

Chapter 5

Revolutions in the 1980s and 1990s

Key Topics

IBM PC Revolution
Mobile Phone Technology
World Wide Web

5.1 Introduction

The 1980s and 1990s were a time of fundamental change in the computing field. The industry moved from a world dominated by mainframe computers to a brave new world dominated by networks of personal computers. The invention of the World Wide Web was a revolution in computing, and it has altered consumer and business behaviour. The speed of microprocessors improved dramatically during the period, and there were large increases in memory and storage in personal computers. This increase in processing power has transformed computers from machines dedicated to business or scientific use to sophisticated machines that may play music or videos or engage in multimedia communication.

Personal computers were now affordable to ordinary consumers, and this led to a large consumer market for home computers and the application software to run on the computers. It was now feasible to have a personal computer on every employee's desk, and this led to an increase in employee productivity as well as a demand for business applications for personal computers. The early applications included editors such as the 'Brief programming editor' which was popular with computer programmers, the 'Wordstar word processor' application which was a text-based word-processing system which employed a markup language and the Norton Utilities which included a set of tools to analyse the hard disk of a machine and allowed a file that had been accidentally deleted to be recovered.

The Lotus 123 spreadsheet application was developed in the mid-1980s. It is a spreadsheet program and included charting and graphing capabilities, and it was developed by the Lotus Corporation (now part of IBM). However, 123 was later eclipsed by Microsoft Excel.

The Analogue Mobile Phone System (AMPS) was a first-generation mobile phone system standard developed by Bell Labs. It was introduced into North America in the early 1980s and was a paradigm shift in communication. Communication had been traditionally between places, but with mobile phone technology it was now between people. By the late 1980s, mobile phone technology was being introduced worldwide by companies such as Motorola and Ericsson.

The analog mobile phone networks allowed voice communication only, as text messaging and more advanced features only became available in later generations of mobile telephony. The quality of the voice communication was weak compared to today's technology, as it was susceptible to static and noise, and had no protection from eavesdropping using a scanner. It used frequency division multiple access (FDMA) with separate frequencies (or channels) used for each conversation.

The World Wide Web was invented by Tim Berners-Lee at CERN in the early 1990s. It is a major milestone in computing and has altered business and consumer behaviour. It allows business to operate in a globalised world and is an essential part of modern business.

5.2 The Personal PC Revolution

IBM introduced the IBM Personal Computer (or PC) in 1981 as a machine to be used by small businesses and personal users in the home. The IBM strategy at the time was to get into the home computer market that was then dominated by Commodore, Atari and Apple. It was the cheapest computer produced up to then and was priced at \$1,565. It offered 16 kB of memory (expandable to 256 kB), a floppy disk and a monitor. The IBM personal computer became an immediate success and became the industry standard.

The goal was to get the personal computer to the market quickly, and IBM assembled a small team of twelve people led by Don Estridge to achieve this. They designed and developed the IBM PC within 1 year, and as time to market was a key driver, they built the machine with 'off-the-shelf' parts from a number of equipment manufacturers. They had intended using the IBM 801 processor developed at the IBM Research Centre in Yorktown Heights, but decided instead to use the Intel 8088 microprocessor which was inferior to the IBM 801. They chose the PC-DOS operating system from Microsoft rather than developing their own operating system (Fig. 5.1).

The unique IBM elements in the personal computer were limited to the system unit and keyboard. The team decided on an open architecture so that other manufacturers could produce and sell peripheral components and software without purchasing a licence. They published the IBM PC Technical Reference Manual

Fig. 5.1 IBM personal computer (Courtesy of IBM archives)



which included the complete circuit schematics, the IBM ROM BIOS source code and other engineering and programming information.

The open architecture led to a new industry of ‘IBM-compatible’ computers which had all of the essential features of the IBM PC but were cheaper. The terms of the licensing of PC-DOS operating system gave Microsoft the rights to the MS-DOS operating system used on the IBM compatibles and led inexorably to the rise of the Microsoft Corporation. The IBM Personal Computer XT was introduced in 1983. This model had more memory, a dual-sided diskette drive and a high-performance fixed-disk drive. It was followed by the Personal Computer/AT introduced in 1984.

The development of the IBM PC meant that computers were now affordable to ordinary users, and this led to a huge consumer market for personal computers and software. It led to the development of business software such as spreadsheets and accountancy packages, banking packages, programmer developer tools such as compilers and specialised editors, and computer games.

The Apple Macintosh was announced during a famous television commercial aired during the Super Bowl in 1984. It was quite different from the IBM PC in that it included a friendly and intuitive graphical user interface, and the machine was much easier to use than the standard IBM PC. The latter was a command-driven operating system and required the users to be familiar with its commands. The introduction of the Mac GUI was an important milestone in the computing field.

However, the Apple Macintosh was more expensive than the IBM PC, and cost proved to be a decisive factor for consumers when purchasing a personal computer. The IBM PC and the various IBM-compatible computers remained dominant.

