure 2). Taking the United States as an example, in 2012 the average American spent 12.4 hours each day online or consuming media (which includes duplicated consumption, for example listening to the radio while reading a newspaper). Of this time 251 minutes were spent on the internet. By 2015 this figure had reached 329 minutes, and by 2017 it is expected to increase further to 356 minutes. In other words, over this five-year period people will have spent an extra 105 minutes of their day online—partly at the expense of traditional media.

Figure 2

Internet usage in the United States



Note: Data includes simultaneous media consumption. 'Others' comprises e-commerce, travel bookings, and other online activity not included elsewhere.
Sources: Zenith Optimedia, eMarketer, Pew Research Center; A.T. Kearney analysis

The fastest growth is in video and music consumption, accounting for 62 of those 105 minutes, supported by higher-speed bandwidth and a plethora of new online music and video services to meet all tastes. As the breadth of everyday activities that can be performed online increases, the amount of time spent on non-social network or media activities is also increasing. Although this trend will vary by region and the United States is further ahead than most others in this transition, it is reasonable to expect these general trends to apply more or less universally. Naturally, it is this growth in time spent using the many services on the internet that continues to drive growth throughout the value chain.

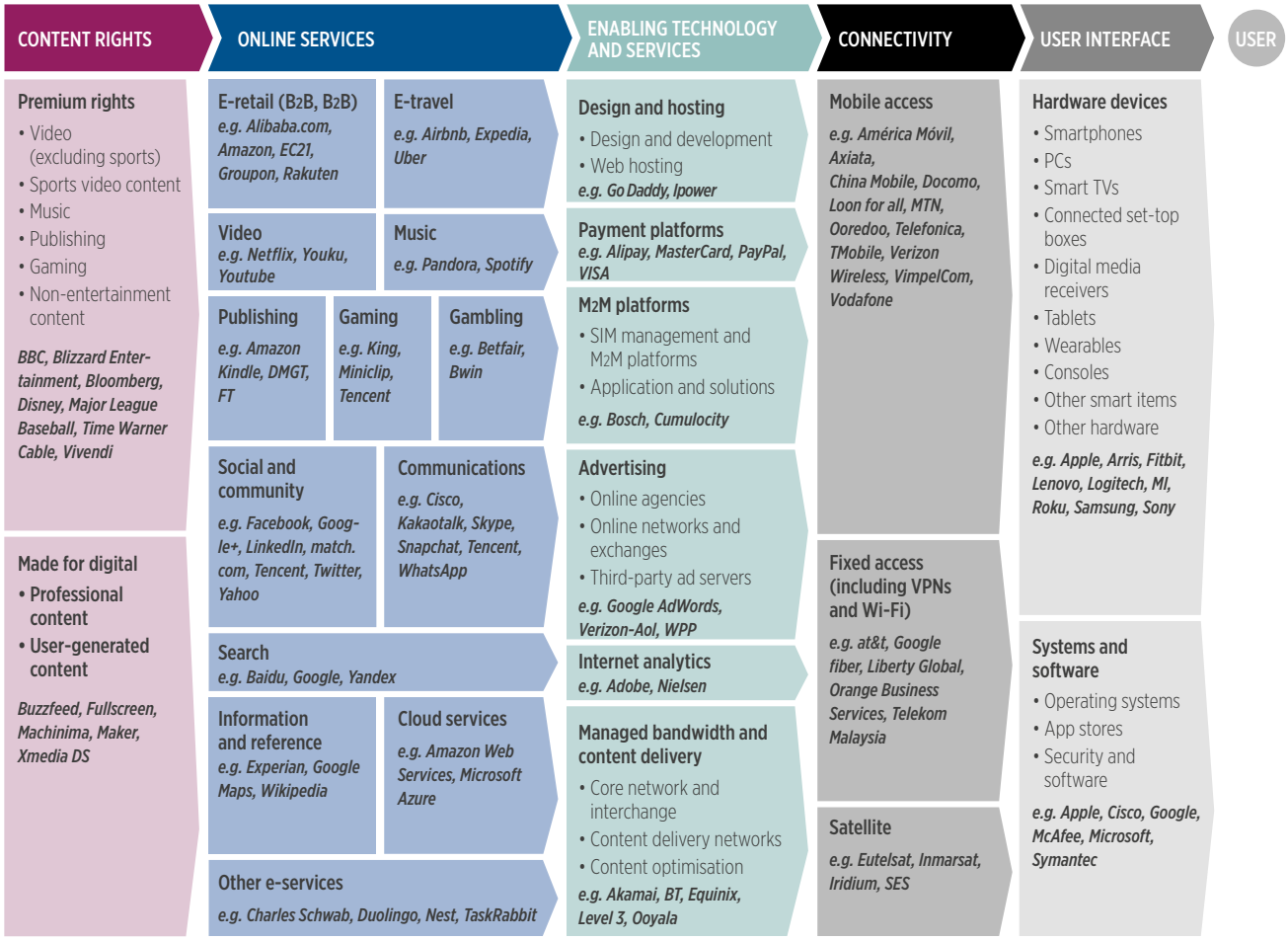
Internet value chain

The 2010 internet value chain has been updated for 2015 to reflect the current internet landscape (see figure 3). The logic remains the same in terms of representing all the players involved in the end-to-end service experienced by end users using the internet for whatever purpose. We retain the five main segments—content rights, online services, enabling technology and services, connectivity, and user interface—which are subdivided into 37 categories. We have sought, as far as possible, to keep the areas and categories in line with the 2010 structure to facilitate comparison and trends, but inevitably there have been redefinitions and additions. Further details are included in the Methodology section at the end of this report.

Figure 3

Internet value chain

Illustrative



Note: M2M is machine to machine, and VPN is virtual private network.

Source: A.T. Kearney analysis

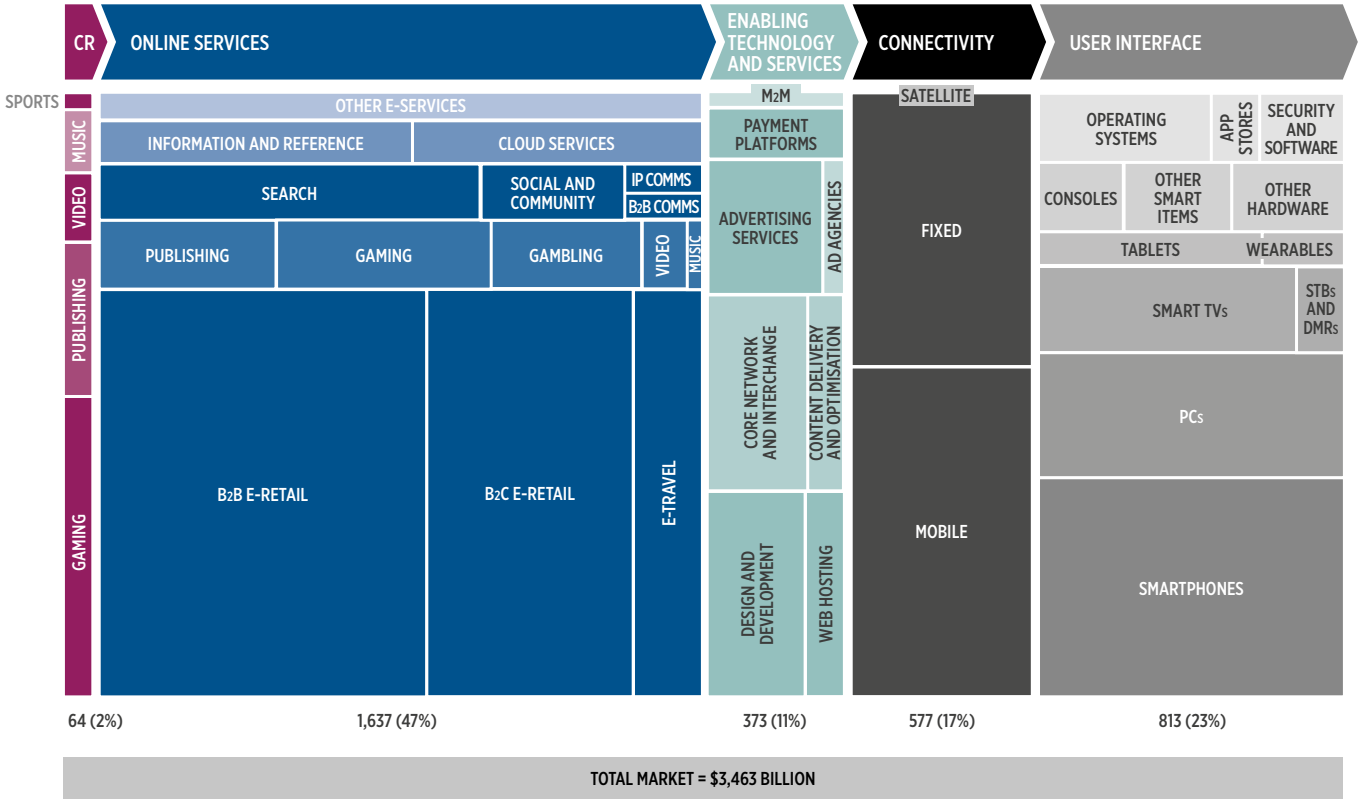
It is important to note that this 2015 value chain, and the corresponding analysis below, combines B2C and B2B. The reason for this is the increasing overlap between B2C and B2B in online services; for example social networks such as LinkedIn, e-retail services such as Amazon, and communication platforms such as Skype (to name a few) actively serve both the B2C and B2B market.[1] With the value chain structured to encompass all types of players, we analyse the size of each category (and, in select cases, subcategory) in terms of revenues, growth rates, EBIT performance, degree of concentration, and market capitalisation.

Adding up the global revenues of each category, we estimate the internet economy to be worth nearly $3.5 trillion in 2015—more than 4 per cent of gross world product, up from less than 2 per cent in 2008 (see figure 4). It is important to note that we only count the proportion of spend attributable to internet provision of a product or service. That is, if someone buys a used car from a website, we count the commission earned and not the full value of the car. For this reason, our analysis differs from some other reports that ask the question 'what proportion of the economy is touched in some way by the internet?'

Figure 4

Market size by segment and category

$ billion, % of total market, 2015



Notes: The value chain is represented at category level, except when showing it at subcategory level would enhance the analysis and understanding. E-retail excludes all other paid-for services captured in other parts of the internet value chain; also excludes sales of digital media content (publishing, gaming, video, music) and electronic data interchange. 'Ad agencies' includes analytics, which is insufficiently large to be broken out. CR is content rights, IP is internet protocol, M2M is machine to machine, STB is set-top box, and DMR is digital media receiver.

Sources: Financial statements, investor presentations, broker reports; A.T. Kearney analysis

Online services, which are the services many consumers probably perceive to actually be 'the internet', represents slightly less than 50 per cent of the total value chain. The next largest area, making up 24 per cent, is the market for user interface, which covers the devices and software that end users employ to access those online services. The remaining revenues are distributed across connectivity, enabling technology and services, and content rights.

1 The Methodology section provides a full definition of each category and subcategory.

Content rights

Content rights covers the companies that own, and in most cases sell to others, the rights to various types of content for distribution via the internet. It is important to note that this does not cover the actual creation or production of the content. Our view is that content creation and production—at least in the case of traditional content such as sport, music, and cinema—would be taking place anyway. What is related to the internet is the sale of the 'internet rights'.

The internet is changing the nature of content. Historically limited to professional companies and a limited pool of proven 'talent', in the digital age content has been truly democratised, with every individual given the opportunity to not only gather an audience but also to monetise it. The global nature of the internet supports 'long-tail' economics, whereby a relatively small number of geographically dispersed readers, viewers, or listeners with a common interest can now be aggregated to form a sizeable audience.[2]

We distinguish between two categories within content rights:

- **Premium rights.** This category includes professionally produced video, audio, print, and gaming content that is distributed via both internet and non-internet channels (for example, via terrestrial or pay TV) and is paid for by any number of commercial models (including, among others, user subscriptions or advertising-funded broadcasters). Non-entertainment content is also included here, such as paid information services for B2B customers. Our analysis addresses the portion of revenue generated from digital distribution that is paid to the rights owners.
- **Made for digital.** Similar in concept to premium rights, this segment consists of content that is primarily produced for distribution via the internet. It spans the full range, from amateur user-generated content to professionally produced content. Typically, but not exclusively, these are short-form videos for niche markets or on special-interest topics, distributed via service platforms such as YouTube or Vimeo.

In the context of the overall value chain, the value of content rights is relatively small at $64 billion, representing just 2 per cent, almost all of which comes from the premium rights category. The made for digital category is still nascent but is changing the nature of the internet.[3] Amateur user-generated content has existed since the early stages of the internet, but monetisation has typically been non-existent or trivial. Recent years have seen the emergence of semi-professional or professional-grade online video content. YouTube hosts an ecosystem of major made-for-digital video networks such as Disney-owned Maker Studios and AT&T/Chernin-owned Fullscreen, which together accounted for 12 per cent of YouTube video views in 2014. The biggest artists on these networks have turned professional, generating significant revenues. For example, Swedish artist PewDiePie is reported to have earned $7 million in 2014. In this context, the boundaries between professional and user-generated content are increasingly blurring.

