**HISTORY OF INTERNET**

**ABSTRACT**

The Internet is now over four decades old. A survey of its evolution from a military experiment conducted in the context of the Cold War to a General-Purpose Technology illustrates the extent to which the network was shaped, not just by the intrinsic affordances of its underpinning technologies, but also by political, ideological, social, and economic factors.

**INTRODUCTION**

The Internet that we use today – i.e. the network of computer networks based on the Transmission Control Protocol (TCP)/Internet Protocol (IP) suite of protocols is now relatively old technology. Research on its design commenced in 1973 and the network became operational in January 1983. For the first two decades of its existence, it was the preserve of a technological, academic, and research elite. From the early 1990s, it began to percolate into mainstream society and is now (2016) widely regarded as a General-Purpose Technology (GPT) without which modern society could not function. So, in a relatively short period the technology went from being something regarded as exotic, to an apparently mundane utility, like mains electricity.

Several factors make it difficult for citizens to appreciate the nature and significance of the Internet. One is the distortion imposed by the ‘Whig interpretation’ of Internet history – the tendency to view its development with the 20/20 vision provided by hindsight. This provides a misleading impression of a linear progression from one great idea to the next, and obscures the paths of development that could have been, but were not, taken.

Yet there was nothing inevitable about the evolutionary path that the Internet has taken. Like all technologies, it has been shaped not just by critical technical decisions made at various stages in its history, but also by accident and by economic, social, and cultural forces.

Another factor occluding a clear understanding of the network is the short-termism of much public discourse about it, a trait that might be satirized as ‘the sociology of the last five minutes’. This is largely a product of two factors: the capacity of the network to enable unanticipated innovations and launch them into society, and the obsession of the mass media with the ‘New New Thing’.

Other factors militating against a rounded appreciation of the Internet are definitional or conceptual. An example of the former is the widespread misapprehension that it is a unitary network rather than a network of computer networks. To most non-technical people, who experience the Internet as if it were a seamless whole, this will seem to be a technical detail, but as we shall see, the distinction is significant in terms of understanding the evolution of the system and in appreciating its capacity for disruption.

A final conceptual error is the widespread tendency to confuse the network with one or more of the applications that people use. Thus, for example, many users think that the World Wide Web is ‘the Internet’. Others make the same mistake in respect of Facebook (see e.g. Moo 2016). But the Web and Facebook are just particular examples of data-enabled services that run on the infrastructure that constitutes the Internet, and mistaking them for the network is analogous to thinking that intercity trains, say, define the railway system.

Although, as observed earlier, the Internet is a relatively old technology, in another sense we may only be at the beginning of the ‘Internet era’, in the sense that we are only now reaching the point where the network is mature, widespread, and developed enough to be eligible for the status of a GPT. Bresnehan defines a GPT in terms of three characteristics:

1. it is widely used;
2. it is capable of ongoing technical improvement; and
3. it enables innovation in application sectors.

The network is therefore not yet ubiquitous in global terms, although in most industrial countries it effectively is. As far as criterion (ii) is concerned, it has been steadily and continuously improved and extended. As far as criterion (iii) goes, the network definitely qualifies, partly because a capacity for disruptive innovation is ‘baked into’ its architecture, and while the network has to date clearly enabled innovation, until recently this has tended to be in predictable application sectors (e.g. information goods and services). An important question for the future, therefore, is the extent to which it will have significant impacts in application areas that are far removed from information technology.

**HISTORY**

As with most technologies , the roots of the Internet go back a long way, mostly to the post-World War II era, but in some respects to the late 1930s.The evolution of the network to date can be summarized in terms of two main phases: its development from a military experiment to a civilian utility, and the commercialization of the network.

**Phase one: from military experiment to civilian utility (1967–1995)**

**Pre-history: 1956–1966**

That the Internet owes its existence to the Cold War is well known. But, as ever, retrospective generalization glosses over a more complicated story.

The first strand of this concerns the doctrine of ‘mutual assured destruction’ (MAD) which governed the nuclear stand-off between the United States and the Soviet Union. MAD supposedly ensured national security by guaranteeing that if one side launched a nuclear attack, the other would retaliate in (devastating) kind. There was, however, one apparent flaw in the logic, in that the doctrine could give an advantage to the aggressor if his pre-emptive strike was so devastating that it rendered the enemy's command-and-control system inoperative, thereby making it impossible to retaliate.

There was therefore an urgent need to design a communications system capable of surviving a devastating thermonuclear attack. This challenge was taken up by a researcher in the RAND Corporation, Paul Baran, who came up with a design for a mesh network based on high levels of link redundancy and a digital communications technology called packet switching. At a time when communications networks were almost exclusively analogue and based on circuit switching, these were radical ideas. Baran worked out a detailed design for a network based on these principles, but for various bureaucratic and other reasons, a prototype network was never built, and the trail apparently went cold.

It transpired, however, that Baran was not the only person to come up with the packet switching idea. In the UK's National Physical Laboratory, Donald Davies was seeking to create a new kind of communications network for purely civilian applications. He sought to exploit the advantages of digital switches to enable responsive, interactive time-shared computing over large distances and realized that the circuit switching technology of the analogue telephone system was not adequate for this task. So, Davies independently conceived the idea of packet switching as a means of achieving his goal.

The second strand of the story opens with the Soviet Union's successful launch of the Sputnik satellite in October 1957, an event that profoundly shocked the US defense establishment and led to the setting up of the Advanced Research Projects Agency (ARPA) within the Department of Defense. Early in its organizational life, ARPA morphed into the agency within the Pentagon that funded advanced, ‘blue-skies’ research which could have military applications. In due course, ARPA found itself funding the purchase, operation, and maintenance of at least a dozen expensive mainframe computers for the various university departments and institutes which held research contracts from the agency. The problem was that these machines were incompatible with one another, and therefore could not function as shared resources for the community of ARPA-funded researchers across the US (Hafner and Lyon 1996, 41). From this came the idea, and the funding, for a network that would enable these valuable resources to be shared. ARPANET (Advanced Research Projects Agency Network) was the result.

**The ARPANET: 1967–1972**

The idea of a ‘resource-sharing’ network first emerged in ARPA in 1966 (Naughton 1999, 84). Design work, conducted in a collegial style (Abbate 1999, 56) unusual in the defense industry, then proceeded over the next two years. The contract to build the network was awarded in early 1969 to Bolt, Beranek and Newman, a Boston-based consultancy firm with strong links to MIT.

The technological and conceptual challenges that faced the network's designers have long been obliterated by the omniscience of hindsight, but they were formidable. Given that the network was supposed to facilitate the sharing of expensive and scarce resources, namely the mainframe computers that ARPA had funded in various research centers across the country, a key obstacle to overcome was the fact that these machines were incompatible with one another. For each of them to participate in a network would require the creation of complex, customized networking software which would enable each machine to communicate with every other machine on the system. In the end, this problem was not so much solved as side-stepped: it was decided to build a ‘sub-net’ of identical minicomputers (which came to be called ‘interface message processors’ or IMPs) each linked to a single mainframe ‘host’. In that way the task of writing networking software for a host was greatly reduced: it would simply have to communicate with a single machine – the IMP assigned to it.

Given the technical challenges implicit in the task, the ARPANET was built with astonishing speed. By 1972, the network was essentially complete; the 15 original sites were all connected and operational and a major public demonstration of the system was held in Washington, DC in the Autumn of that year.

From the perspective of the present, three aspects of the ARPANET project stand out.

The first is that while it was a triumph of project management in the conventional sense, success was achieved in an unusually collegial way. This was sensible for several reasons: the network was intended to link high-profile researchers working in elite institutions, and such individuals are not easily herded, plus it made sense to harness the collective IQ of that community at every level, including that of graduate students. For that reason, for example, design of the central protocols of the network was entrusted to a Network Working Group that largely consisted of students. In this way was established the collaborative ethos that has been an important feature of Internet technical development up to the present day.

