The Internet, more preferably referred to as a global network of networks, is a remarkably complex technical system built on the creative contributions of scientists around the world from the 1950s till today. Throughout its evolution, the Internet has been promoted as a significant tool for meeting a range of human needs. Through the years it has been possible to produce social benefits including easier and more widespread access to computers and information which in turn increased scientific collaboration; economic growth; the development of technologies and an increased ability to maintain social ties over long distances; the democratization of content creation; and online political and social activism. This doesn’t mean the development of the internet had no downsides. The Internet’s rapid growth has also spawned technical crises, such as a scarcity of network addresses, and social dilemmas, including malicious and illegal activities and persistent digital divides based on income, location, age, gender, and education. Such problems continue to demand creative solutions from.

The Internet has several general themes that characterize its technical development.

First, from the 1950s to the present there has been a steady increase in the size of data networks and the variety of services they offer. Rapid growth and diversity have forced network designers to overcome incompatibilities between computer systems and components, manage data traffic to avoid congestion and chaos, and reach international agreement on technical standards. These challenges have led to fundamental advances in research areas such as operating systems and queuing theory. A second trend has been the modeling of network functions as a series of layers, each of which behaves according to a standard protocol, a set of rules for interaction that is implemented in software or hardware. Layering reduces the complexity of the network system and minimizes the amount of standardization necessary, which makes it easier for networks to join the Internet. A third important feature of the Internet’s technical development has been an unusually decentralized and participatory design process. This has opened the system to innovation from a variety of directions and has encouraged informal worldwide collaboration. The following sections describe some of the major milestones in the evolution of the Internet and its predecessors.

Terminal networks were based on a relatively simple hub-and-spoke model that connected numerous users to a single central computer resource. More complex networks involving multiple computers were built by computer scientists from the late 1960s to the late 1970s. Experimenting with new technologies, researchers aimed to break the barriers to sharing data between dissimilar computer systems. Scientists and their government sponsors saw a threefold promise in networking: the ability to share scarce and expensive computers, which would increase access while decreasing costs; the ability to share data and work collaboratively with colleagues in other locations; and the opportunity to advance the theory and practice of computer science.

Three of the most important early research networks were the ARPANET, the NPL Mark I, and CYCLADES .

By far the most successful application of the early research networks was electronic mail, which became a standard service in the early 1970s.

Though they were not open to the general public, the early research networks went beyond providing computer access for a small group of scientists. They produced solutions to formidable technical obstacles and established vital resources for future innovation, including standard techniques and a community of researchers and engineers experienced in networking.

In the mid-1970s, the emergence of research networks was paralleled by three other trends: proprietary networking systems offered by computer manufacturers; public data networks built by national telecommunications carriers (PTTs); and grassroots networks that were improvised by individuals with little funding.. Thus computer networking reflected and augmented the trend toward economic globalization that accelerated in the 1980s and beyond.

While proprietary systems provided a vital service to organizations with many computers from the same manufacturer, these networks were generally not compatible with computers from rival manufacturers. This could be a problem within a single organization and certainly raised an obstacle to building a national or international network.

The PTTs’ vision of data networking, modeled on the phone system, included not only universal access but also international connections. Realizing that this would require agreement on a shared network protocol, in 1975–76 the Consultative Committee on International Telegraphy and Telephony of the International Telecommunications Union developed a packet-switching network standard called X.25. X.25 provided a reliable connection called a virtual circuit between two points on a network, allowing terminal users to access online resources without having to install complex networking software. Early adopters of the new standard included Canada’s Datapac network (1977), France’s Transpac (1978), Japan’s DDX (1979), the British Post Office’s PSS (1980), and the multinational Euronet (1979). While X.25 was later superseded by other technologies such as frame relay, it provided a base for the rapid development of public networks around the world and avoided the chaos of competing incompatible standards. Another influential standards effort in the late 1970s was the Open Systems Interconnection model created by the International Standards Organization. This defined the functions for seven layers of network services, ranging from low-level hardware connections to high-level applications and user interfaces. Although there was much debate over these standards (Abbate 1999), adopting a common model helped computer scientists and manufacturers move closer to creating fully interoperable network systems.

Public data networks provided the first online access for much of the world’s population. They also sponsored new types of content and services that made data networks relevant to non-technical users.

The development of public data networks reflected an emerging view—by both individual users and the highest levels of government—that access to computer communications was a public good, a resource that would be necessary for full citizenship in the twenty-first century. In serving this mission, public data networks were complemented by a third trend of this period: improvised grassroots networks. These low-cost networks used existing software and simple dial-up connections to exchange mail and discussion lists among an informal community of users. The most well-known were USENET, which was established in 1979 using UNIX protocols, and BITNET, created in 1981 using IBM protocols. These networks played an important role in providing communication to people who had no access to formal networking infrastructure.

Another technical development that helped drive the demand for internetworking was local area networks.

The Internet architecture had two main elements. The first was a set of protocols called TCP/IP, or Transmission Control Protocol and Internet Protocol. The insight behind TCP was that the host protocol could guarantee a reliable connection between hosts even if they were connected by an unreliable network, such as a packet radio or Ethernet system

The second creative element was the use of special computers called gateways as the interface between different networks (Cerf 1979). Gateways are now commonly known as routers; as the name implies, they determine the route that packets should take to get from one network to another. A network would direct non-local packets to a nearby gateway, which would forward the packets to their destination network.

The Internet architecture made it possible to build a worldwide data communications infrastructure, but it did not directly address the question of content. In the 1980s, almost all content on the Internet was plain text. It was relatively difficult for users to locate information they wanted; the user had to know in advance the address of the site hosting the data, since there were no search engines or links between sites. The breakthrough that transformed how Internet content was created, displayed, and found was the World Wide Web.

The World Wide Web was the brainchild of Tim Berners-Lee, a British researcher at CERN, the international physics laboratory in Geneva. He envisioned the Internet as a collaborative space where people could share information of all kinds. In his proposed system, users could create pages of content on computers called web servers, and the web pages could be viewed with a program called a browser.

Perhaps most troubling was the persistent inequality of access to the Internet and its opportunities for economic development, political participation, government transparency, and the growth of local science and technology. Significant gaps remained between rich and poor regions, urban and rural citizens, young and old.