2 See, for example, Chris Anderson, *The Long Tail: Why the Future of Business is Selling Less of More* (London: Random House Business, 2009).
3 With revenues of $250 million in 2015, made for digital is too small to appear in figure 4. However, the category is expected to more than double in size to $550 million by 2020.

Online services

Online services is a diverse segment covering the range of consumer and business services provided over the internet through browsers or application platforms. It encompasses much of what most consumers probably perceive to be the actual 'internet'. Since 2010, we have recategorised and expanded the range of online services categories included in the internet value chain to reflect the increasing breadth of services available.

For the purposes of this analysis we group these services in five main clusters.

E-COMMERCE

- **E-retail.** E-retail includes all companies that sell goods and services online, either to consumers or businesses. Any service where a sales transaction can be made online is included, even if the payment or fulfilment takes place offline. Together with well-known e-retail companies such as Amazon and eBay, this category also includes social buying services similar to Groupon or Meituan. Dedicated B2B retail exchanges are also included in this category.

- **E-travel.** This category includes online booking and travel agency services (for example, Expedia, airline websites, and travel apps), as well as newer online ride-hailing or ride-sharing services such as Uber, Didi, and Lyft, and other sharing economy sites such as Airbnb.

For both e-retail and e-travel, the actual goods and services purchased are very much 'real-world' rather than online services and without the internet the purchases would in most cases be conducted through a different channel (albeit in a more time-consuming and less transparent way, from the user's perspective). To account for this, when sizing and valuing these segments we only take into account the margin earned on the transactions by the retailers, not the gross value of transactions carried out via the internet. The shift of retail from offline to online channels is discussed later in this report.

ENTERTAINMENT

Many of the services end users access on the internet are entertainment related, in most cases providing a new and enhanced distribution channel for services that would otherwise have been enjoyed offline. For example, internet-based services enable a much broader choice of video, music, and gaming services, together with instant availability, than was available previously.

- **Publishing.** Far more than being a new way to distribute the written word, in many cases online publishing services offer a rich experience of multimedia content, with embedded video, links to supporting materials, and other valuable features. Examples include dedicated online sites (such as Huffington Post and BuzzFeed), the online properties of traditional publishers (for example, ft.com), and e-books.

- **Gaming.** This category includes platform-based video gaming with an internet connection (for example, Xbox Live), casual online games (such as *Candy Crush*), and 'massively multiplayer' online games (for instance, *World of Warcraft*) that use the internet to connect thousands of users around the world simultaneously within a single game.

- **Gambling.** Online gambling is a segment that continues to grow, despite restrictions in some countries. As well as a new channel for the traditional bookmakers, the internet has enabled a new form of gambling with exchange platforms allowing customers to offer odds as well as place bets with one another. Betfair is an example of such a platform.

- **Video.** These services are essentially platforms to host and distribute video content, although many players are now investing to generate their own content—most notably Netflix (with *House of Cards*) and YouTube (which is funding new channels to develop original content before spinning them off). In addition, this category includes the sale and rental of digital video content.

- **Music.** What began with illegal pirate file-sharing via platforms such as Napster has now matured to the point that in many markets a variety of legal download and streaming services are available. There is a growing trend towards streaming services, rather than 'buy and download', due at least in part to the increasing ubiquity of internet access and the improved reliability and quality of connections.

These services have all experienced steady growth over the past seven years and are worth approximately $207 billion in 2015. However, the level of revenue growth of the entertainment-related cluster of online services is perhaps less than might be expected, at around 10 per cent per annum.

On the one hand, gaming and publishing have seen strong growth of 32 per cent and 27 per cent per annum respectively. Traditional gaming platforms, such as PlayStation and Xbox, have taken their customer bases online by adding and successfully monetising online functionality, such as the ability to compete with friends or in large multiplayer games. Similarly, publishing platforms, with the growth of e-books and respected online titles that can be monetised via advertising or subscription, have matured into respected content services.

Video and music services, on the other hand—despite the large and growing user bases of the well-known players—have not been able to capitalise on the switch to online in the same way. Video represents only a small share of the internet value chain ($25 billion, or 1.5 per cent of online services and just 0.7 per cent of the total internet economy). Monetisation on advertising-based services such as YouTube is still nascent. YouTube's estimated advertising revenues in 2014 were $4 billion, but this was on an active user base of more than one billion people watching an estimated 75+ billion hours of content. Yahoo, which relies on more traditional display and search advertising, also generated revenues of approximately $4 billion in 2015 off a user base that is similarly sized but spends significantly less time on its sites than equivalent YouTube users.

SEARCH, INFORMATION, AND REFERENCE SERVICES

One of the many great benefits the internet has brought to society as a whole is making a vast array of information readily available to a large proportion of the global population.

- **Search services**, including global search engines (such as Google and Bing) and local ones (such as Baidu and Yandex), are often the first entry point to finding the exact information or service a user needs. These services are almost entirely advertising funded from a public internet perspective, although some also derive commercial revenues from providing similar services to private companies to search their own internal information systems. (The commercial revenues from these latter services are not considered to be part of the internet value chain). We estimate the revenues from internet search worldwide to be around $88 billion in 2015 and likely to continue to increase at around 14 per cent per year through 2020, driven by user growth and ongoing interest from advertisers.

- Additionally, the internet has spawned a myriad of online **information and reference services**, of which Google Maps and Wikipedia are two of the most widely used. These are a combination of commercial (usually advertising-funded) services and online collaborations that may also attract advertising revenues, solicit donations, or draw on voluntary funding. Online B2B information services such as Experian also fall under the rubric of information and reference services. At around $76 billion, these services—both B2B and B2C—generate nearly as much revenue as search services. However, we expect much more modest growth rates in the low single digits since these services, while interesting and valuable, are unlikely to see the sort of growth in usage (and therefore advertising revenues or donations) that search services will.

SOCIAL, COMMUNITY, AND COMMUNICATIONS

These services are among the largest on the internet in terms of user numbers.

- **Social and community services** include the likes of Facebook, Twitter, and LinkedIn, as well as more specialised services such as Flickr photo-sharing and Tumblr microblogging. Many of these services began with specific segments of users (high school and university graduating classes in the case of Facebook) but have since become tools to connect much broader communities of users—and to connect businesses and brands with their customers. We estimate these services have grown at around 22 per cent per year but from a low base, so their global revenues are only $33 billion. Social networks, most notably Facebook, do, however, increasingly act as a hub and gateway for other services such as e-commerce, gaming, and publishing. For example Facebook signed a deal in 2015 with the *New York Times, National Geographic*, and BuzzFeed to distribute content on its site. Thus the impact of this segment on the value chain is perhaps greater than its revenue size suggests and goes some way towards explaining the valuation of such companies.

- Internet-based **communication services** are becoming the popular choice for direct communications, replacing phone calls and text messages offered by the traditional telecoms companies to a greater or lesser degree in almost all countries. Prominent examples include internet protocol-based (IP-based) communications services (for example, Skype, WhatsApp, and QQ), and B2B unified communications subscription services (such as Cisco Jabber). Although they have had a massive impact by displacing telecoms operator revenues, the revenues of the services themselves are much lower, since many services are free and have minimal advertising income. We estimate their global revenue at around $22 billion, which is less than the turnover of many domestic telecoms companies (for example, BT in the United Kingdom has $26 billion, and NTT in Japan has $93 billion). However, we do expect communications services revenues to grow by as much as 20 per cent per year for the next five years, provided that players are able to effectively monetise their services. Despite a general consumer reluctance to pay for online communication services, Asian providers have shown the potential of this model. For example, even as early as 2012 Tencent generated payments from more than 30 million users of its QQ instant messaging service. The B2B segment also shows this is possible by offering feature-rich applications and providing secure and reliable communications.

CLOUD AND OTHER E-SERVICES

- **Cloud services** make up the majority of the remaining online services, with an estimated value of $63 billion. This covers the many services that are now hosted in remote data centres and accessed from anywhere on the internet, and it spans data storage, on-demand data processing, and fully hosted software services, which together replace much of the hardware and software functionality that would previously have been installed at customer premises, whether at offices or at homes.

- A range of **other e-services** are included in the overall online services segment, including user-paid services such as e-learning, e-brokerage, paid apps, and advertising-based web services and apps. It also includes the front end of various 'Internet of Things' services. The services themselves are made up of 'smart' devices, such as Wi-Fi connected thermostats, the value of which are captured in the user interface segment of our framework. Similarly the connectivity component of the Internet of Things market is captured in the connectivity segment of the framework.

Enabling technology and services

The enabling technology and services segment covers a wide range of services that often are not immediately visible to internet users but are essential to the efficient operation of the overall internet infrastructure and the websites, servers, platforms, and services that use it. As a whole the segment has grown from $159 billion in 2008 to $373 billion in 2015, posting a 13 per cent compound annual growth rate that is slower than the other main segments but still substantial. This somewhat slower growth is likely because many of the services do not scale directly with the revenue or usage going over them but rather with the number of service providers using them. For example, an analytics service that tracks usage patterns on a particular retail site will not earn double the revenue just because the numbers in its reports have doubled in magnitude. They most likely would double, though, if they could sell a similar reporting service to a different retailer. There are many different services offered in this segment, some very niche focused, so for simplicity we have grouped them into three main clusters.

ENABLING PLATFORMS

A range of services underpin the smooth running of many online services and activities:

- **Design and hosting** covers from basic websites to more advanced services such as distributed content. This continues to be a significant market, driven by both overall internet growth and the complexity of making services available across multiple platforms with more sophisticated functionality and layout. This segment is worth around $124 billion in 2015 and likely to keep growing at a steady rate of more than 10 per cent per annum.

- **Payment platforms** comprise companies providing transaction systems that process end-user online payments. A number of models are included here, among them proprietary online services (such as PayPal) and services that are extensions of traditional credit or debit card platforms. The revenue estimate of $31 billion is based on the transaction fees the platform service provider earns, not the gross value of payments transacted.

- **Machine-to-machine (M2M) platforms** include companies providing the range of integration, management, and operation of core platforms that enable M2M-based services. The revenue estimate of $9.5 billion is based on the share that is internet related (as opposed to regular private M2M services, for example via SMS), which is still modest but growing quickly.

ADVERTISING

Although the bulk of advertising revenue goes to the service provider that 'owns' the end-user relationship, a range of intermediary companies act as agents to serve and place these ads. Exchanges also exist where online advertising space is traded, in some cases via mini-auctions conducted in microseconds to decide which advertisement a user will see. To avoid double counting, we only take the ad agency or exchange provider's markup as the revenue in this segment, not the full value of advertising they may handle (which shows up as revenue to the site or service where the advert is placed). Given the sheer scale of advertising on the internet, this segment is worth $84 billion, and we expect it to continue to grow at between 25 and 30 per cent annually as even more advertising revenues shift online.

One potential threat to this growth, however, is ad-blocking services. Companies are taking different positions and approaches. Apple has made ad blocking a core feature of its operating system, while Yahoo is restricting access to certain services where ad-blocking software is detected. In Germany, where more than 30 per cent of people use ad blocking, media groups have taken legal action against ad-blocking software producers. Axel Springer has gone so far as to ban readers who use ad blocking from the website of the country's leading tabloid.

Continued strong growth of mobile market revenues in developing countries in Africa and Asia is offsetting the gradual decline in developed nations.

MANAGED BANDWIDTH AND CONTENT DELIVERY

The internet is built on the concept of interconnected networks. The basic building block in most cases is an individual telecoms operator network that provides access to a customer—a network that we count in the connectivity segment of the internet value chain. However, there are companies that provide wholesale services that interconnect these access providers, as well as specialist content delivery networks and adaptation services that may use private infrastructure and private connections to deliver content and traffic to end users. We estimate this segment is worth $123 billion in 2015, up from $87 billion in 2008. This represents compound annual growth of 5 per cent, and we expect the segment to continue to grow at a single-digit rate. Despite the relentless increase in traffic, there has been vigorous competition in the core network and content delivery subcategories. Unit prices of IP transit services have dropped by up to 90 per cent between 2008 and 2015, while the rise in private peering agreements has led to a reduction in the demand for paid-for services. On the content delivery side, in addition to direct price pressure, there is a growing trend towards bundling content delivery with more advanced services such as security and hosting, which are counted in their respective categories, so the reported revenues for content delivery itself have not shown the same high levels of growth as they have in the past.

Connectivity

The connectivity segment represents the means by which end users connect to the internet. For most users this takes the form of either a fixed connection such as digital subscriber line (DSL) broadband, or a radio-based mobile network using 2G, 3G, or 4G data services. For completeness we include other means such as connectivity via satellites, but these services are very small in comparison.

- For **mobile access**, the sizing is based on a number of data sources, since many consumers now buy a bundle of voice, data, and SMS without specific tariffs attributed to each. We specifically exclude SMS revenues as well as all traditional voice revenues, since these do not relate to the internet value chain. We also exclude the handset payments made within many mobile bundles in order to avoid double counting with the user interface segment. In most cases, the main suppliers of these services are mobile network providers (such as Vodafone, Verizon Wireless, and China Mobile), but end users may actually contract with a range of mobile virtual network operators (MVNOs) who are reselling connections and capacity on these networks in any given country.