Secondly, the ARPANET provides an interesting case study in the extent to which technologies are socially shaped. In this case, the shaping was done by the network's users, first of all because many of them were actively involved in the design of the network and therefore they were both designers and ‘customers’, that is, users. And in the latter capacity, they sprang some major surprises on ARPA managers. The network was intended to be a facility for resource-sharing, but it transpired that it was not much used for this original purpose. Instead, its users employed it mostly for communicating with one another, sharing files and software, and for sending and receiving email. In that sense, the community of users came up with a new conception of what ‘networking’ meant – not so much the sharing of machines as the linking of people. As Abbate puts it, ‘Increasingly people within and outside the ARPA community would come to see the ARPANET not as a computing system but rather as a communications system’ . Given the technical sophistication of the network's users, it is also not surprising that they were vocal in their demands for system modification and innovation. But while many user tweaks were ‘encouraged or at least tolerated’ by ARPA, the agency did not always welcome users’ attempts to steer the evolution of the system. Its reluctance in this respect may not have been due to hierarchical reflexes so much as the need to reassure Congress that the network was not a publicly funded experiment in computer science, but an administrative tool useful for military and defense purposes.

Thirdly, although the ARPANET was based on the packet switching technology that characterizes the modern Internet, it was a unitary network: the subnet of identical, centrally managed IMPs constituted the core of the system. And the network was owned and administered by a single entity – ARPA. So, although the ARPANET was the precursor of what came later, it differed in significant ways from its successors.

**Development of the TCP/IP-based ‘internetwork’: 1973–1983**

During and after the construction of the ARPANET, other significant developments in networking technology were under way. At the University of Hawaii, researchers had built ALOHA – a packet-switched network that operated, not over leased telephone lines, as ARPANET did, but via radio. Within ARPA, it was decided to build on this work by creating a packet-switched radio network (named PRNET) in the San Francisco area. The motivation for this was obvious: ARPA was part of the US Department of Defense and its planners were interested in the potential of packet switching for command-and-control in battlefield conditions. The agency had also begun to experiment with using the technology in satellite communications, for example, for linking seismic monitoring stations in Scandinavia (established to monitor Soviet nuclear testing) with the US, via a network which was christened SATNET.

By the early to mid-1970s, therefore, ARPA found itself running three separate ‘experimental’ networks – ARPANET, PRNET, and SATNET – all of which used packet switching technology, but in different ways. An obvious next step was to see whether a method for ‘internetworking’ them, so that they functioned as an apparently seamless whole, could be developed.

The ‘internetworking’ project began in late 1973. A key challenge for the designers of the new system was to find a way of transitioning from a unitary network like ARPANET to something that could incorporate a variety of different networks that were owned and operated by independent organizations and entities. From a technical point of view, there were various ways of achieving this goal. One was to allow networks wishing to join the new ‘internetwork’ to retain their existing protocols and simply construct ‘gateway’ computers that would translate those into a common set of conventions. The other was to require that all candidate networks adopted a new set of protocols, which would become the lingua franca of the new overarching network.

In the end, the second option was adopted, and a suite of interlocking protocols centered on two new ones – TCP and IP – evolved. In this way TCP/IP became the cornerstone of the new ‘network of networks’. The great advantage of this approach was that implicit in it was the possibility of organic growth: as long as a given network ‘spoke’ TCP/IP it was free to join the Internet. And because the system was not owned or controlled by anybody (unlike the ARPANET), there were no gatekeepers to control admission to it.

But the potential for organic growth was not the only affordance implicit in the TCP/IP architecture. The designers also faced the puzzle of how to create a network that would be as future-proof as possible, that is, one that could cope with applications that had not been anticipated by the designers. Their solution was to design a system that was not optimized for any particular application (in contrast to, say, the analogue telephone network, which had been optimized for voice calls but proved inadequate for computer-to-computer communication). The Internet, concluded its designers, should do only one thing: it should take in data packets at one end and do its best to deliver them to their destination. It would be entirely agnostic about the contents or purpose of the packets. In this way, all of the ingenuity would be left to users of the network. If someone had an idea that could be realized using data packets, then the Internet would do it for them with no questions asked.9

This philosophy – of leaving innovation to the edges of the network – had profound implications. As Van Schewick describes it, the TCP/IP design created an architecture for ‘permission less innovation’ which enabled the explosion of disruptive creativity that is perhaps the most distinctive feature of the Internet.

As the new network took shape, the ARPANET continued to operate alongside it. But because it was no longer an experimental facility, ARPA began to look for a new owner for it. It was first offered to AT&T, the national regulated telephone monopoly, but the company turned it down . In 1975, the agency transferred operational responsibility for the network to the Defense Communications Agency (DCA) which provided communications services for the US armed forces. This had predictable effects: it began the process of reorienting the network away from its original research focus and towards military applications; it inevitably led to tensions between the military mindset and the more freewheeling ethos of the research community; and it also led to heightened concerns about computer security and access controls.

While this was happening, the Internet project was gathering pace and the TCP/IP family of protocols was being finalized. The imperative was to extend adoption of the new protocols to the point where network effects came into operation. This turned out to be more difficult than anticipated: many nodes were reluctant to devote the necessary resources to configure their operations around the new protocols. It was at this point that DCA management of the ARPANET was to prove decisive. In March 1981, the Pentagon announced that all ARPANET hosts would be required to adopt TCP/IP by January 1983. Not all sites were able to meet the deadline, but by the middle of 1983, every ARPANET host was running TCP/IP , which is why we can say that 1983 marks the beginning of the Internet that we use today.

A few months before that, however, DCA concern about the security of the network had led to a decision to split it into civilian and military domains. From October 1982, one domain – the ARPANET – would continue as a research enterprise; the other – labelled MILNET – would henceforth be entirely devoted to military communications. The switchover was implemented in April 1983.

**Transition from a military/research network to a ‘civilian’ one: 1983–1995**

The creation of the MILNET domain meant that ARPANET returned to being a research-focused network dominated by universities and research institutions, so the breach was an essential first step towards achieving ARPA's goal of transferring the network to civilian control. The second step was to take measures to foster the dissemination of TCP/IP technology within the computer industry. To that end, ARPA funded various operators to create TCP implementations for various operating systems (notably Unix10) and launched a $20m fund to help computer manufacturers implement TCP/IP software on their machines. So, by 1990, TCP/IP was available for most computers, at least in the US market.

Until the end of the 1970s, access to the developing Internet was restricted to those working in a relatively small number of institutions which held research contracts from ARPA. As computer science became an accepted academic discipline in universities, the exclusiveness of the ARPANET/Internet club was increasingly perceived as irritating and dysfunctional. This led the US National Science Foundation (NSF) to fund the creation of the Computer Science Network (CSNET) in the early 1980s. After an initial hiccup, it was decided CSNET would use the TCP/IP protocols, which meant that a connection between CSNET and ARPANET was feasible and so, at a stroke, the community of networked computer scientists was significantly expanded. While access to ARPANET was only granted to researchers funded by the agency, membership of CSNET was open to computer scientists in any institution willing to pay the annual subscription (although commercial use of the network was prohibited under the NSF's ‘acceptable use’ policy). The result was that the network began to grow at a faster rate – from 2000 host computers in 1985, to 185,000 in October 1989, and 1,776,000 in July 1993.11

CSNET turned out to be just the first step in the NSF's involvement in networking. In mid-1984, the foundation began funding the establishment of several new supercomputing centers around the US. To make these available to the widest possible community of researchers, a national network was required. The original idea was for a network – NFSNET – linking the centers that would form the ‘backbone’ of a wider academic network, but in 1998, an agreement was reached to use the ARPANET as the (temporary) backbone of the new network while it was being built. With this decision the Internet became ‘a civilian network in all but name’. It transpired, however, that the ageing ARPANET proved inadequate as a backbone for a rapidly expanding national network, and so in the end a swap was done, with NFSNET becoming the backbone for the ARPANET.