- Similarly, the **fixed access** service category covers the connectivity of internet service providers over fixed networks, which could be delivered to end users over a range of access technologies such as DSL, cable (DOCSIS), direct fibre, and public Wi-Fi. In most countries, the main suppliers are the former incumbent telecoms operator and a range of newer alternative network operators, either using their own networks (such as cable operators) or using unbundled local loops from the former incumbent connected to their own core and aggregation networks. As with mobile, the revenues captured in our analysis are only those related to internet access services, and so exclude voice services and private data network services used by business customers as part of corporate networks.

For both fixed and mobile revenues, we allocate only that portion of total customer spend related to internet connectivity as opposed to traditional person-to-person communication. Inevitably there is some margin for debate in this allocation, but we have relied on official data from various sources to prepare this analysis, as described in the methodology.

When considering voice and SMS services in addition to internet services, the total telecoms sector globally has been roughly flat since 2008 (less than 1 per cent compound annual growth), which masks a number of counterbalancing trends within the context of overall telecommunication revenues:

1. There is a shift from fixed to mobile telecoms networks, as new higher-speed services are rolled out globally and access to these services continues to rise. The GSMA expects 4G to account for 60 per cent of connections in Europe by 2020, up from 20 per cent in 2015. Globally, total mobile network revenues have been growing at around 3.5 per cent per year since 2008, while revenues from fixed services have been declining at 2.9 per cent annually.

2. Revenue from traditional voice services are declining globally for both fixed and mobile providers as price and volumes decrease, replaced by new forms of communication services, most of them internet based. In some cases this is reflected in tariff structures; in other cases it is visible in customer buying and usage patterns.

3. There is also a regional shift taking place, with a gradual decline in revenues in developed markets being offset by continued strong growth in developing countries. Total mobile revenues grew by an average of 4 per cent annually between 2011 and 2015. However, while Africa and Asia both had annual growth rates of 6 per cent, Europe's mobile market revenues shrank by 3 per cent per annum.

Looking further ahead, we expect growth in the connectivity segment to slow to 7 per cent between 2015 and 2020, versus 14 per cent from 2008 and 2015—and as a result, connectivity as a segment will make up a smaller proportion of the overall internet value chain in 2020 (14 per cent versus 17 per cent today). The ongoing decline in revenues associated with legacy voice services, combined with this modest growth in internet connectivity revenues, means that the majority of global telecoms operators' revenues in both the fixed and mobile sectors will come from internet-related services by 2020.

User interface

The final segment of the internet value chain is the most tangible from a user perspective and includes the devices, systems, and software they use to access the internet and the services in the other segments.

In some cases, the same manufacturer is responsible for producing both the devices and the software they contain, as occurs with Apple products. In many other cases, however, device manufacturers incorporate a customised version of an open operating system developed by others, such as devices running Android.

DEVICES

The devices used to access the internet have historically comprised computers, smartphones, and tablets, but they now also cover a growing array of connected devices. This includes new types of connected screens at opposite ends of the spectrum of screen sizes, with smart TVs at the top end and smart wearables (including watches and headsets) at the bottom end.

In addition, an increasing number of screen-less connected devices act as gateways. These include connected TV set-top boxes, digital media receivers, and games consoles. Pay TV service providers are increasingly providing customers with connected set-top boxes that enable multiscreen, multiroom, and

interactive services, which can drive higher ARPU from their subscribers. At the same time stand-alone set-top boxes, which are commonly used in markets with high penetration of free-to-air satellite TV, are increasingly connected to the internet as the cost of IP box technology has decreased: 57 per cent of set-top boxes shipped in 2015 were connectable, up from 44 per cent in 2014. Digital media receivers provide a similar function and, for example, include Apple TV, Amazon's Fire, and Google's Chromecast. Many of the major providers of online video services have launched such products to gain greater influence over the end-user experience. Virtually all consoles are now IP enabled, which not only allows for game downloads and multi-player online gaming, but also permits the use of consoles as entertainment hubs to stream and download video and music.

For the sake of completeness, we also include other hardware that enables internet access such as modems and routers, as well as select other smart items. Smart cars and connected white goods (such as washing machines, refrigerators, and other home appliances) are the two most prominent categories at the time of writing, although the connected item landscape is developing and expanding rapidly. The number of connected cars is expected to grow from 25 million in 2015 to 211 million in 2020, and new features will include in-vehicle connectivity, media streaming, personal assistant services, and vehicle-to-driver communication. Cumulative smart white goods sold are expected to grow from 11 million in 2015 to 205 million in 2020.[4]

Within the devices cluster, smartphones are now the largest category with $294 billion of sales, and they have overtaken PCs—the second largest category in the cluster—in terms of market size since our study in 2010. Estimated smartphone sales volumes will have reached 1.4 billion units in 2015, or one smartphone sold for every five people on the planet (a number that would be even higher if the resale of used smartphones was considered). Smart TVs have emerged as the third biggest category, with sales of $115 billion. China is by far the largest smart TV market in the world, leading with a penetration rate of more than 30 per cent; Australia, at 17 per cent, is the market with the second highest penetration rate of smart TVs. Beyond smartphones, tablets, and smart TVs, there is now a high degree of fragmentation in the connected device landscape, which reflects the many ways in which consumers and business can now access the internet.

The strongest growth is expected to come from wearables and other smart items (connected cars and white goods), with both growing at more than 30 per cent per annum between 2015 and 2020, albeit from a relatively small base. Of the large categories, smart TVs will have the highest growth rate, at 13 per cent annually during that period. The PC market is expected to remain flat, while smartphones and tablets will grow at less than 3 per cent annually, partly due to saturation in mature markets and downward price pressure from low-cost entrants (such as Chinese manufacturer Xiaomi) in emerging ones.

The complete internet value chain is estimated to grow by 11 per cent annually over the next five years, reaching $5.8 trillion by 2020.

4 Source: IHS Home Appliances Intelligence Services. (This estimate includes dishwashers, humidity sensors, microwave ovens, refrigerators, freezers, hobs, ovens, thermostats, washers, and dryers.)

SYSTEMS AND SOFTWARE

This cluster includes operating systems, app stores, and security and software. Operating systems and app stores are closely aligned across most devices, with Google and Apple running rival ecosystems of Android/Play Store and iOS/Apple App Store respectively. In line with the growth of cloud computing, PC operating systems are increasingly sold as downloaded upgrades rather than in boxes. Microsoft refers to its latest operating system, Windows 10, as the 'last version of Windows', as it will be upgraded on a continuous basis from the cloud, rather than using stepped upgrades through the release of new versions of the operating system.

The security and software category includes antivirus and anti-malware software, as well as professional-grade B2B endpoint and network security provided by companies such as Cisco, Juniper, and Check Point. Browsers are also considered.

The app store market is expected to expand by approximately 30 per cent per annum between 2015 and 2020, driven by the increasing willingness of people to pay for apps and by growth in mobile advertising. In contrast, operating systems growth is expected to remain relatively flat as operating systems are seen as an enabler for customer access and control, rather than a revenue or profit source in their own right. The security and software market will grow moderately at 5 to 10 per cent yearly, as companies especially continue to spend on internet security.

Outlook

Looking at all areas of the internet value chain combined, the total size increased at an average annual growth rate of 16 per cent between 2008 and 2015 and is expected to grow at 11 per cent per annum over the next five years, which will lead the total value of the internet value chain to grow from $3.5 trillion in 2015 to $5.8 trillion by 2020 (see figure 5 on page 23). Higher smartphone penetration, spend on data connectivity, consumption of online media, and spend on e-commerce logically fit together, and in turn they drive increased value in digital content rights, spend on online advertising, and revenues for billing platforms (to name a few of the related items).

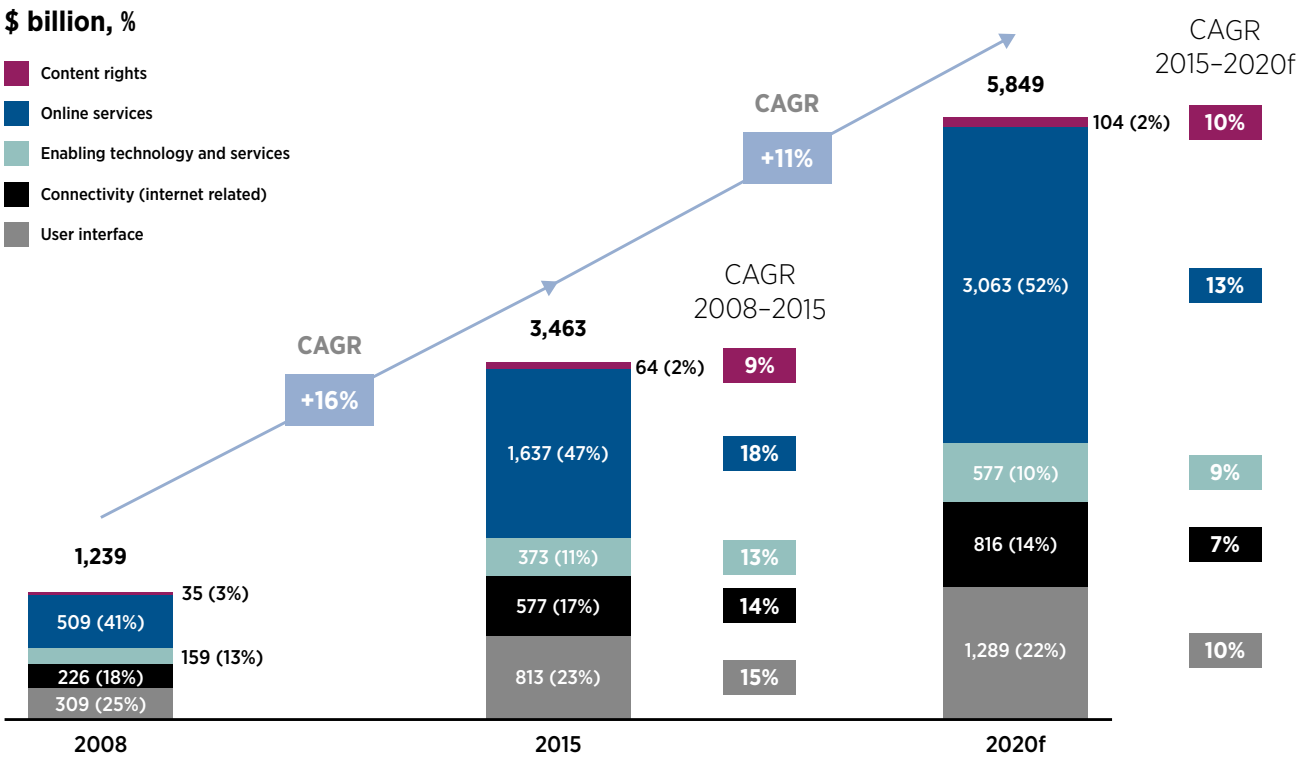
We expect, however, to see the fastest growth in online services, with a CAGR of 13 per cent over the next five years, leading this area to increase its share of internet value chain revenues to more than 50 per cent, while all other areas will experience a decreased share of the total market. The biggest driver in absolute terms will continue to be e-retail, which will almost double in size by 2020 to become a nearly $2 trillion market globally.

By 2020 B2C e-retail will also have overtaken B2B e-retail in size. Key enablers to this will be increasing number of services in developing markets, quality of service, and overall consumer comfort with online sales transactions.

Of course, making predictions about the internet is challenging and carries a wide margin of error, even if in many respects the sector is maturing. Game-changing innovations that could either boost or curb growth are possible at any time, and they can come from many directions. Just as private companies are acting unilaterally against online threats to their business models in a way that seeks to contain the growth of the internet economy, some government actions could potentially have the same effect. Uber has been outlawed in at least seven cities already, while San Francisco considered banning Airbnb and similar services in the city in 2014 to protect the local housing market, before eventually allowing them to continue to operate under more restrictive conditions.

Figure 5

Internet value chain size and growth by segment



Note: Includes restatements of 2008 data to 2015 structure to enable comparability.
Source: A.T. Kearney analysis

Economic analysis

Revenue flows into and across the internet

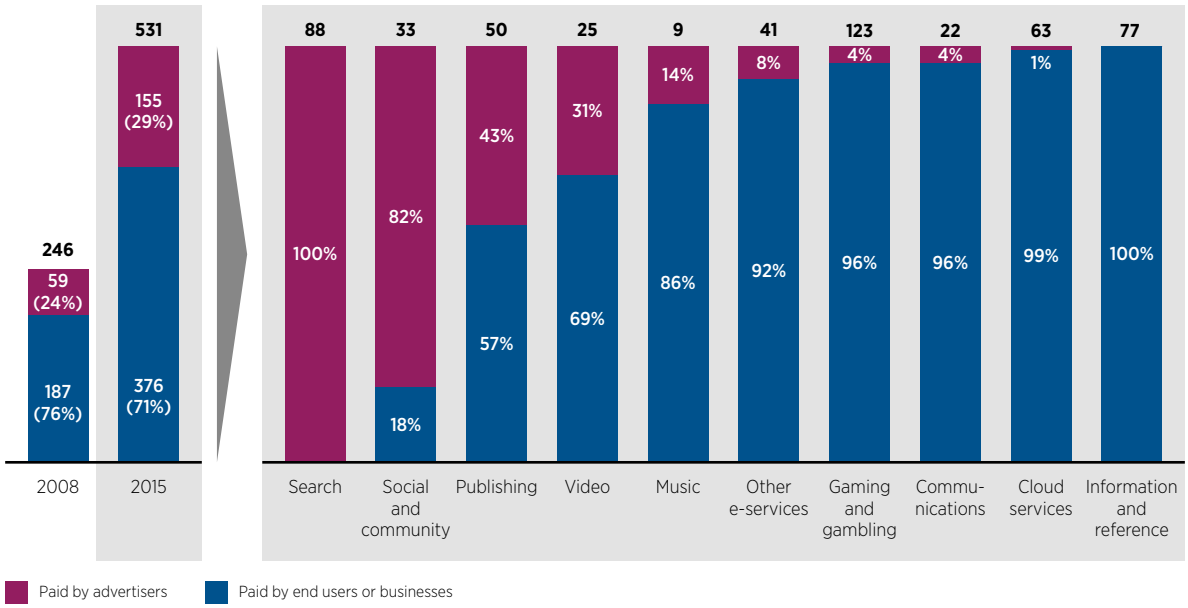
Nearly one-half of the economic inflows into the internet economy are comprised of consumer and business payments to online services companies. A look at where revenues come from and how the providers in this segment derive their income reveals a shift since 2008 (see figure 6). Advertising revenue streams have grown strongly as the various online advertising channels (including search, display ads, video advertising, and in-app advertising) have increased in sophistication and moved from a niche to a mainstream advertising channel. The level of engagement they are able to deliver between advertiser and potential customer, together with much greater feedback in terms of individual customer behaviour and reactions to online advertising, makes them attractive in comparison with offline channels. As a result, a greater proportion of the revenues of online services providers comes from advertising sources now than in 2008 (29 per cent of the total versus 24 per cent in 2008). However, revenues directly from end users—whether via one-off purchases, subscription services, or pay-as-you-go models—have also grown substantially, doubling in the same period to $376 billion in 2015.

Search services are fully funded by advertising revenues, and to a large extent so are social networking and community sites. However, publishing (which includes newspaper, magazine, and book publishing) is a mix of user-paid and advertiser-paid revenue. When considering only newspaper publishing, the mix is more skewed to advertising, with 76 per cent advertiser paid and 24 per cent user paid. This contrasts to an even 50-50 per cent split between advertising and circulation revenues for offline newspaper publishing, reflecting a segment that is still defining its online business model. That is, online newspapers still waver between erecting a paywall for premium content and offering free-access sites with high readership and, therefore, advertising income.

Figure 6

Online services split by revenue type (excluding e-retail and e-travel)

$ billion, % of total



Source: A.T. Kearney analysis

Many of the other online entertainment services companies use a hybrid revenue model, combining some free or partially advertising-funded services as an enticement, with additional content and functionality offered to users who choose to subscribe. This is generally known as the 'freemium' approach. Although some services may be viable with advertising revenues alone, generally a key success factor is their ability to convert free users into paying subscribers. In video, 69 per cent of revenues come from paying subscribers, while 86 per cent of music revenues and 99 per cent of cloud services revenues come directly from users' pockets.

It is important to note that these splits only refer to the sources of revenue. In many cases, looking at a split of the number of users who are subscribers versus 'free' could give a very different picture. For example, a music streaming service may earn the majority of its income from paying subscribers, while the majority of its users listen via a free advertising-funded service. Different companies are also following varying strategies within segments: for example, in video YouTube largely follows an advertising video-on-demand (AVOD) model, while Netflix follows a subscription video-on-demand (SVOD) model.

At the same time, it is important to note the interrelationships across the value chain that govern money flows and economic dependencies. Content rights companies receive revenues from online services operators, in particular consumer entertainment companies in video, music, publishing, and gaming. Enabling technology companies are mostly pure B2B service providers, and many receive a large part of their revenues from other companies in the internet value chain, for example in relation to web design hosting, advertising services, payments, and content delivery. For example, an online video service provider such as Hulu pays enabling technology companies in the internet value chain to maintain its website, optimise content delivery across multiple platforms, serve ads on its website, advertise its own services on other websites, and process subscription payments. In addition, it pays media companies (in the content rights segment) to license content for its platform, telecoms operators (in the connectivity segment) for its own in-office connectivity, and device manufacturers and software firms (in the user interface segment) for its office equipment.

Profitability

Beyond revenues, we assess the relative profitability across the internet value chain as measured by EBIT margin. This metric is useful, as it takes into account the variations in depreciation between categories resulting from their differing capital intensity.[5]

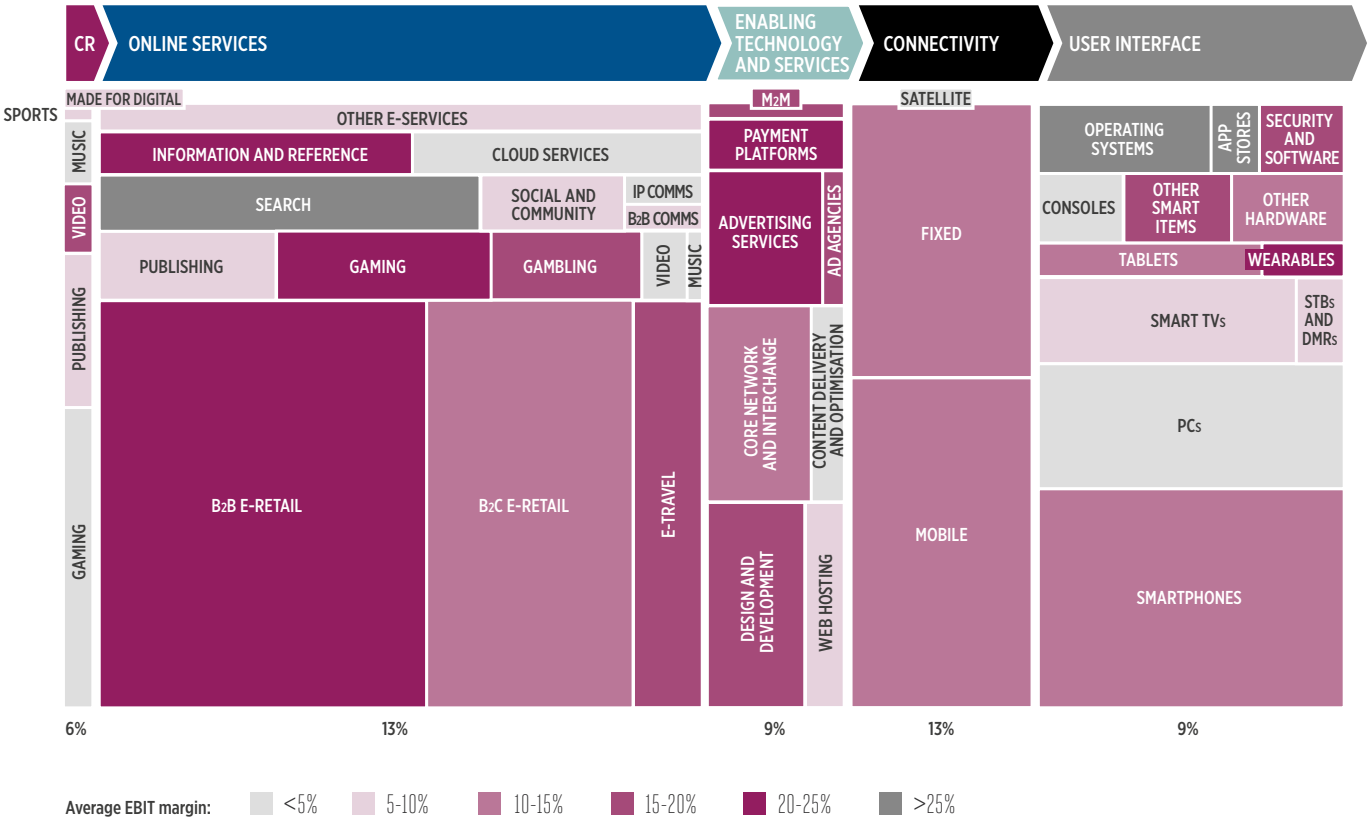
EBIT margins differ considerably across the internet value chain and also within each of the five segments (see figure 7 on page 26). The most profitable online services and enabling technology categories—e-retail, search, gaming, information and reference services, payment platforms, and advertising services—all feature significant network effects, economies of scale, or both. The network effects of search and online advertising businesses such as Google and Baidu, payment platforms such as PayPal, and B2B e-retail platforms are significant in their respective sectors, enabling the leaders to extract high margins. The scale and long-term reputation of the leading B2B information service providers such as Experian and Bloomberg create a significant barrier to entry in the business segment, thus supporting the profitability of their online operations. The companies with the leading operating systems and app stores in the internet environment are also highly profitable, using their scale and strategic market positions as gateways to their benefit.

It should be noted that within categories and subcategories there are often exceptions, where the overall margins are low on average but the leaders have high profitability. For example, in content delivery and optimisation Akamai reports EBIT margins of more than 25 per cent, placing it in the highest bracket in the internet value chain. However other content delivery network operators have much lower profitability.

5 The margins presented here are not necessarily those of the players with the largest market shares. Please see the Methodology section for further information and clarification.

Figure 7

EBIT margin across the internet value chain



Note: The value chain is represented at category level, except when showing it at subcategory level would enhance the analysis and understanding. Average EBIT margin is derived from the top three to eight players per category. To ensure representative financials, only companies that derive at least 30% of revenues from the category are included. CR is content rights, IP is internet protocol, M2M is machine to machine, STB is set-top box, and DMR is digital media receiver.

Sources: Financial statements, investor presentations, broker reports; A.T. Kearney analysis

By contrast to online services, the high levels of competition and product or service commoditisation in the connectivity and user interface segments have been major factors in suppressing profit margins. Apple is one of the few exceptions, thanks to its success in building a differentiated product and operating ecosystem at the high end of the market. A recent industry report estimates that Apple captured 94 per cent of the profits of the smartphone sector in Q3 2015, despite accounting for less than 14 per cent of smartphones shipped.[6]

Certain low-margin online services, such as cloud services and IP communications, are provided as loss leaders to consumers. At the time of writing, Microsoft and Amazon both offer 5 gigabytes of free online cloud storage, while IP communication services such as WhatsApp, Facebook Messenger, and Skype form an important part of their parent companies' ecosystems as traffic drivers, without the intention for them to be major profit contributors on their own.

6 Source: Canaccord Genuity

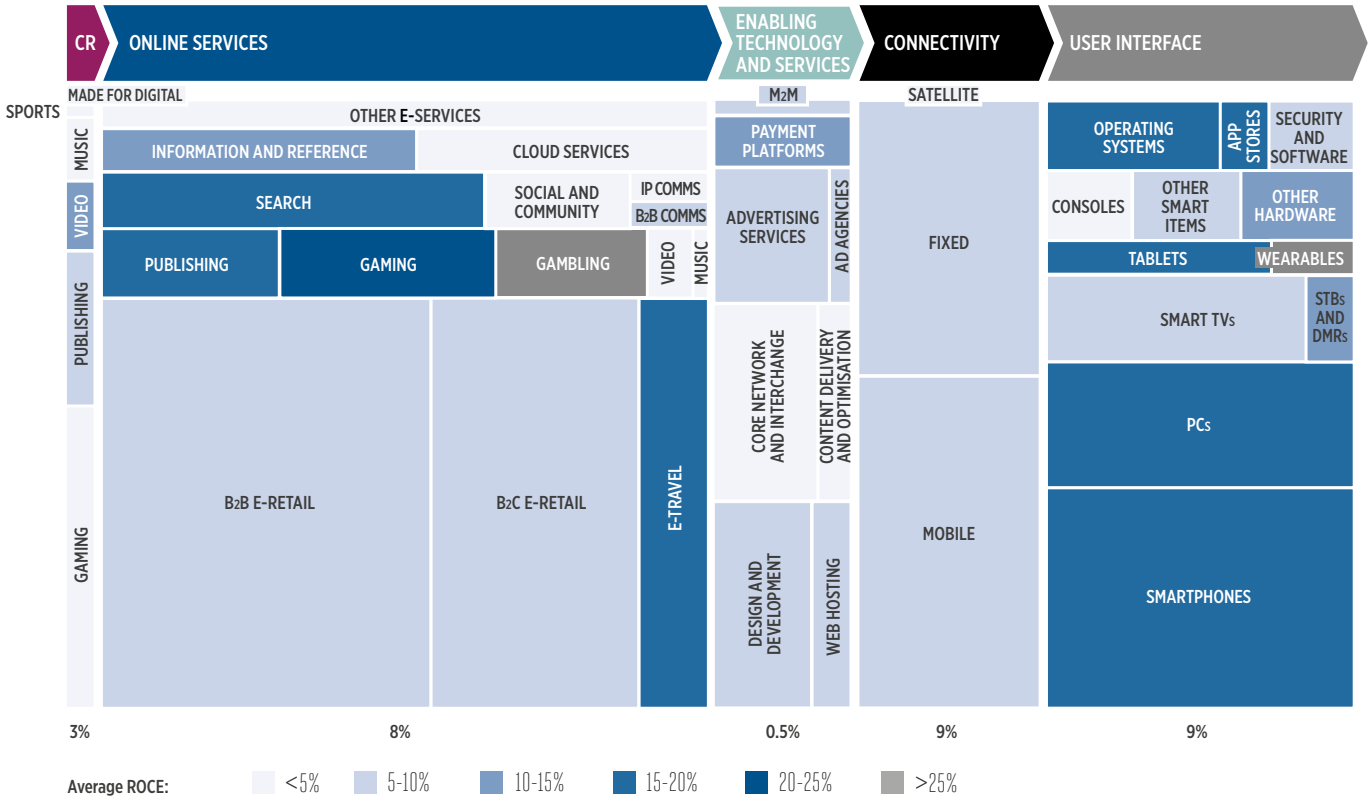
Return on capital

When considering the return on capital employed (ROCE), the picture is in some cases markedly different from that of in-year profit margins (see figure 8). Many of the higher-EBIT categories show a more modest ROCE. This is frequently because continual capital investment is required to preserve market position and enable growth.