On 28 February 1990, the ARPANET was officially decommissioned; the era of formal military involvement in the operation of the Internet had ended. That still left open the question of how the network should be funded in the coming decades. Should it remain a publicly funded operation, with the NSF using taxpayers’ dollars to pay the costs? Among the arguments against this was that it implied a continuation of the rule that the network could not be used for commercial purposes – which would preclude the exploitation of the economic potential of the technology. In the end, the NSF decided that the only way to allow commercial use of the Net would be to privatize it – to take it off the government's books.

And this is in fact what happened. In 1994, the NSF implemented a plan to allow Internet service to be taken over by commercial companies known as ‘Internet Service Providers’ (ISPs), each of which would operate its own backbone, enabling the old NSF backbone to be decommissioned. Customers would connect to one of the companies’ backbones, and the ISPs would operate a set of gateways at which a number of ISPs could interconnect their systems, allowing traffic to pass smoothly from one network to another, giving end users the illusion of interacting with a seamless, unitary system. What this also implied, though, was that the network was ‘open for businesses.

The process by which the network was privatized was a critical determinant of how the Internet evolved, and it has been largely obscured by the Whig interpretation of the network's history. But there was nothing preordained about the transition. The eventual outcome of the NSF's handover of the network to private interests was a product of judgement, foresight, consultation, political astuteness, luck, and timing.

A full account of the process lies beyond the scope of this paper, so a single illustration must suffice. One of the key questions facing the NSF administrators was: what kinds of commercial entities should run the network's backbone? A decade or so earlier, the answer would almost certainly have been AT&T, the regulated telephone monopoly. In 1991–1992, when the actual decision had to be made, an equally plausible candidate might have been IBM (and indeed IBM saw itself precisely in that frame). The attractions for replacing a unitary public service provider (NSF) with a single commercial provider, were obvious in terms of continuity, stability, and order. But giving a single organization such a degree of control over the network would violate its fundamental design axioms. It was therefore important to ensure that a number of competing ISPs should run the backbone. But that raised the question of how these organizations would co-operate in such a way that the illusion of a seamless network would be maintained. The ISPs proposed a solution: The Commercial Internet Exchange – essentially a router that took traffic from a number of competing ISPs who had agreed to pass data traffic between their networks. Since each exchange was funded by a flat-rate subscription from its members, data exchange between them was effectively free, rather than being metered by volume. This ‘peering’ system became the predominant model for interconnection and evolved to become a central component of the network's infrastructure. But in order to make it feasible in 1992, a small yet significant amendment to the NSF's Charter had to be made – and this was achieved by a Bill, sponsored by a Virginia Congressman, Rick Boucher. The point of this story is simple: there is nothing preordained about technological development.

**Phase two: the commercial Internet (1995–present)**

**The first Internet boom: 1995–2000**

In the 1980s, ‘cyberspace’ – the term coined by the novelist William Gibson to describe the virtual world behind the computer screen – was an unusual space. It was essentially a geek preserve, with a social ethos that was communal, libertarian, collaborative, occasionally raucous, anti-establishment and rich in debate and discussion. It had no commerce, no hierarchies, no crime and no spam, and in general it was populated by people who either knew one another, or at least knew others’ institutional affiliations. In that sense, cyberspace and the so-called real world existed as parallel universes. Most people outside of the magic circle had no knowledge of the network – and even if they did, they would have found it difficult to gain admission to it.

Two developments eroded the distinction between the two universes and caused them gradually to merge. The first was the commercialization of the network achieved by the NSF's decision to hand the backbone over to ISPs. This meant that lay people could now access the network – generally via slow dial-up connections. The second development was the arrival of the network's second ‘killer application’ – the World Wide Web.

The Web was the creation of a single individual – the physicist and computer scientist Tim Berners-Lee, who was employed in the late 1980s and early 1990s at CERN, the multinational particle-research laboratory located just outside Geneva in Switzerland. The underlying idea was to develop a way of publishing, locating, and retrieving documents stored on Internet servers across the world, something that would be useful for a large international laboratory like CERN, which had large numbers of visiting physicists and a perennial problem with document control. Berners-Lee's idea was to take an established technology called ‘hypertext’ – software which created documents with extensive cross-referencing between related sections of text and associated graphics – and make it work across the Internet. In a remarkable burst of creativity at the end of 1990, Berners-Lee created a working prototype of what he dubbed the ‘Worldwide Web’, in three months.

The prototype, however, did not generate much excitement at CERN, save among a small group of enthusiasts led by Berners-Lee's colleague, Robert Cailliau. Most people did not see the potential of the Web at the beginning. With hindsight, this seems surprising, but in fact it is perfectly plausible when one remembers the context in which the technology first appeared. As Gillies and Cailliau put it:

CERN's management was wary of committing resources to projects outside the laboratory's core area of physics research. The new LHC accelerator was not yet approved by the laboratory's member states, the Americans were planning to build a similar machine, and management's main priority was convincing member state governments that Europe really did need another million-dollar atom smasher. They were keen to be seen to be spending the taxpayers’ money wisely, and pumping resources into what they saw as no more than an interesting curiosity did not look like the way to do it.

From virtually the outset of the project, Berners-Lee had been posting documentation on the project on CERN's Internet server (info.cern.ch). In March 1991, he released the code to a selected number of CERN colleagues who were using NeXT workstations. In August, having obtained agreement from CERN management that the laboratory had no interest in retaining the IP rights to the software, he uploaded to info.cern.ch the program he had written to run the Web on NeXT machines, plus the code for a simple line-mode (i.e. text) browser and for a generic web server, and posted a note drawing attention to this in alt.hypertext, the Internet discussion group for researchers working on hypertext. Shortly afterwards, he opened a public Telnet server15 on info.cern.ch which would enable anyone to dial-in and use the browser installed on the CERN machine. This had the advantage of allowing people who were not in a position to install the Web software on their own machines to experiment with it.

Despite all this, dissemination of the Web in 1991–1992 was slow and remained so until the spring of 1993, when Marc Andreessen and Eric Bina, then working at the National Center for Supercomputer Applications (NCSA) at the University of Illinois at Urbana-Champaign, released Mosaic, a browser they had written for the Web. Although Mosaic was not the first graphical browser, it was the first one to display graphics inline (i.e. as an integral component of a page, rather than in a separate window).

The launch of Mosaic was a landmark moment in the evolution of both the Web and the Internet. It provided a dramatic illustration of the Web's potential for both publication and commerce. It opened up the possibility that the Web could be an entertainment medium. And because one needed access to the Internet in order to use the Web, Mosaic triggered a sudden surge in the demand for Internet connections among the general public. One source claim that in 1993, traffic on the nascent World Wide Web increased by over 300,000%.

Andreessen left Illinois in 1994 to join with the technology entrepreneur Jim Clark in order to set up Netscape, the first company founded expressly to exploit the Web commercially. The company's first product was a browser, Netscape Navigator, which although resembling Mosaic in many respects, had been coded from scratch to avoid intellectual property disputes with the NCSA. Navigator rapidly became the dominant browser in the nascent market, partly because versions of it were available for a range of computer systems, including the IBM PC.

On 9 August 1995, the Netscape corporation filed for an Initial Public Offering (IPO). The stock was priced at $28 a share. In the first day of trading, the price peaked at $75 before eventually closing at just over $58, a price that valued the year-old company at $2.9 billion.

Netscape's extraordinary IPO triggered intense speculative interest in the Internet and paved the way for the first Internet boom, an extraordinary outbreak of what the economist Robert Schiller dubbed ‘irrational exuberance’ , and which was later christened the ‘dot-com bubble’. What fueled the mania was speculative interest in the stock market valuation of a multitude of Web-based companies (‘dot-coms’) which materialized following Netscape's extraordinary debut, and which was amplified by the activities of fund managers, stock analysts, journalists, and pundits. As one skeptical observer put it, what really happened was that ‘Wall Street moved West’.

The core business model of these fledgling companies was the idea of harnessing the network effects implicit in the rapid growth of consumer interest in the Internet, in order to obtain a dominant market share in a range of sectors. At the height of the frenzy, dot-com companies with few customers, little (sometimes no) revenues and few employees, briefly enjoyed stock market valuations greater than those of long-established companies with significant revenues and thousands of employees.

The boom followed the traditional pattern of speculative manias through the centuries and, eventually, in March 2000, the bubble burst. In just over a month, the total market capitalization of companies on the NASDAQ exchange fell from $6.71 trillion to $5.78 trillion. In other words, nearly a trillion dollars in value had been obliterated. And fewer than half of the dot-coms founded in the boom survived the crash (Goldfarb, Kirsch, and Miller 2007).

In the disillusionment that followed, many people drew the conclusion that the Internet phenomenon was overblown. This was understandable, but misconceived. If the first Internet bubble showed anything (other than the perennial gullibility of humans) it was that expectations can sometimes run far ahead of technological, and economic, reality. The truth is that in the last decade of the twentieth century, the Internet was still not a technology mature enough to bear the weight of the (feverish) expectations of dot-com investors.

At that time, for example, only an estimated 413m people – 6.7% of the global population – had access to the Net. Most of them connected to the network via slow, noisy, and low-bandwidth dial-up lines. There was virtually no wireless networking outside of research labs, and very few people had persistent IP addresses. Most mobile phones did not connect to the network, and the few that did, connected via very limited WAP connections. There was very little ‘cloud’ computing. Given these realities, the Internet of the late 1990s was very much an immature technology.

The most paradoxical aspect of the first Internet boom however, is that the bubble created much of the technological infrastructure necessary to hasten the maturation of the network. When the bubble began to inflate, some canny observers quoted the old maxim of the Californian Gold Rush of the 1850s: that the people who made most money in California were not the miners or those who panned for gold, but the merchants who sold them pickaxes and shovels. The modern embodiments of those merchants were the telecommunications companies which, in the 1990s, invested heavily in building large fiber-optic cable networks and server farms to service the ‘new’ economy that was apparently coming into being. When the bubble burst, these companies were left with apparently unwanted assets, and some went bankrupt. But the infrastructure that they had built remained, and indeed turned out to be critical in enabling what came next. As the economist J. Bradford DeLong put it, ‘Investors lost their money. We now get to use all their stuff. What got built wasn't profitable, but a large chunk of it will be very useful’.

And this is an old story. DeLong points out, for example, that the ‘railway mania’ of the nineteenth century lost investors a lot of money, but the extent of the railway network that was the product of the frenzy enabled completely new industries to be built.

Americans and the American economy benefited enormously from the resulting network of railroad tracks that stretched from sea to shining sea. For a curious thing happened as railroad bankruptcies and price wars put steady downward pressure on shipping prices and slashed rail freight and passenger rates across the country: New industries sprang up.

Consider, for example, the old Montgomery Ward and Sears Roebuck catalogs. Sears and Montgomery Ward discovered at the end of the 19th century that the cost of shipping consumer goods to rural America was no longer a competitive burden.

Mail a catalog to every household in the country. Offer them big-city goods at near big-city discounts. Rake in the money from satisfied customers. For two generations this business model – call it the ‘railroad services’ business model – was a license to print money, made possible only by the gross overbuilding of railroads, the resulting collapse of freight rates, and the fact that railroad investors had had to kiss nearly all their money good-bye. Their pain was outweighed by the gain to American consumers and manufacturers, who could now order and ship goods essentially free. The irrational exuberance of the late 1800s made the railroads a money-losing industry – and a wealth-creating industry. The more money investors lost through overbuilding, the lower freight rates became, and the more railroads belched out wealth for everybody else.19

Profits, in other words, are not the same thing as social value. And so it proved with the Internet.

**‘Web 2.0’: 2000–2003**

The Web was originally conceived as a means of sharing information among particle physicists who were scattered across the world. Since most of that information was in the form of documents, the design was therefore for a system that would make it possible to format these documents in a standardized way, publish them online, and make them easy to access. So, the first ‘release’ of the Web (to use a software term) created a worldwide repository of linked, static documents held on servers distributed across the Internet.

Given that it was intended as a system for academic researchers, the original Web design was probably fit for purpose in its first two years. But once the Mosaic browser appeared in 1993 and the commercial possibilities of the technology became obvious to the corporate world, the limitations of the original concept began to grate. The early Web did not make provisions for images, for example. And it was a one-way, read-only medium with no mechanism for enabling people to interact with web pages, which meant that it was unsuitable for e-commerce. There was no way for users to talk back to authors or publishers; no way to change or personalize web pages; no way to find other readers of the same page; and no way to share or collaborate over the Web.

From 1993 onwards therefore, there was a steady accretion of innovative technologies designed to extend Berners-Lee's creation and to overcome some of its perceived limitations. The main driver behind this was e-commerce, which desperately needed to transform the Web into a medium that facilitated transactions.

In order to make transactions possible, a whole range of problems had to be solved. For example, ways had to be found to allow interactivity between browsers and servers; to facilitate personalization of web content; and to overcome the problem that the HTTP protocol was both insecure (in that communications between browser and server could be intercepted and monitored by third parties) and stateless (i.e. unable to support multistep transactions).

In time, solutions to these problems emerged in the forms of: ‘cookies’; HTTPS (an encrypted version of the basic HTTP protocol); the evolution of browsers with capabilities added by specialized ‘plug-ins’ which enabled them to handle audio and video and other kinds of file; and, eventually, JavaScript, which effectively turned web pages into small virtual machines. Many of these technologies had an ad hoc feel to them, which was hardly surprising, given that they had been grafted onto a system rather than being designed into it. But they nevertheless proved extraordinarily powerful in supporting the dramatic expansion of the Web from 1995 onwards.

In pondering the Web 1.0 enterprises that had survived the crash, and the new ones that had arisen afterwards, it became clear that they had several important features in common, an observation which eventually led to them being dubbed ‘Web 2.0’ by one prominent observer of the technology. One of these features was that they harnessed the collective intelligence available on the Web, either via software such as Google's PageRank algorithm (which ranks web pages using a kind of automated peer-review) or by exploiting the willingness of users to engage with the enterprise (as, for example, in Amazon's utilization of product reviews by customers). Another example of collective intelligence at work was Wikipedia – an enterprise made possible by Ward Cunningham's invention of the ‘wiki’ – a web page that could be edited by anyone who read it (see Naughton 2012, 95). Cunningham's software transformed the Web from a one-way, read-only medium, into what Tim Berners-Lee later called the ‘read–write Web’.

A second distinguishing feature of the ‘new’ Web was ‘user-generated content’ or ‘peer production’ – that is, material created and published freely by people who do it for no apparent economic motive.

Another distinctive feature of the ‘new’ Web was that many of the emerging services on it were dynamically interconnected by means of software tools like the syndication tool RSS and Application Programming Interfaces (APIs). The latter provide the ‘hooks’ on which other pieces of software can hang. What was distinctive about some of the web services that evolved after 1999 was that they used APIs to specify how entire web services could work together. A typical example is the API published by Google for its Maps service. This made it possible for people to create other services – called ‘mashups’ – which linked Google Maps with other Internet-accessible data sources.