For example, the largest e-commerce companies compete on service quality, which includes speed of delivery. This requires investment in physical distribution infrastructure and innovation. Amazon, for instance, now operates warehouses in approximately 130 locations and has invested in drone delivery technology.

Figure 8

ROCE across the Internet value chain



Note: The value chain is represented at category level, except when showing it at subcategory level would enhance the analysis and understanding. Average EBIT margin is derived from the top three to eight players per category. To ensure representative financials, only companies that derive at least 30% of revenues from the category are included. CR is content rights, IP is internet protocol, M2M is machine to machine, STB is set-top box, and DMR is digital media receiver.

Sources: Financial statements, investor presentations, broker reports; A.T. Kearney analysis

The same principle applies to enabling technology and connectivity providers, which are investing in physical infrastructure such as mobile networks, data centres, and server capacity to meet the demands of continual internet traffic growth. Despite being one of the more profitable companies in the internet economy, the investments required by Akamai to grow and defend its position in content delivery leads to a more 'normal' ROCE, in the 10 to 15 per cent range.

The online services with relatively low return on capital (and also low profitability) are generally nascent ones. These include video, music, and social and community. For video and music this is most likely a reflection of limited consumer willingness to pay for content, combined with heavy investment in technology infrastructure and, in some cases, content rights for future growth. In the case of social and community, Facebook and Match are the exception and demonstrate

the impact of being a market leader in categories with high network effects. While these companies had ROCE of 13 per cent and 20 per cent respectively, most other social network and dating providers had low-to-negative returns. Similarly, EBIT margins of 40 per cent for Facebook and 24 per cent for Match were very substantial compared with single-digit margins for most of the rest of the category.

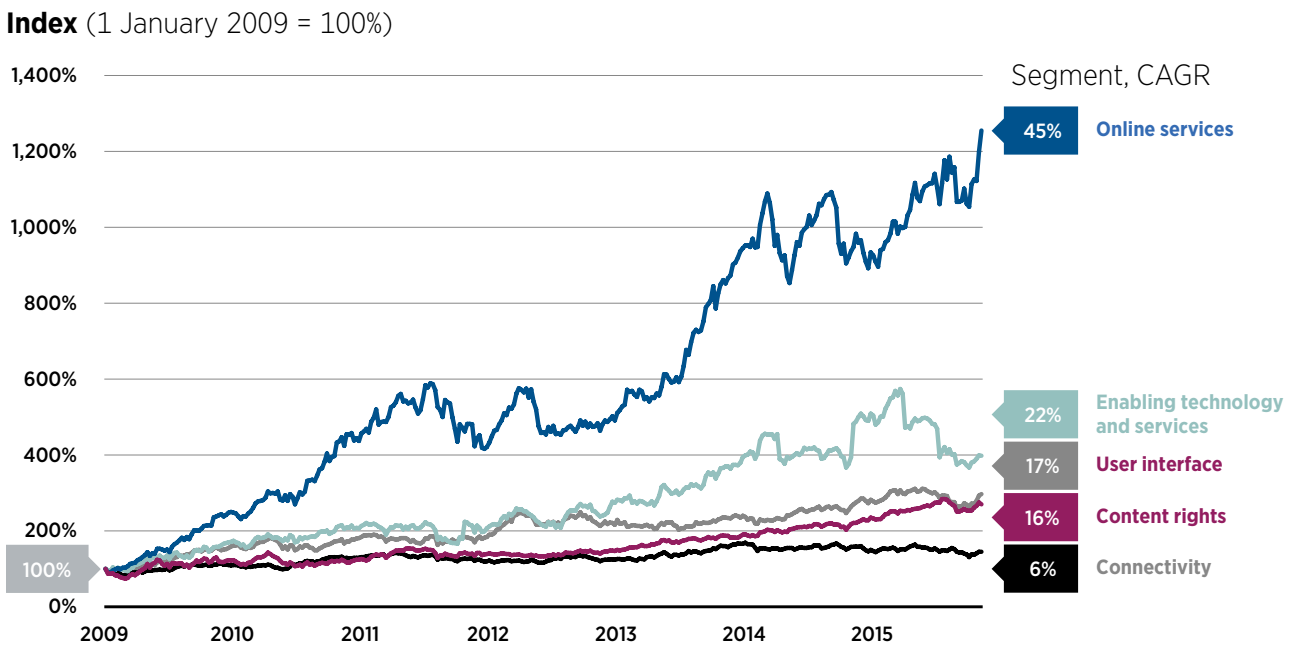
A small number of categories appear to enjoy both relatively high profitability and return on capital. These include gaming and gambling, both of which enjoy strong network effects, willingness to pay, and customer loyalty (or 'stickiness') in relatively low capital-intensity sectors.

Shareholder value

When considering the relative shareholder value of the five segments of the internet value chain since 2009, again based on a basket of representative companies, major differences emerge (see figure 9). Online services companies have on the whole significantly outperformed all other segments. This reflects general confidence in the future growth prospects of the biggest internet companies, and their ability to retain and improve their market position and business performance. When compared with the market as a whole, all segments except connectivity outperform the S&P 500 Index, which generated average annual returns of 12 per cent during the 2009–2015 period.

Figure 9

Market capitalisation by segment



Notes: Market capitalisations are based on a basket of players for each category: A) Online services: Amazon, Google, Netflix, Alibaba, eBay, Baidu, Tencent, Facebook, Priceline, Salesforce.com, JD.com; B) Enabling technology: Akamai, Google, Level 3, GoDaddy, Publicis, PayPal; C) User interface: Microsoft, Apple, Samsung, Dell, Cisco, Sony; D) Content rights: Walt Disney, Newscorp, Time Warner, Warner Music Group, Vivendi, Electronic Arts; E) Connectivity (top 10): China Mobile, Verizon, AT&T, Vodafone, NTT, Softbank, Deutsche Telekom, Telefónica, América Móvil, China Telecom. Content rights and connectivity companies generally pay out higher dividends than the technology companies in the other segments, which will reduce market cap on a relative basis.

Sources: Bloomberg; A.T. Kearney analysis

Parallels are made with the dot-com bubble at the turn of the millennium, and there is an element of truth that many of the online services and, to a lesser extent, enabling technology companies have relatively high EV/EBITDA multiples. The baskets of online services and enabling technology companies in this case average 43.6x and 19.8x respectively, in contrast to 8.0x for the connectivity providers and 6.6x for the user interface companies.[7] It is also true that, unlike most publicly listed online services companies, many companies in the other segments are 'dividend stocks', providing shareholder returns through regular dividend payouts rather than through stock price appreciation.

Online services companies have, on the whole, significantly outperformed all other internet segments since 2009 in terms of market capitalisation.

When comparing the situation today with the turn of the millennium, however, the online services companies analysed here on the whole have proven revenue streams, business models based on network effects or other sources of competitive advantage, and identifiable assets such as servers or proprietary technology (for instance, search or advertising algorithms).

At the same time, they are also relatively unencumbered by geographic boundaries or regulatory restrictions (although there are indications that this is shifting, for example, with the debates on privacy). Recent commentary on stock market trends has suggested that these firms are also benefiting from investor scepticism about the prospects of traditional sectors of the economy. Ironically, some of this scepticism is caused by competition and disruption from the internet.

7 Based on historical economic value to trailing 12-month EBITDA for the last reporting period, which in most cases ends on 30 September 2015

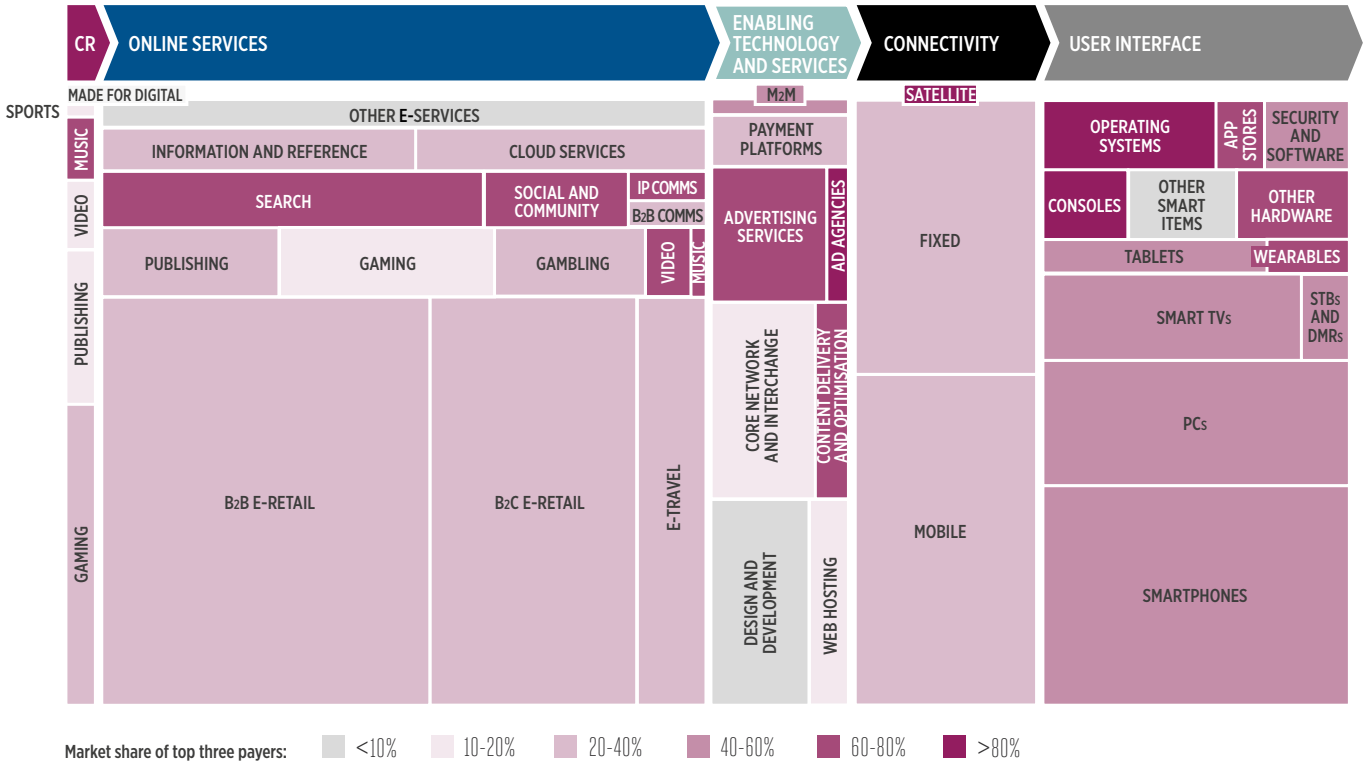
Competitive health of the internet

Competitive analysis across the internet value chain

To evaluate the relative competitiveness of the various categories within the value chain, we assess the cumulative global market share of the three largest companies (see figure 10). Clearly a driving factor of the different degrees of market concentration is the extent to which the categories are global and their products and services standardised, and whether these companies can easily operate across borders.

Figure 10

Cumulative market share of top three players in each category



Notes: The value chain is represented at category level, except when showing it at subcategory level would enhance the analysis and understanding. CR is content rights, IP is internet protocol, M2M is machine to machine, STB is set-top box, and DMR is digital media receiver.

Sources: Financial statements, investor presentations, broker reports; A.T. Kearney analysis

The largest **online services** category, e-retail, is relatively fragmented, which is a reflection of the fragmentation of the global retail market and the logistical challenge of providing a competitive service without a local base. In most markets, local retailers with their own online sales still have a majority share. At the other end of the scale, social and community, search, and IP communications are three of the most concentrated online services categories, with very powerful network effects and relative ease of operating a global service.

In entertainment, video and music are also concentrated, but for a different reason. In this case the concentration is driven by the relatively small number of players that have been able to build global scale and strong brands that allow them to successfully monetise online content.

The online video market is, however, becoming increasingly competitive. Although we are seeing rapid global expansion by the biggest operators—Netflix now operates in 190 countries and YouTube recently launched its own SVOD service, YouTube Red—we are also seeing new entrants and services competing against them. New local online video players are following the 'Netflix model' (for example, icflix in the Middle East and iflix in South-East Asia), taking advantage of local market knowledge and the opportunity to be first-movers. At the same time, content rights owners are bypassing third-party platforms with their own SVOD services (as Disney has done by launching its DisneyLife over-the-top service in the United Kingdom in 2015). The evolution of the online video market is enabled by increasing speed and affordability of broadband connections, an ongoing shift in advertising spend to online channels, and, in many parts of the world, a gradually increasing willingness and ability to pay for online content.