Fourthly, many of the new Web services were distinctive by never being ‘finished’ – by being in what programmers would call a ‘perpetual Beta’ stage. This intrinsic, experimental ethos of the emerging Web was exemplified by the Google search engine which, when it launched, and for a considerable time afterwards, carried the subscript ‘BETA’. What was significant about this was that it signaled its designers’ philosophy of regarding their web-based service as a work in progress – subject to continual and sometimes rapid change – rather than as something fixed and immutable. What made this possible of course, was the fact that it was a cloud-based service, so every user's version of the software could be upgraded at a stroke, and without any effort on their part, beyond occasionally upgrading their browser software or installing some (free) plug-ins designed to take advantage of whatever new features Google had decided to add.

A final distinguishing characteristic of the post-1999 Web was that the enterprises and services that were becoming dominant were effectively using the Web as a programming platform. So, while the Internet was the platform on which Web 1.0 was built, Web 1.0 in turn became the platform on which the iconic services of Web 2.0 were constructed. This was made possible firstly by the fact that the Web provided a common standard, and secondly by the fact that if a service was provided via the http protocol, it could bypass the firewalls used by organizations to prevent unauthorized intrusions (since most firewalls were programmed to allow ‘web pages’ to pass through).

**Mobile connectivity, surveillance, cybercrime, corporate power, changing patterns of use and their implications: (2004–present)**

The most recent phase in the evolution of the Internet has been characterized by significant changes in the ways that people access and use the network and by the ways in which the infrastructure of the network has evolved to cope with these changes.

A comprehensive survey of these developments is beyond the scope of this paper, so an outline of some of the more significant will have to suffice. Of these, the most prominent are: the rise of mobile connectivity; the rapid expansion of so-called social media; pervasive surveillance by both state and commercial entities; increase of the power and influence wielded by a small number of large technology companies and consolidation of their grip on the network; increases in cybercrime; the possibility of ‘Balkanization’ of the network; changes in patterns of media consumption; and the emergence of new intermediaries like Uber, Airbnb, and Coursera which use the network as a platform on which to run businesses that are potentially very disruptive to incumbents.

**Mobile connectivity**

In many respects, the most significant moment in the recent history of the Internet was the arrival of the ‘smartphone’ – i.e. a mobile phone that can access the Internet – in 2007. Adoption of smartphones (and related mobile devices, like tablet computers) has increased rapidly, to the point where it is clear that most of the next few billion Internet users, mostly from developing countries, will access the network via a smartphone. The implications of this development are profound. On the one hand, access to the network – and all the good things that could flow from that – will come within the reach of communities that have hitherto found themselves on the wrong side of the ‘digital divide’. On the other hand, ubiquitous mobile connectivity will increase further the power and influence of corporations over Internet users because of (i) the latter's dependence on companies for both connectivity and content, and (ii) mobile devices’ dependence on cloud computing resources for much of their functionality.

**Social media**

Online social networking services have quite a venerable pedigree in Internet terms (see Naughton 2012, 98–101), but in the last few years the market has been dominated by Facebook (founded in 2004), LinkedIn (2003) and Twitter (2006). Of these, Facebook is by far the most dominant. As of Autumn, 2015, it had 1.55 billion ‘monthly active users’, 90% of whom access the service from mobile devices. Given that Facebook was the brainchild of a single individual, a Harvard sophomore, its current prominence is an impressive demonstration of the capacity of the Internet to enable ‘permission less innovation’.

**Pervasive surveillance**

‘Surveillance is the business model of the Internet. We build systems that spy on people in exchange for services. Corporations call it marketing.’ This statement from a noted computer security expert is a hyperbolic way of encapsulating the symbiotic relationship between Internet users and companies. On the one hand, users clearly value online services like search and social networking, but they have traditionally been reluctant to pay for them; on the other hand, Internet companies wanted to ‘get big fast’ in order to harness network effects, and the quickest way to do that was to offer services for free. The business model that emerged from this symbiotic relationship is advertising-based: users agree that the service providers may gather data about them based on their online behavior and use the resulting knowledge to target advertising at them, hence the trope that ‘if the service is free, then you are the product’.

Up to now, this surveillance-based model has worked well for the Googles and Facebooks of the online world. But its long-term sustainability is not assured; there are signs, for example, that users are becoming resistant to targeted advertising, and use of ad-blocking software is on the rise .

The last 15 years have also seen massive expansion in state surveillance of Internet and mobile communications, stimulated in large part by the ‘state of exception’ (Agamben 2005) necessitated by the so-called war on terror. There was probably a vague awareness among the general public that security and intelligence services were monitoring people's communications, but it took the revelations by the former National Security Agency (NSA) contractor, Edward Snowden, in 2013, to demonstrate the scale and intrusiveness of this surveillance.

Snowden's revelations have provoked much controversy, prompted a number of official inquiries (notably in the US and the UK) and the publication, in the UK, of a draft new Investigatory Powers Bill which is scheduled to become law before the end of 2016. At the time of writing, the Bill is on its passage through Parliament, but it seems unlikely that current surveillance practices will be abandoned, though oversight arrangements may change. And although public attitudes to covert surveillance seem to be culturally dependent, at least as measured by opinion polling, all the indications are that extensive surveillance of communications has become a fixture in liberal democracies, with unpredictable long-term consequences for privacy, human rights, and civil liberties.

**Corporate power**

Two aspects of ‘power’ are important in a networked world. One is the coercive, surveillance, and other power exercised by states. The other is that wielded by the handful of large digital corporations that has come to dominate the Internet over the last two decades. This raises a number of interrelated questions. What exactly is the nature of digital corporations’ power? How does it differ from the kinds of power wielded by large, non-digital companies? In what ways is it – or might it be – problematic? And are the legislative tools possessed by states for the regulation of corporate power, fit for purpose in a digital era?

The five companies – Apple, Google, Facebook, Yahoo, Amazon, and Microsoft – have acquired significant power and influence and play important roles in the everyday lives of billions of people. In three of these cases – Apple, Amazon, and Microsoft – the power they wield mostly takes a familiar form: market dominance in relatively conventional environments, those of retail commerce and computer software and/or hardware respectively. In that sense, their market dominance seems relatively unproblematic, at least in conceptual terms: all operate in well-understood market environments and in one case (Microsoft) antitrust legislation has been brought to bear on the company by both US and European regulators. So, although the market power of the trio raises interesting legal and other questions, it does not appear to be conceptually challenging.

The same cannot be said, however, of the power wielded by ‘pure’ Internet companies like Google, Facebook (and to a lesser extent, Yahoo). Their power seems just as significant but is harder to conceptualize.

**Cybercrime**

The term ‘cybercrime’ covers a multitude of online misdeeds, from sophisticated attacks on government and corporate websites, to spam emails offering fake prizes. Its rise seems correlated – at least in countries like the UK – with a fall in reported offline crime. This might be a coincidence, but a more plausible hypothesis is that it reflects the reality that the chances of being apprehended and convicted for online crime are alarmingly low.

As far as companies are concerned, cybercrime is a real and growing threat and one that is chronically under-reported. According to a 2014 study by PricewaterhouseCoopers, 69% of UK companies had experienced a cybersecurity ‘incident’ in the previous year, but an earlier government inquiry found that businesses reported only 2% of such incidents to police.

Since cybercrime is now a global industry, effective measures to deal with it require a coordinated international response. Although in some areas law enforcement agencies have shown that such co-operation can work, arrangements for dealing more generally with cybercrime are slow and patchy. A solution to the problem lies some distance ahead in the future.

**‘Balkanization’**

Although the Internet has its origins in the US, from the outset it was conceived as a global network that transcended territorial boundaries. As the network expanded however, tensions began to emerge between this ‘global’ network and local customs, culture, and laws. The kind of free expression protected by the First Amendment to the US Constitution, for example, was deemed unacceptable in other cultures. Over time, these tensions extended to clashes between local laws and the operating and commercial assumptions of US-based Internet companies.

Tensions between local jurisdictions determined to enforce their laws and cultural norms on the network have steadily increased over the last decade, leading to fears that the Internet would eventually be ‘Balkanized’, that is, split into locally controlled subnets. To a certain extent, this has already happened – for example, in China, which is now the largest Internet market in the world but where the government retains very tight and sophisticated control over the network. Other governments – notably those of Iran, the Russian Federation and some Middle-Eastern regimes – have also instituted increasingly tight control over use of the Internet by their citizens.

Until mid-2013, the momentum towards Balkanization of the network was relatively modest. In 2013, however, revelations by the former NSA contractor, Edward Snowden, about the surveillance capability of US and allied governments, radically altered the picture. Snowden's revelations of the extent of US covert penetration and surveillance of network communications have provided authoritarian and quasi-democratic regimes with a convenient rationale for extending their control. And even in liberal democracies, the reassertion of local territorial rights has become more noticeable – as, for example, in the ‘Scherms’ judgment by the European Court of Justice (Court of Justice of the European Union 2015), which ruled invalid the ‘Safe Harbor’ agreement between the EU and the US, under which personal data of European citizens held by American Internet companies could be ‘exported’ to server farms in the continental US. As a result, US Internet companies like Microsoft have decided to hold European citizens’ data on server farms located in EU countries. So, it is conceivable that a kind of de-facto Balkanization is under way.

**Changing patterns of media consumption**

Since the Internet, in principle, enables anyone with a network connection to become a global publisher, it was seen at the outset as a radically different kind of medium from the mass media which had dominated the print and broadcast world. Whereas those earlier media were few-to-many systems, the Internet could be a many-to-many medium; its users could be active creators of content, rather than passive consumers of content created by others. But as the network has evolved to connect billions of users, this early vision of its potential as a communications medium has been tempered by experience. Analysis of data traffic on the network suggests that the kind of passive consumption that characterized the broadcast era is returning. On North American landline connections, for example, Netflix – a movie-streaming service – accounts for 36.5% of downstream traffic in the peak evening hours. The network still offers great creative opportunities for its users, but the odds of it turning into ‘billion-channel TV’ may be shortening.

**Changes in network infrastructure**

In 1995, an estimated 16m people worldwide had access to the Internet. The current number of users is estimated to be in the region of 3.5 billion. In 1995, all users accessed the network via fixed-line connections; currently over half of all users access it via mobile devices. And most of the applications that are popular with contemporary users did not exist – and indeed would not have been feasible – on the network as it was in 1995. The remarkable thing about the Internet is that, while its infrastructure has had to evolve radically over those two decades to meet the ever-changing demands of its users, it still remains largely true to its fundamental architectural principles.

This is an extraordinary achievement, made possible by what Greenstein describes as a ‘combination of inventive specialization and technical meritocracy’. Inventive specialization evolved naturally from the early days because groups of engineers routinely coalesced around specific technical challenges in order to improve particular functions in the network. Technical meritocracy was likewise an inheritance from the early days of the ARPANET design – a prevailing ethos that ideas should succeed (or fail, as many did) on their technical merits, rather than on the organizational status of whoever proposed them.

One illustration of this process in action is the evolution of ‘content delivery networks’ (CDNs) – distributed networks of proxy servers located in multiple data centers across the world. Their function is to improve the speed and reliability with which digital content can reach users who demand it. Essentially, CDNs cache (temporarily store) digital content closer to where communities of users are located so that, for example, on-demand streaming video arrives promptly, and at higher quality than would be the case if it were being streamed directly from a central server farm on the other side of the globe. CDNs now serve a large proportion of contemporary Internet content, and without them, the kind of services that mobile users in particular take for granted would be impossible. In that sense, they are a rational technical solution to a problem that, if left unsolved, would have reduced the overall utility of a network that has increasingly been called upon to serve passive consumers of multimedia content.

**CONCLUSION**

This survey of the evolution of the Internet over four decades highlights a number of themes.

The first is the extent to which its development was socially shaped. The intrinsic affordances of digital technology did, of course, play an important role in the network's evolution. But it was also shaped by non-technological forces: its military provenance, for example; the surveillance-based business models that evolved to support the ‘free’ services provided by companies like Google and Facebook; the collaborative, non-commercial social ethos of the engineering community that developed the protocol layer of the network.

This last factor deserves special attention, because the ethos of the developer community was effectively ‘baked into’ some of the protocols. Just to take one example, the original (1982) version of the SMTP protocol (Simple Mail Transfer Protocol), which governs how mail servers handle messages, had no provision for authentication – i.e. for checking that the ‘sender’ of a message was actually the real sender – because at that stage email traffic took place between researchers and institutions that were known to one another. But once the network was commercialized, absence of authentication was what enabled the spoofing of email addresses and enabled the rise of spam: the social context had changed.

Secondly, like many other technologies, the evolution of the Internet, from its earliest beginnings to a mature technology, involved both public investment and private capital. The ARPANET, and the development of the TCP/IP network that followed it, were exclusively funded by taxpayers’ money, initially via the Department of Defense and later via the NSF. Privatization of the network in the mid-1990s then brought in a torrent of investment capital in a five-year speculative bubble. But while this bubble caused a financial crash, it also resulted in a massive expansion in the communications infrastructure needed to turn the network into a ubiquitous public utility. In that sense, as the economist and venture capitalist William Janeway observe, bubbles matter.

They matter because they not only transfer wealth from greater to less-great fools, and to the knaves that prey on the former. Occasionally – critically – they transfer wealth to fortunate opportunists and insightful entrepreneurs in the market economy who are granted access to cash on favorable terms and put it to work with astounding consequences.

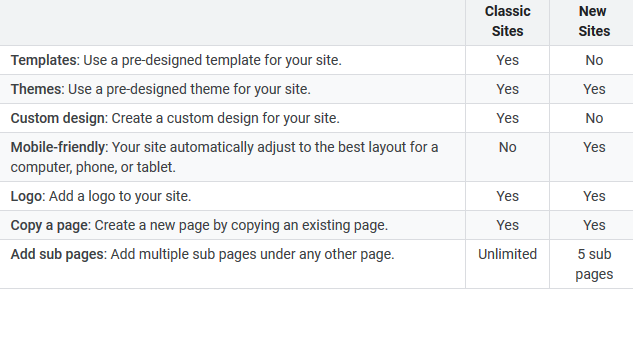
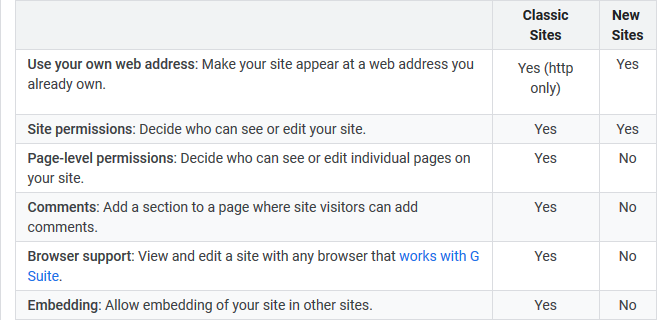
Thirdly, we can see an intriguing contradiction emerging between the affordances of digital technology as time progresses. In the period from 1995 to (roughly) 2005, the architecture of the network definitely facilitated ‘permission less innovation’. Software is pure ‘thought-stuff’, the barriers to entry were very low and so entrepreneurs and inventors like the founders of eBay, Google, Skype, Facebook, and others were able to launch, with very little capital, services and enterprises that eventually became global corporations.