Finally, gaming is seeing an increasing degree of concentration, partly driven by acquisitions as the major players seek to grow by buying up potential challengers who have developed a successful game or series. For example Activision, already a top five video game company, recently acquired King, which owns *Candy Crush Saga*, the most downloaded app in Apple's App Store.

Connectivity is moderately fragmented at a global level, with the top three players taking approximately a quarter of the market. However, at a country level this segment is more concentrated, with spectrum limitations and the scale of infrastructure investments setting limits on the number of infrastructure-based players (although in some countries a vibrant reseller market provides additional competition). The relative fragmentation at a global level is in contrast to the IP-based communication providers, which provide a similar service but without geographic or regulatory restrictions to prevent them from targeting a global audience. WhatsApp has nearly a billion users globally.

The **user interface** segment is relatively concentrated, which reflects the concentration of the electronics sector at a global level and relatively high barriers to entry in the largest categories. Apple and Samsung alone control more than 35 per cent of the smartphone market in terms of volume, compared with 12 per cent in the 2008 analysis (when Nokia's market share exceeded 40 per cent). Similar companies are found in the tablet, smart TV, and other smart items categories, and in Apple's case also in operating systems and app stores. It is interesting to note that this segment has been relatively highly concentrated ever since the advent of the mobile phone, from Motorola (analogue) to Nokia (GSM) to Apple and Samsung (3G and 4G). While there are natural economies of scale in research and development and fixed overheads, there are also strong elements of scale in marketing and ecosystem strength. It is arguably the size and pull of the Apple and Android ecosystems that have led to the demise of Nokia and BlackBerry as device market leaders, but even within the Android ecosystem Samsung has emerged as a clear leader while other manufacturers of comparable products, such as HTC, have struggled. The key driver, relatively minor differences in functionality and experience apart, appears to be marketing clout, where the market leader can afford to significantly outspend rivals, leaving others to target specific niches where they can.

Comparing to the market concentration we found in the 2008 report, there are a number of interesting observations:

- The user interface segment remains the most concentrated for reasons discussed above, and the PCs category in particular has become more concentrated.
- Connectivity has shown little change in terms of concentration, which, given the infrastructure basis, is not surprising. Some in-market and regional consolidation has taken place, but there has been no significant consolidation on a global basis.
- Within online services, search was already concentrated. Other service categories, most notably e-retail and e-travel, have consolidated further as the 'winner-takes-all' nature of online services comes to bear. The increased speed of the internet innovation cycle has accelerated this concentration, with services such as Airbnb growing from inception to a global market leader in just seven years.

When comparing the degree of market concentration to EBIT margins in online services, it is notable that search is the only category that is both highly concentrated and has leaders with high margins. This is due to multiple factors, including powerful barriers to entry, clear efficiency and effectiveness benefits of the online advertising model compared with offline alternatives, and, importantly, the fact that the search model is now relatively mature and proven, having existed since the mid-1990s.

Large internet players have established **multi-category ecosystems** to deepen their engagement with consumers.

The other highly concentrated online services categories are less mature and have lower margins. This includes the major video, music, and IP communication providers. With lower barriers to entry and unproven monetisation models, the companies in these categories are sacrificing revenues and profitability in the short term to grow scale, much as Facebook and Google did in their early years. Some companies are now showing signs of reaching critical mass in the market and are successfully switching to a more profit-driven model. For example, although most social and community companies have relatively low margins, Facebook and Tencent are performing well. Both had EBIT margins in 2014 of 35 to 40 per cent, in Facebook's case up from only 11 per cent in 2012. Whether the video and music online services providers are able to follow the same path from scale to monetisation is open to debate, given their heavy reliance on increasingly expensive professional content sourced from third parties.

Size and positioning of leading internet companies

It is evident from the analysis that within most categories in the value chain there are winners and losers, and an indication that in several categories a small number of large players capture a disproportionate share of the value while the rest are unable to generate positive economic returns. In this context, it is helpful to evaluate further who these large players are and whether this group of companies is static or dynamic.

As the internet has grown and evolved, the competitive landscape has shifted. In our 2010 report we compared the top 15 US online services providers by the number of unique internet visitors for a given month in 2009 with those 10 years earlier in 1999 and found that there had been a significant upheaval, with eight of the 15 either no longer existing or being absorbed into another company, and only four appearing on both lists.

Figure 11

Evolution of top 15 US sites, measured by number of unique visitors

1999

Property	UVs (m)	Main genre
1. AOL Sites	46	Portal
2. Microsoft Sites	32	Portal
3. Yahoo Sites	31	Portal
4. Lycos	29	Search
5. Go Network	21	Portal
6. Geocities	19	Web hosting
7. Excite Network	17	Portal, hub
8. Time Warner	13	Media
9. Blue Mountain Arts	12	E-cards
10. AltaVista	11	Search
11. Amazon	10	E-commerce
12. Xoom	9	Web hosting
13. Snap	9	Search
14. Real Networks	8	Media player
15. CNET	8	Media

2009

Property	UVs (m)	Main genre
1. Google Sites	164	Search
2. Yahoo Sites	158	Portal
3. Microsoft Sites	133	Portal
4. AOL Sites	99	Portal
5. Facebook	97	Community
6. Ask Network	88	Community
7. Fox Interactive	83	Media, social
8. Amazon	70	E-commerce
9. Wikimedia Foundation	69	Reference
10. eBay	67	E-commerce
11. Turner Digital	63	Media
12. CBS Interactive	59	Media
13. Apple	58	Music
14. Glam Media	56	Online media
15. Answers.com	55	Reference

2015

Property	UVs (m)	Main genre
1. Google Sites	245	Diverse
2. Facebook	216	Community
3. Yahoo Sites	209	Diverse
4. Amazon	188	Diverse
5. Microsoft Sites	180	Diverse
6. AOL Sites	170	Media
7. CBS Interactive	148	Media
8. Apple	140	Devices
9. Comcast NBCU	140	Media
10. Mode Media (formerly Glam Media)	138	Online media
11. Twitter	119	Community
12. Wikimedia Foundation	118	Reference
13. LinkedIn	115	Community
14. Turner Digital	115	Media
15. Time Inc. Network	109	Media

Among the top 15 in 2009 and 2015 — Among the top 15 in all three years

Company = No longer operating — # Company = No longer exists as an independent entity

Notes: Numbers include users across all mobile and fixed-line platforms, including via apps. GeoCities is now only available in Japan. UV is unique visitor.
Sources: ComScore; A.T. Kearney analysis

Fast forward another six years to today and the story is quite different (see figure 11). Eleven of the top 15 in 2009 are still among the top 15 in 2015. Of the four new companies breaking into the table, two are media companies (one being the result of the merger between Comcast and NBC Universal), and two are social and community service providers. Of the four 'survivors' between 1999 and 2009, three remain as stand-alone companies following the acquisition of AOL by Verizon.

There are three key points to note from this picture. The first is that there seems to be an increasing degree of stability and concentration in the internet, even accounting for the shorter time lag than in the 2009 versus 1999 analysis. This is also the case in many traditional sectors. For example, just as traditional retail has become concentrated through the emergence of supermarkets and hypermarkets, the same is happening online, albeit within a vastly accelerated timeline. Taking search, in 1999 there were three stand-alone search engines in the top 15 US list: Lycos, AltaVista, and Snap. In addition AOL, Microsoft, and Yahoo all operated their own search engines, making six search engines in total. By 2009 the number of search engines was down to three: Google, Ask, and Microsoft. AOL and Yahoo were powered by Google. In 2015 this has been reduced to two—Google and Microsoft Bing, which also power AOL and Yahoo search respectively.

The second is the evolution of the starting point or 'hub' of the online experience. In 1999 portals played a key role in getting people online for the first time and providing a 'one-stop shop'. By 2009, search engines and social media had started to take over this role. Today, social and community sites are increasingly prominent on this list, with Facebook, Twitter, and LinkedIn among the top 15 in the United States. Google+ also has approximately 40 million US users and is

growing rapidly. This trend is underpinned by the growth of mobile internet, which lends itself to short-form, small-screen consumption.

The third has been the need to continue to grow to maintain, let alone gain, position. The largest US player in 1999, AOL with 46 million unique visitors, would not have been on the top 15 US list in 2009. In 2009 AOL had 99 million unique visitors in the United States, which would have been outside the top 15 in 2015. As internet penetration approaches 100 per cent in the United States and other developed markets, the biggest companies are shifting from an acquisition-focused strategy to one based on creating multiple touchpoints and increasing users' engagement and share of time spent online. This is reflected by the diversification of their activities.

Today, the largest internet companies operate across the internet value chain (see figure 12). Google operates in 28 of the 37 categories across the internet value chain, Apple in 22, Amazon in 19, and Facebook in 14. The Chinese players are equally diversified: Baidu operates in 21 categories, with Alibaba and Tencent both in 17. The first wave of expansion has generally been from their core business into different online services and the advertising and payments categories of enabling technology and services. This has been followed by entering selected user interface categories through organic and inorganic moves. More recently there has been a further move into connectivity and content rights. Google has announced Project Loon, which will use high-altitude balloons to beam connectivity to the ground, while Facebook recently entered into a partnership with satellite operator Eutelsat, with the same goal of providing affordable connectivity to the mass market. Amazon and Google YouTube are investing in original programming, as are Tencent, Alibaba, and Baidu.

Figure 12

Major players' presence across the internet value chain

Number of categories where present in respective segment

'Home' category		Content rights (2 categories)	Online services (13 categories)	Enabling technology and services (6 categories)	Connectivity (3 categories)	User interface (13 categories)	Total categories where present
Google	Search	1	11	4	3	9	28
Apple	Smart-phones		7	3	1	11	22
Baidu	Search	1	11	4	1	4	21
Amazon	E-retail	1	7	5	1	5	19
Alibaba	E-retail	1	10	2		4	17
Tencent	Social	1	8	3		5	17
Facebook	Social	1	7	3	1	2	14

Source: A.T. Kearney analysis

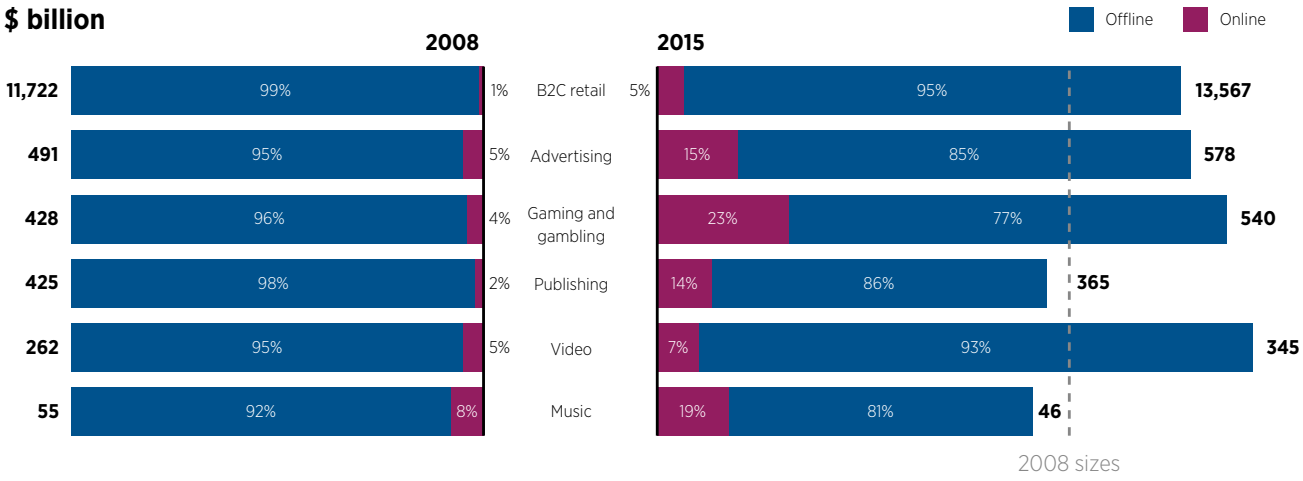
Establishing ecosystems of properties has enabled the large internet players to not only build their user bases but also to deepen engagement through the diversity of consumer touchpoints. This in turn increases their ability to monetise, not only through user transaction services but also through targeted advertising based on deep user data gathered through those touchpoints. Moreover, analysing user data supports the ability to provide customised services that will attract and retain further users, thus strengthening the overall ecosystem. This diversification is enabled by having profitable 'home' categories, which can fund and ultimately benefit from expansion and experimentation in new parts of the internet value chain. Overall, this data-driven virtuous cycle is enabling the leaders to put up formidable entry barriers and consolidate their position as the most used internet services.

Online versus offline

Naturally, as users spend more time online, the proportion of the economy shifting online is likewise rising (see figure 13).

Figure 13

Online vs. offline market size in select categories



Notes: Online share of B2C retail includes all user-generated B2C spending on online services. Online includes all sales transactions completed online, regardless of where payment or actual delivery takes place. Offline video market excludes public licence fees; includes consumer spending on all video formats, including TV advertising, pay TV subscriptions, films on demand, TV programming, box office spending for cinema, and other premium filmed entertainment content.

Sources: Market research, Euromonitor: A.T. Kearney analysis

In 2005 Amazon founder and CEO Jeff Bezos famously predicted that online would ultimately account for 10 to 15 per cent of retail. Ten years later, at a global level this figure has grown to 5 per cent, but the United Kingdom at 15 per cent has already reached the top end of that forecast—and online is expected to account for more than 20 per cent of the UK retail market by 2019. As the major e-retail companies continue to invest in new delivery technologies, such as Amazon's delivery drone programme, and the wealth of online retail intelligence in terms of product ratings and reviews continues to grow, the benefits to users of online over offline retail will increase and help offset concerns over online payment security.

The growth of e-commerce is by no means a zero-sum game with a straight substitution effect on offline retail. As shown in figure 13, e-commerce is growing the overall retail market. Aside from the giant internet retailers such as Amazon and Alibaba and the online arms of the large physical retailers, we are seeing a great deal of diversity and innovation in business models.

For example, specialist marketplaces are connecting buyers and sellers in new ways, with the United Kingdom in particular being a thriving market for such innovation. The e-commerce business notonthehighstreet.com sells unique, often personalised products from small businesses. Similarly, Yumbles is a marketplace for independent food and drink makers to sell distinctive produce to UK consumers. Both of these fast-growing e-commerce companies enable small businesses or talented, creative individuals without the scale or resources to operate their own platforms to massively extend their reach. Whereas previously in an offline economy these sellers would have been largely limited to stalls in local markets, now thanks to online marketplaces they have instant access to a nationwide or even international market. This has clear economic benefits through increased consumer choice and supporting growth and job creation by small and medium-sized enterprises. Nonetheless, in certain product categories intense price competition is stimulating volumes but not necessarily the value of retail sales. Traditional retailers in some markets have to offset a price disadvantage caused by differential sales or value-added tax treatment for online retailers.

The benefits of new delivery technologies and improved online retail intelligence will offset consumers' concerns over online payment security.

Advertising continues to shift online with new technologies, such as programmatic buying, helping to enhance targeting and campaign measurability. The rapid development of mobile advertising is also strengthening this trend, with smartphone functionality supporting geographic and behavioural targeting. Moreover, mobile advertising is being actively combined with mobile payment platforms and e-commerce to take a customer from advertising to product selection to fulfilment, further improving the value proposition to both advertisers and consumers. As with e-retail, these factors are adding to the advantage of online compared with offline in advertising.

Gaming and gambling have seen the fastest growth and shift of value online, with the majority of video games now being internet enabled. Again the benefits of online over offline are clear, such as the ability to play games on a global basis and place bets from any connected device without needing to visit a bookmaker.

Publishing has seen a sevenfold increase in the share of market value online, the highest growth among the remaining online services categories. This is partly driven by the ongoing decline of total market size and partly by the increasing success of publishers in monetising their content online, for example through paywalls and new micro-subscription services. Similarly, the music sector has declined overall while online music service providers are experiencing rapid revenue growth, leading the proportion of total revenue from online to more than double.

Video has until now seen slower growth in online share. This is partly because the offline video market, particularly broadcast advertising and pay TV, is continuing to grow strongly, and partly because offline continues to offer clear benefits over online in terms of image and sound quality.

Conclusions

After a period of volatility during the first 15 or 20 years, the internet is now maturing into a more stable state, with a mix of established leaders and challengers. Those leaders are acting in similar ways to more traditional companies, buying up innovative companies that can enhance their own growth rates, building scale through horizontal integration, and driving efficiencies through vertical integration.

A.T. Kearney's forecast of future growth suggests that the online services segment of the value chain will continue to be the largest and experience the fastest growth, accounting for more than 50 per cent of internet value chain revenues by 2020. Within that, e-commerce is the biggest driver, which reflects a clear and established business model with plenty of scope for further growth in eroding the share of offline sales. The proportion of online services revenue that comes from advertising has risen to 29 per cent, but the majority is still direct customer payments, either for services or e-commerce purchases.

The major internet companies continue to expand their footprint across the value chain. After a first wave that saw expansion across online services and enabling technology and services, then a second wave into user interface, we are now seeing a third wave that is taking the major internet players into connectivity and content rights as they seek to determine the many touchpoints and increase the 'stickiness' of their customer base.

These major players are preserving or building their market positions through a portfolio approach, whereby the established and profitable core businesses in their ecosystem support the growth of nascent ones. They acquire players that can enhance their ecosystem or protect their revenue streams (as Facebook did by purchasing WhatsApp and Instagram, and as Google has done by investing in Uber). This strategy has in general led to higher-than-average financial performance and buoyant valuations, although it can also result in parts of the value chain with large user bases but with little or no revenues or profitability (for instance, IP communication services).

The value of the internet connectivity segment is growing at a slower rate than the total value chain, and so its share of the total is declining. Within the connectivity segment, three shifts are taking place. One is from fixed to mobile networks, as new higher-speed mobile services are rolled out globally and access to these services continues to rise. Secondly, operators globally are seeing a greater proportion of their revenues attributable to internet connectivity services. However in the fixed segment—and, in many regions, in the mobile segment too—the growth in internet services revenues is being more than offset by the decline in legacy revenue streams (mostly voice and SMS), resulting in an overall decline in revenues to operators as more of this segment moves online. (The third shift is the relative growth in emerging markets.)

The imbalance between traffic and value highlighted in our 2010 report remains. Video continues to be the prime driver of traffic growth and consumes ever greater proportions of internet traffic, yet it accounts for only a small share of the direct revenues and profitability within the value chain, dwarfed in terms of revenues by e-commerce and even gaming and gambling services.

Categories with strong network and scale effects, combined with high relative ease of globalisation, are the ones that are in turn the most concentrated (for example, search, social, video, devices, and advertising). Since 2008 we have seen an increasing concentration in many of these categories as the major US players expand globally (for example, Facebook, Apple, Amazon, and now Netflix). Consistent with the characteristics of a maturing segment and helped by the winner-takes-all nature of many internet businesses, the big players are able to maintain their positions and there is less turnover and dynamism than may be expected. The largest players in any segment are taking full advantage of the inherent network and scale effects of the internet to build their business and strengthen their position—and using this to deliver higher returns and profit margins.

Looking more broadly, the stock market valuations of internet online services companies continue to rise inexorably, delivering compound annual growth of 45 per cent since 2009 versus 6 to 22 per cent for the other segments. Apart from the economic advantages of internet market leaders highlighted above, this trend is also perhaps exaggerated by the fact that in the face of significant economic challenges, online services benefit from being one of the few growth prospects available for investors.

In summary, we have identified a number of general findings that have implications for players concerned with the internet value chain, from corporate executives to policymakers:

- The segments of the internet value chain have some distinct characteristics, yet many companies increasingly compete in multiple segments, with business models based around connecting elements of these segments together to create value for both themselves and their customers.

- While the shift from offline to online is boosting efficiency and opening new possibilities in many segments, from taxi services to holiday rentals, this shift could also be creating a deflationary impact on the offline segments. The consequences of this need to be better understood.

- Finally, although the internet is taken to be very much synonymous with innovation and disruptive competition, the degree of change at the corporate level is slowing. Some of the largest players are able to exploit scale and growing revenue streams to build ever stronger networks of services and users—and to entrench their positions, leading to a survival of the largest.

Both corporate strategy development and the regulatory agenda (especially competition policy) have already begun to focus on some of these trends. They will no doubt play a greater role as the internet value chain grows in its centrality to the global economy.

Methodology and data sources

Methodology

OVERALL SCOPE

Ring-fencing the internet with a clear boundary demarcating it from the offline economy is understandably difficult. Within the scope of this report are all major segments and categories that play a direct role in the internet economy. Some markets and companies exist and operate as a direct result of the creation of the internet (for example, cloud services), while others have a partial link to the internet economy but would also exist without the internet (PCs, for instance). In the latter case we do not include the whole market value, but rather apportion an appropriate percentage to the internet economy.

Companies that are not directly internet related but serve internet companies (such as a utility providing electricity to a Netflix server farm) are excluded from this report.

VALUE CHAIN DEFINITION

The internet value chain comprises five segments with 37 underlying categories. Categories are split into further subcategories to conduct sizing and growth analyses. In this report, however, findings are reported at a category level. The details are provided below.

The internet value chain in this report builds on the original 2010 version to the extent possible, to enable continuity and comparability. We retain the same five segments, but we introduce notable changes in the categories to reflect the substantial evolution of the internet over the past five years. Much of this evolution has been driven by technology and innovation, particularly in the user interface segment, where we add wearables and smart TVs.

The connectivity segment has not changed materially, although we break out fixed and mobile connectivity and also assess the satellite connectivity segment, which, despite being relatively small, provides important internet access to remote parts of the world not covered by fixed-line or mobile networks.

The enabling technology and services segment has become more complex and thus warrants further categorisation to break out important elements such as M2M and content delivery. This segment now includes the core network and interchange category to reflect the fact that the companies here overlap substantially with those in other enabling technology and services categories and, unlike the other connectivity categories, are not end-consumer services.

The online services segment has been at the heart of the changes we have seen in the internet landscape, but we keep the categories largely consistent with those of the original internet value chain, with some minor exceptions. Similarly, the content rights segment structure is mostly consistent, save for the addition of a sports subcategory to reflect the distinct characteristics of this content genre.

One of the most material changes we make in this report is to combine B2C and B2B into a single internet value chain, as the distinction between these two is increasingly blurred. Many companies use Skype for business

communication and major online services providers such as LinkedIn have a mix of business and individual users, while devices are frequently used for both work and pleasure. More generally, the internet has dramatically simplified the process and lowered the cost of starting a business. Thus an increasing number of people have both salaried jobs as well as internet-based 'evening and weekend' businesses on the side, further blurring the lines between B2C and B2B.

For the purpose of comparability, the original internet value chain sizing using 2008 data is recalculated using the updated methodology.

PRIMARY ANALYSES CONDUCTED

This report is based on a series of analyses to provide insights into the economics of the internet.

Analysis	Approach
Market sizing	• All market sizes are based on gross global revenues unless otherwise stated. Most data is from 2015. • For all online services categories, revenues generated from advertising and from end users are calculated separately. — Advertising: includes all formats of digital or internet advertising (search, display, digital video, rich media, and sponsorship). Advertising revenues are net of discounts, regardless of rate card. — End users: includes subscriptions, pay-per-use services, and purchases of digital goods.
Market concentration	• Concentration analysis is mostly based on 2014 global market share (in terms of revenue) of the three largest companies in the segment. The significance of this analysis should be evaluated in the context of how feasible it is for players in each category to expand beyond their home markets, as explained in the body of this report. • For the device categories in the user interface segment, concentration is determined by the number of units rather than revenue.
Financials	• The primary analyses used are: 1) profitability (EBIT margin), and 2) return on capital employed (EBIT as a percentage of total assets less liabilities). • The financials are calculated based on the average of a panel of up to eight companies, with a minimum threshold of 30 per cent of company revenues coming from the relevant category to ensure relevance. It is important to note that, as a result, the margins shown are not necessarily those of the players in the category with the biggest market shares. For example, although in cloud services two of the top three companies globally are Amazon and Microsoft, cloud services account for well below 10 per cent of their respective revenues. Therefore, the margin reported for this category is based on the performance of smaller, pure cloud service providers, even though the margins of the bigger, global providers such as Amazon and Microsoft may be higher. • Data is sourced from annual reports and Bloomberg.
Shareholder value	• Market capitalisation analysis is based on a basket of representative companies for each of the five segments. The basket includes the largest publicly listed players as well as others to ensure a spread of companies across constituent categories. • This data is sourced from Bloomberg.

INTERNET VALUE CHAIN DEFINITIONS BY CATEGORY

Below are further details on the approach taken for the categories and subcategories included in the internet value chain, with a focus on the revenue sizing approach, to complement the descriptions provided in the main report.

CONTENT RIGHTS

Category	Methodology and description
Premium rights	• Market size is based on the percentage of revenues from online services that is paid to content rights owners, either as: — Revenues from digital product sales after commission — Content acquisition or licence cost • We estimate the percentage of total online revenues that flows to the corresponding content rights owners. • The value included is incremental. That is, it reflects the additional value generated from content in the internet economy.
Made for digital	• Revenues received by user-generated content owners, using the earnings of the top 1,000 dedicated YouTube channels as a proxy.

ONLINE SERVICES

Category	Subcategory	Methodology and description
E-retail	**B2C e-retail**	• Websites or apps selling goods or services via any device, regardless of payment or fulfilment method. Includes revenues from 'click-and-collect' sales transactions. • Revenues are based on total transaction values less the direct cost of the goods or services sold and fulfilment. The percentage to be subtracted is an estimate based on company reports for leading operators. • Includes social buying. Excludes video, music, gaming, e-books, travel, cloud, and event tickets sales, which have their own categories (see below).
	B2B e-retail	• Sales transactions between businesses (including manufacturers, wholesalers, and retailers) conducted through the internet, including via mobile e-commerce. • Revenues are based on total transaction values less the direct cost of the goods or services sold and fulfilment. The percentage to be subtracted is an estimate based on company reports for leading operators. • Excludes EDI transactions, professional publishing, directory, B2B information services, B2B communications, business e-learning, and business cloud services, which have their own categories (see below).