But the technology has other distinctive affordances too, which became progressively more pronounced from 2005 onwards. The most significant of these affordances are: zero marginal costs; powerful network effects; the dominance of Power Law distributions in cyberspace; and technological lock-in (Anderson 2014). The resultant of these affordances points towards winner-takes-all outcomes – as seen, for example, in Google's domination of the search market, Facebook's in social networking and Amazon's in online retailing and cloud computing. So, while the Internet in principle still facilitates permission less innovation, the chances of insurgents displacing incumbents – at least in pure Internet businesses – seem less likely. Whereas Google was able to displace other search engines in 1996 simply by having a better page-ranking algorithm, nowadays a newcomer with an innovative idea in search will face an incumbent with huge troves of user data and large server farms distributed across the globe. The barrier to entry has thus been raised to a formidable extent.

What this suggests is that the Internet has evolved into a GPT, much as railway networks did in the late nineteenth century. At the same time, it is now mature and extensive enough to serve as a foundation on which new kinds of innovation, much of it in areas apparently unrelated to information goods, can build. In that sense, it is conceivable that enterprises like the cab-hailing application Uber, or the room-hiring service Airbnb, may turn out to be the contemporary equivalent of the mail-order services of the nineteenth century: unthinkable before the technology, and unremarkable afterwards.

Finally, there is the overriding issue of control. In his magisterial history of the dominant communications technologies of the twentieth century, the legal scholar Tim Wu discerns a pattern – a cycle. Each new technology: the telephone, radio, movies, and television, initially engendered waves of creativity, excitement, and utopian hopes. But each, in the end, was ‘captured’ by corporate interests, sometimes with the connivance of government (as with telephony and AT&T). Wu notes that the Internet, at its inception four decades ago, also engendered the same kind of excitement and utopian hopes, and asks whether, in the end, it will suffer the same fate. It is a good question. The historian will say that it is too early to tell. Others may disagree.

**OBSERVATION AND ASSESSMENT OF WEBSITES USING WAY BACK MACHINE**

* **Google**
* **Design and organize:**
* **View and edit:**
* **Themes, Colors and Fonts:**
* **Facebook**
* **Login page:** In 2007 Facebook’s login page is only have login with email. And it gives service only in English language. Also there is no join form in login page, but there is a button called “register” to join. But in 2019 login page and sign in page become at one page. So if we don’t have account we can sign in at the same page with login page. In other side Facebook in 2019 have phone option other than email. If we don’t have email we can sign in with mobile phone. And Facebook 2019 gives services more than 43 languages.
* **Platform:** in 2007 Facebook was only a platform to share photos and texts. But in 2019 Facebook enabled to share audio, video and software including photo and text.
* **Content :** in 2007 we could only search for friends who is in Facebook. But in 2019 we can search for events, news, fundraisers.
* **Users:** in 2007 the users of Facebook was only 20 million. But now it reaches 2.4 billion users.
* **Twitter**
* **Theme and Font:** in 2007 twitter had unattractive home page. And there was many links in one page. But in 2020 twitter reduced number of links almost to zero and make it very simple to sign in and log in.
* **WordPress**
* **Platform:** in 2004 WordPress.org is a platform only focused on aesthetics, web standards, and usability. But in 2020 it added not only website development it started to give development area for blogs and software.
* **Wikipedia**
* **Content:** in 2003 Wikipedia wrote only 100,000 articles. In 2020 the number reached over 6 million articles.
* **Theme, Color and Fonts:** in 2003 Wikipedia only written using only HTML. And its links are condensed at one place and difficult to choose. But in 2020 it become more user friendly and use interactive website.
* **Users:** in 2003 had 45 million active users in a month. Now Wikipedia has 500 million unique users with in a month.
* **Theme, Color and Font:** in 2003 WordPress uses simple but compact html and simple CSS decoration. But in 2020 WordPress uses the most advanced and complicated CSS decoration.

**TYPES OF WEBSITE**

**There are 12 types of websites.**

**1.Entertainment website**

* [**http://www.youtube.com**](http://www.youtube.com) **–** is an American video-sharing platform.
* [**http://www.netflix.com**](http://www.netflix.com) **–** is an American media-service provider and production company. The site primary business is its subscription-based streaming service which offers online streaming of a library of films and television programs, including those produced in-house**.**
* [**http://www.IMDB.com**](http://www.IMDB.com) **–** is an online database of information related to films, television programs, home videos, video games, and streaming content online including cast, production crew and personal biographies, plot summaries, trivia, fan and critical reviews, and rating**.**
* [**http://www.spotify.com**](http://www.spotify.com) **–** is a site that provide audio streaming platform.
* [**http://www.bilibili.com**](http://www.bilibili.com) **–** is a Chinese video sharing website themed around animation, comic, and game, where users can submit, view and add commentary subtitles on videos.

**2. News website**

* [**http://news.yahoo.com**](http://news.yahoo.com) **–** is a new website that originated as internet-based news aggregator by yahoo!.
* [**http://edition.CNN.com**](http://edition.CNN.com)– is an American news-based pay television channel owned by AT&T Warner Media**.**
* **http://**[**www.washingtonpost.com**](http://www.washingtonpost.com)**--** is a major American daily news paper.
* **http://**[**www.bbc.com/News**](http://www.bbc.com/News)**--** is an operational business division of BBC responsible for the gathering and broadcasting of news and current affairs**.**
* [**http://www.nbcnews.com**](http://www.nbcnews.com)– is a news website owned and operated by NBCUniversal as the online arm of NBC news.

**3 . Informational website**

* **http://**[**www.freshbooks.com**](http://www.freshbooks.com)
* **http://**[**www.airbnb.com**](http://www.airbnb.com)
* [**http://www.mcdonough.com**](http://www.mcdonough.com)
* **http://**[**www.mosaicartnow.com**](http://www.mosaicartnow.com)
* **http://**[**www.polygon.com**](http://www.polygon.com)

1. **Advocacy websites**

* **[http://www.childtherapy.com](http://www.childtherapy.com/)**
* [**http://www.ahrp.org**](http://www.ahrp.org)
* [**http://www.greenpeace.org**](http://www.greenpeace.org/) **– is a non-governmental environmental organization.**
* **[http://www.navs.org](http://www.navs.org/)**
* **[http://www.undoit.org](http://www.undoit.org/)**

1. **Blog websites**

* [**http://www.wordpress.org**](http://www.wordpress.org/)– is a free and open-source content management system. WordPress originally created for blog-publishing system.
* **[http://www.wix.com](http://www.wix.com/)**
* [**http://www.weebly.com**](http://www.weebly.com/) **–** is a blogging website that is easy to blog**.**
* [**http://www.blogger.com**](http://www.blogger.com/) **–** is a blog-publishing service that allows multi-user blogs with time-stamped entries.
* [**http://postach.io**](http://www.postach.io/) **–** is a blog-publishing website.

1. **Educational websites**

* [**http://www.udemy.com**](http://www.udemy.com/)– Udemy is an online learning platform aimed at professional adults and students, developed in may 2010.
* [**http://www.scribid.com**](http://www.scribid.com/) – is an American e-book and audiobook subscription service that includes one million titles. Scribid hosts 60 million documents on its open publishing platform and has 80 million users, and has been referred to as “the Netflix for books”.
* [**http://www.quizlet.com**](http://www.quizlet.com/)– is a mobile and web-based study application that allows students to study information via learning tools and games. And the website have 50 million active users**.**
* **http://**[**www.stackoverflow.com**](http://www.stackoverflow.com)– is a question and answer site for professional and enthusiast programmers. It is privately held website, the flagship site of the stack exchange network, created in 2008.
* **http://**[**www.edX.com**](http://www.edX.com) **–** is a massive open online course provider. It hosts online university-level courses in a wide range of disciplines to a worldwide student body, including some courses at no charge. It also conducts research into learning base on how people use its platform. EdX is nonprofit organization and runs on the free open edX open-source software platform.