Category	Subcategory	Methodology and description
E-travel	(Not applicable)	• Includes all sales generated by online bookings and through online travel agencies. Includes mobile websites and app-based sales. Sales are considered to be online as long as the booking is made online, regardless of where actual payment takes place. Bookings initiated online and finalised on the phone are also included. • Online ride-sharing services such as Uber and Lyft are included. • Revenues are based on total transaction values less the direct cost of the service sold.
Video	**SVOD (OTT)**	• Subscription video services provided through OTT channels, bypassing traditional broadcast TV. Includes players such as Netflix and Hulu. • Includes both on-demand and live streaming services. • Includes stand-alone online services from pay TV operators (for example, Sky's Now TV); excludes pay TV operators' multiscreen packages (such as Sky's Go or Comcast's Xfinity). • Excludes any revenue generated by pirate services.
	SVOD (multiscreen)	• Digital home video through online video-on-demand and pay-per-view services provided by a pay TV operator as part of a subscription package • Includes proportional revenue from operator 'TV Everywhere' packages (such as Sky's Go or Comcast's Xfinity) that bundle OTT with conventional pay TV services; excludes revenues from stand-alone OTT services (for instance, Sky's Now TV).
	Open video-on-demand ecosystems	• Open online video ecosystems such as YouTube, which in general follow an advertising model • Revenues are calculated based on AVOD market size.
	Video sales or rental (digital)	• Purchases or downloads of digital filmed entertainment products. Includes websites providing online rental transactions of physical filmed entertainment products (although this share is considered negligible). • Includes only the revenue share/gross margin of the online service provider. • Excludes any revenue generated by pirate services.

AVOD: advertising video on demand; OTT: over the top; SVOD: subscription video on demand

Category	Subcategory	Methodology and description
Music	**SMOD or streaming**	• Revenues from subscription or advertiser-supported streaming audio content-on-demand services (for example, Spotify or Pandora) • Includes global terrestrial radio online advertising. • Excludes any revenue generated by pirate services.
	Music sales (digital)	• Revenues from licensed recorded music downloads via app stores or other licensed services (such as iTunes) • Includes only the revenue share/gross margin of the online service provider. • Excludes any revenue generated by pirate services.
Publishing	**Consumer publishing**	• Digital advertising, subscription, and pay-per-view revenues for consumer magazines and newspapers • Includes pure-play digital players such as BuzzFeed or Huffington Post.
	Professional publishing	• Revenues from electronic professional and educational books, and digital advertising and circulation of global trade magazines.
	Book sales (digital)	• Net revenue from the sale of consumer electronic books • Includes only the revenue share/gross margin of the online service provider.
Gaming	**Video gaming**	• Includes digital console games, online or microtransaction console games, digital PC games, and global online or microtransaction PC games. • Revenues include subscriptions, in-game online advertising, and the sale of in-game virtual items.
	Casual games	• Includes app- and browser-based social or casual gaming.
Gambling	(Not applicable)	• Websites and applications providing all types of online gambling services, including betting and card-based services
Social and community	**Social**	• Revenues from social networking websites such as Facebook, LinkedIn, or Tencent • Includes paid advertising appearing within social networks and social network applications. • Excludes any spend by marketers that goes towards developing or maintaining a social network presence.
	Portals (communica-tions-led)	• Display advertising and value-add services by hubs such as Yahoo or AOL that derive a large portion of their traffic from email services
	Online dating	• Online dating and mobile dating app revenues

SMOD: subscription music on demand

Category	Subcategory	Methodology and description
Communications	**IP communications**	• Includes OTT VoIP and consumer IM. • OTT VOIP only includes third-party VoIP. That is, it includes VoIP based on bespoke applications downloaded by end users from a website. VoIP operated by telecoms operators is excluded.
	B2B communications	• B2B unified communications. Includes IP centrex, hosted UC, and managed UC. Includes IP-based voice services and additional UC services (such as Microsoft enterprise voice and Cisco Jabber).
Search	**Search engines**	• Advertising revenues generated by search engines through paid-for results (for example, Google AdWords)
	Directories	• Digital advertising spend on digital editions of directories such as Yellow Pages services online
Information and reference	**B2B information services**	• Digital share of revenues from business-focused data and intelligence services
	Reference	• Dedicated reference websites or apps, such as Google Maps or Wikipedia, which (where commercial) largely derive their revenues from display advertising and sponsored placements
Cloud services	**SaaS**	• Includes business intelligence applications, CRM, digital content creation, enterprise content management, enterprise resource planning, office automation suites, other applications software, project and portfolio management, supply chain management, web conferencing, teaming platforms, and social software suites.
	PaaS	• Includes applications development, applications infrastructure, and middleware, business intelligence platforms, and database management systems.
	IaaS	• Includes computing, printing, and storage services.
	Private cloud	• Service revenues from dedicated hosted private clouds
Other e-services	**E-learning**	• Payments for web- or app-based education and training programmes for both enterprises and consumers
	Other online services	• Online user revenues from paid-for apps, in-app purchases, and any other internet-based user-paid services • Also includes other web-based or in-app advertising.

CRM: customer relationship management; IaaS: infrastructure as a service; IM: instant messaging; IP: internet protocol; PaaS: platform as a service; SaaS: software as a service; UC: unified communications; VoIP: voice over internet protocol

ENABLING TECHNOLOGY AND SERVICES

Category	Subcategory	Methodology and description
Design and hosting	**Design and development**	• Companies that design and develop both websites and apps
	Web hosting	• Companies that provide a service allowing individuals or organisations to store their websites on their servers and make them available on the internet
Payment platforms	(Not applicable)	• Companies providing systems that process end-user online payment transactions • Revenues are based on the estimated value of user-paid (B2C and B2B) online services, multiplied by the average transaction fee percentage for each type of online payment.
M2M platforms	**SIM management and M2M platform**	• Service revenues accrued by wireless carriers, specifically from the provision of M2M services • Includes service integration and managed connectivity. • Percentage of revenues is allocated based on the share of internet-based M2M connectivity (as opposed to, for example, standard SMS).
	M2M applications and solutions	• Development of the applications that utilise M2M functionality and provide the end-to-end service
Advertising	**Online ad networks or exchanges**	• Online ad networks' or exchanges' share of net global advertising revenues • Includes companies that: — Provide intermediary online advertising services to advertisers — Acquire ad inventory from websites to resell to advertisers or to programmatic or other platforms for buying and selling inventory — Offer tools to optimise online advertising effectiveness
	Online ad services	• Online ad servers' share of net global advertising revenues • Online ad server companies offering technology that places ads on websites
	Online ad agencies	• Online advertising agencies' share of net global advertising revenues (that is, net of discounts, regardless of rate card) • Online advertising agencies include companies that: — Offer data and analytics on internet user and usage metrics — Provide services to plan online campaigns and acquire online ad inventory for advertisers — Design, produce, host, and serve online ads

M2M: machine to machine; SMS: short message service; SIM: subscriber identification module

Category	Subcategory	Methodology and description
Internet analytics	(Not applicable)	• Companies offering data and analytics on internet user and usage metrics • Includes licensing providers only, as hosted providers are captured under the SaaS subcategory of cloud services.
Managed bandwidth and content delivery	**Core network and interchange**	• Includes companies that own and operate the core telecommunications network, providing wholesale services to retail access providers, and operators providing the 'super-exchanges' of internet traffic between core network operators. — There are limited stand-alone or independent interchange operators besides Level 3 Communications and XO Communications, which are both US operators. In most other major markets, large telecoms operators provide interchange services. • Global wholesale revenues are used in the sizing calculations.
	Content delivery optimisation	• Companies that offer services to optimise the flow of content through the internet • Includes media delivery, website and network performance, security, and servicing and support.

CONNECTIVITY

Category	Subcategory	Methodology and description
Mobile access	(Not applicable)	• Includes spend on internet access over cellular air interfaces, generally via a 2G, 3G, or 4G network. • Sizing is based on a number of data sources since many subscribers buy a bundle of voice, data, and SMS without specific tariffs attributed to each. • SMS revenues and handset payments (as well as all traditional voice revenues) are excluded, with handset payments captured in the user interface segment. • Analysis includes both consumer and business services, as well as services from network operators and MVNOs.

MVNO: mobile virtual network operator; SMS: short message service

Category	Subcategory	Methodology and description
Fixed access	**Retail access**	• Connectivity of internet service providers over fixed networks, delivered to end users over access technologies such as DSL, cable DOCSIS, direct fibre, and Wi-Fi. • Includes services by fixed infrastructure owners and operators using unbundled local loops. • Excludes voice (dial-tone) services and private data network services often used by business customers as part of corporate networks. • Analysis includes both consumer and business services.
	VPN services	• Includes MPLS-based and IPsec-based VPN. • Excludes layer 2 MPLS-based VPN technologies (such as VPLS), in-house implementations of IP or IPsec VPNs, and remote access IPsec VPNs that provide VPN access from a soft client (for example, on a PC or other device).
Satellite and other IP services	(Not applicable)	• Global mobile data services market for companies providing internet access via satellite, such as in-flight data on commercial aircraft

DOCSIS: data over cable service interface specification; DSL: digital subscriber line; IP: internet protocol; IPsec: internet protocol security; MPLS: multiprotocol label switching; VPLS: virtual private local area network service; VPN: virtual private network

USER INTERFACE

Category	Methodology and description
Smartphones	• Revenues from the sale of all mobile handsets offering internet access • Based on total global smartphone revenues, with differing percentages allocated to the internet value chain for each phone category. Percentage allocations are informed by the level of internet connectivity associated with or expected for each level of handset.
PCs	• Based on total worldwide PC sales, with a proportion based on the percentage of PC time spent on the internet • Includes laptops, netbooks, and ultrabooks.
Smart TVs	• Based on the total revenues of the global smart TV market, multiplied by the proportion of smart TVs that are actively connected • An actively connected smart TV is one that: 1) actively accesses online services or locally shared content from other devices in the home, without the use of an additional device or accessory, and 2) is used in this way at least once per year.
Set-top boxes	• Based on the market value of IP-connected set-top boxes

IP: internet protocol

Category	Methodology and description
Digital media receivers	• Market value of digital media receivers, such as Apple TV, Roku, Chromecast, and Amazon Fire Stick • Based on units sold, multiplied by a weighted average price per unit based on the market shares of the leading players
Tablets	• Includes both basic and utility tablets. • These weigh less than 3.5 lbs (1.6 kg), are typically in tablet form, and are designed primarily to be consumption devices. • Examples of devices included in this category are iPad, iPad Mini, Android-based tablets, Chromebooks, and white-box vendor products.
Wearables	• Retail revenues of wearable devices. These include clothing, watches, and smart glasses (incorporating computing or sensory capabilities). • Devices obtained via third parties such as employers or medical institutions are not included. • 100 per cent of the value is attributed to the internet, as functionality and benefits are wholly dependent on having connectivity—regardless of the source of that connection. (Not all wearables have inbuilt internet connectivity; many currently require a secondary device to provide a connection.)
Consoles	• Personal gaming devices with the ability to connect to the internet • Based on total worldwide console sales, with a proportional allocation based on the amount of gaming that is online
Other smart items	• Includes value of smart car and connected white goods markets. • Smart car market includes safety, home integration, mobility management, vehicle management, entertainment, well-being, and autonomous driving technologies. • Connected white goods market is derived from the average price premium for a 'smart' white good, multiplied by the number of units sold (or forecast to be sold).
Other hardware	• Peripherals allowing other devices to connect to the internet and enabling usage of online services (for example, modems and routers) • Includes broadband consumer premises equipment market.
Operating systems	• Based on B2B enterprise software operating system revenues and derived consumer operating system revenues. • Consumer operating system revenues are based on total consumer PC sales multiplied by OEM licence costs, factoring in reported OEM licence discounts for the top manufacturers.
App stores	• Based on the percentage of revenues from app store purchases and advertising taken by app store operators.
Security and software	• Based on the global revenue for secure content and threat management. Includes endpoint security, network security, messaging security, and web security. • Also includes other internet-related software, including browsers.

OEM: original equipment manufacturer

DATA SOURCES

This report relies on a broad range of primary and secondary data sources. Primary sources include extensive interviews and consultations with experts across all parts of the internet value chain, both within A.T. Kearney and the GSMA and among its members, and externally with experts in various relevant fields. We would like to thank these participants for their support in this research.

Secondary sources include a range of publicly available information, using 2015 data or the latest available. Financial statements, investor presentations, and other releases by the companies included in the internet value chain have all been used extensively in the financial and concentration analysis. Furthermore, we have used research reports from a variety of research companies and industry bodies including Bloomberg, Euromonitor, Forrester, Frost & Sullivan, Gartner, the GSMA, the IAB, IDC, IHS, InfoTrack, Ovum, PWC Media and Entertainment Outlook, SNL Kagan, Synergy Research, and Zenith Optimedia. Internet usage and traffic data primarily comes from Cisco VNI, ComScore Media Metrix, and Nielsen Netratings.

Notes

To download the PDF report please visit the GSMA website at **www.gsma.com/internet-value-chain**

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