1. **Business/Marketing websites**

* [**http://www.bloomberg.com**](http://www.bloomberg.com/) **–** is a privately held financial, software, data, and media company.
* [**http://www.forbess.com**](http://www.forbess.com/) **–** is an American business magazine. Published bi-weekly, it features original articles on finance, industry, investing, and marketing topics.
* [**http://www.ebay.com**](http://www.ebay.com/) **–** is an American multinational e-commerce corporation.
* [**http://www.amazon.com**](http://www.amazon.com/) **--** is an American multinational e-commerce corporation.
* [**http://www.finance.yahoo.com**](http://www.finance.yahoo.com/) **–** is a media property that is part of yahoo!’s network. It provides financial news, data and commentary including stock quotes, press releases, financial reports, and original content.

1. **Content aggregator website**

* **http://**[**www.alltop.com**](http://www.alltop.com)
* **http://**[**www.theweblist.net**](http://www.theweblist.net)
* **http://www.wpnewsdesk.com**
* **http://**[**www.blogengage.com**](http://www.blogengage.com)
* **http://**[**www.popurls.com**](http://www.popurls.com)

1. **Wiki websites**

* [http://www.wikitravel.com](http://www.wikitravel.com/) – is web based collaborative travel guide based on the wiki model and owned by internet brands.
* [**http://www.wikihow.com**](http://www.wikihow.com/) **–** is an online wiki-style community consisting of an extensive database of how-to guides.
* [**http://www.wikibooks.com**](http://www.wikibooks.com/)– is a wiki-based Wikimedia project hosted by the Wikimedia foundation for the creation of free content e-book textbooks and annotated texts that anyone can edit.
* [**http://www.wikipedia.com/**](http://www.wikipedia.com/) **–** is a multilingual online encyclopedia created and maintained as an open collaboration project by a community of volunteer editors using a wiki-based editing system**.**
* [**http://www.wikitionary.com**](http://www.wikitionary.com/) **–** is multilingual, web-based project to create a free content dictionary of terms in all natural languages and a number of artificial languages.

1. **Social network websites**

* [**http://www.facebook.com**](http://www.facebook.com/) **– is an American online social media and social networking service.**
* [**http://www.twitter.com**](http://www.twitter.com/) **– is an American micro blogging and social networking service on which users post and interact with message known as “tweets”.**
* [**http://www.whatsapp.com**](http://www.whatsapp.com/) **– is a freeware, cross-platform messaging and voice over IP service. It allows users to send text messages and voice messages, make voice and video calls, and share images, documents, user locations, and other media.**
* [**http://www.wechat.com**](http://www.wechat.com/) **– is a Chinese multipurpose messaging, social media and mobile payment app developed by Tencent.**
* [**http://www.snapchat.com/**](http://www.snapchat.com/) **– is multimedia messaging app used globally.**

1. **Portal websites**

* [**http://www.aau.edu.et**](http://www.aau.edu.et/) **– is the website of Addis Ababa university, Addis Ababa, Ethiopia.**
* [**http://www.ethiopia.gov.et**](http://www.ethiopia.gov.et/) **– is official Ethiopian government website.**
* [**http://www.evisa.gov.et**](http://www.evisa.gov.et) **– is Ethiopian government website that used to give visa fast and secured.**
* **http://www.moe.gov.et - it is the official website of ministry of education of Ethiopia.**

1. **Personal websites**

* [**http://www.kristagray.com**](http://www.kristagray.com/)  **--- gray’s homepage gives you all the information you need to know about her and her work in a clean, easy-to-read way. Plus her “services” section explains exactly what she’s looking for, making it easy for people to understand how they can work with her.**
* [**http://www.rachaelgking.com**](http://www.rachaelgking.com/) **-- King uses her simple website to tell a compelling story about herself and then give a clear call to action for people to reach out to her to work together. Plus, her social profiles stand out loud and proud, which is critical since she’s a social media professional.**
* [**http://www.kristihines.com**](http://www.kristihines.com/) **– Hines has managed to make the examples of her writing work visual with the help of publication logos, plus testimonials page is second to none.**
* [**http://www.anthonydesigner.com**](http://www.anthonydesigner.com/) **– essentially a fancy online resume, this site does an especially good job of incorporating graphics and images in supper classy way. Specially “why me” section that summarizes Antonies’s greatest attributes.**
* [**http://www.albinotonnina.com**](http://www.albinotonnina.com/) **– this site engaged in Tonnina’s story and experience. It is easy scrolling and beautiful animated graphics**

**GUIDELINE FOR EVALUATING WEBSITES**

These six criteria deal with the content of Web sites rather than the graphics or site design. Apply these criteria when you research on the internet.

**1. AUTHORITY**

* Authority reveals that the person, institution or agency responsible for a site has the qualifications and knowledge to do so. Evaluating a web site for authority:
* Authorship: It should be clear who developed the site.
* Contact informationshould be clearly provided: e-mail address, snail mail address, phone number, and fax number.
* Credentials: the author should state qualifications, credentials, or personal background that gives them authority to present information.
* Check to see if the site supported by an organization or a commercial body .

**2. PURPOSE**

The purpose of the information presented in the site should be clear. Some sites are meant to inform, persuade, state an opinion, entertain, or parody something or someone. Evaluating a web site for purpose:

* Does the content support the purpose of the site?
* Is the information geared to a specific audience (students, scholars, general reader)?
* Is the site organized and focused?
* Are the outside links appropriate for the site?
* Does the site evaluate the links?
* Check the domain of the site. The URL may indicate its purpose.

**3. COVERAGE**

It is difficult to assess the extent of coverage since depth in a site, through the use of links, can be infinite. One author may claim comprehensive coverage of a topic while another may cover just one aspect of a topic. Evaluating a web site for coverage:

* Does the site claim to be selective or comprehensive?
* Are the topics explored in depth?
* Compare the value of the site’s information compared to other similar sites.
* Do the links go to outside sites rather than its own?
* Does the site provide information with no relevant outside links?

**4. CURRENCY**

Currency of the site refers to:

1) how current the information presented is, and

2) how often the site is updated or maintained.

It is important to know when a site was created, when it was last updated, and if all of the links are current. Evaluating a web site for currency involves finding the date information was:

* first written
* placed on the web
* last revised

Then ask if:

* Links are up-to-date
* Links provided should be reliable. Dead links or references to sites that have moved are not useful.
* Information provided so trend related that its usefulness is limited to a certain time period?
* the site been under construction for some time?

**5. OBJECTIVITY**

Objectivity of the site should be clear. Beware of sites that contain bias or do not admit its bias freely. Objective sites present information with a minimum of bias. Evaluating a web site for objectivity:

* Is the information presented with a particular bias?
* Does the information try to sway the audience?
* Does site advertising conflict with the content?
* Is the site trying to explain, inform, persuade, or sell something?

**6. ACCURACY**

There are few standards to verify the accuracy of information on the web. It is the responsibility of the reader to assess the information presented. Evaluating a web site for accuracy:

* Reliability: Is the author affiliated with a known, respectable institution?
* References: do statistics and other factual information receive proper references as to their origin?
* Does the reading you have already done on the subject make the information seem accurate?
* Is the information comparable to other sites on the same topic?
* Does the text follow basic rules of grammar, spelling and composition?
* Is a bibliography or reference list included?