The introduction of the personal computer represented a paradigm shift in computing, and it led to a fundamental change in the way in which people worked.

It placed the power of the computer directly in the hands of millions of people. The previous paradigm was that an individual user had limited control over a computer, and the access privileges of the individual users were strictly controlled by the system administrators. The subsequent introduction of the client-server architecture led to the linking of the personal computers (clients) to larger computers (servers). These servers contained large amounts of data that could be shared with the individual client computers.

The IBM strategy in developing the IBM personal computer was deeply flawed and cost the company dearly. IBM had traditionally produced all of the components for its machines, but with its open architecture model, any manufacturer could produce an IBM compatible machine. It outsourced the development of the microprocessor chip to Intel, and this led to Intel eventually becoming the dominant power in the microprocessor industry. The development of the operating system, PC-DOS (PC disk operating system), was outsourced to a small company called Microsoft. This proved to be a major error by IBM as the terms of the deal with Microsoft were favourable to the latter and allowed it to sell its own version of PC-DOS (MS-DOS) to other manufactures as the operating system for IBM compatibles.

5.3 The Mobile Phone Revolution

The origins of the mobile phone revolution dates back to work done on radio technology from the 1940s. Bell Labs had proposed the idea of a cellular system back in 1947, and it was eventually brought to fruition by researchers at Bell Labs and Motorola.

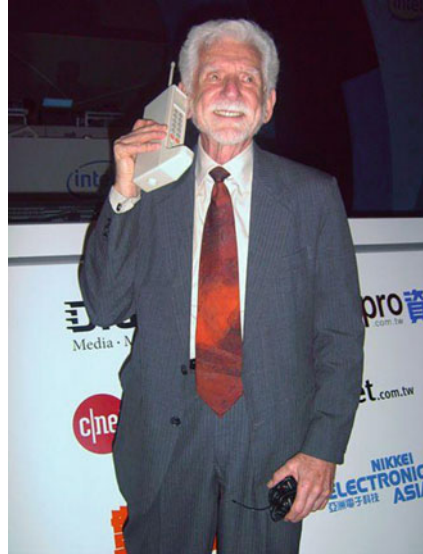
The world's first commercial mobile phone went on sale in 1983. It was the Motorola DynaTAC 8000X and was popularly known as the 'brick' due to its size and shape. It weighed 28 ounces and was 13.5" in length and 3.5" in width; it had a LED display and could store 30 numbers; it had a talk time of 30 min and 8 h of standby. It cost \$3,995 and was too expensive apart from wealthy consumers.

The team at Motorola that developed the DynaTAC8000X was led by Martin Cooper, and he made the first mobile phone call. The DynaTAC today is a collectors' item as most analog networks are now obsolete (Fig. 5.2).

The Analogue Mobile Phone System (AMPS) was a first-generation mobile phone system standard developed by Bell Labs, and it was introduced into North America in the early 1980s. It allowed voice communication only, and the voice communication was susceptible to static and noise and had no protection from eavesdropping using a scanner. It used frequency division multiple access (FDMA), and a separate frequency (or channel) was used for each conversation.

The second generation (2G) of mobile technology was digital, and it was designed to replace the analog technology. It used the Global Systems Mobile (GSM) standard developed by the European Telecommunications Standards Institute (ETSI). It is a cellular network which means that mobile phones connect to it by searching cells in

Fig. 5.2 Martin Cooper re-enacts DynaTAC call (Public domain)



the immediate vicinity. The first GSM call was made by the Finnish prime minister in Finland in 1991, and the first short message service (SMS) or text message was sent in 1992.

One key feature of GSM is its use of the Subscriber Identity Module (SIM) card. This is a detachable smartcard that contains the user's subscription information and phone book. The SIM card may be used on other GSM phones, and this is useful when the user purchases a replacement phone. GSM provides an increased level of security with communication between the subscriber and base station encrypted.

GSM networks continue to evolve, and GPRS (2.5G) became available in 2000. Third-generation mobile UMTS (3G) provides mobile broadband multimedia communication. Mobile phone technology has successfully transformed the earlier paradigm of communication between places to communication between people.

5.4 Birth of the World Wide Web

The invention of the World Wide Web by Tim Berners-Lee in 1990 at CERN in Switzerland is described in Chap. 8. It is a revolutionary milestone in computing, and it has transformed the Internet from mainly academic use to where it is now an integral part of peoples' lives. Users may surf the web, that is hyperlink among the millions of computers in the world and obtain information easily.

Berners-Lee had been working on a key problem facing CERN in the late 1980s. This international centre had a large permanent staff and many visiting scientists, and it was a challenge to keep track of people, computers, documents and databases. Further, it lacked an effective way to share information among

the scientists. Berners-Lee solution to this problem was the invention of the World Wide Web, and so while intended initially as a solution to a particular problem, the invention had global applications.

The major leap that Berners-Lee made was essentially a marriage of the existing technologies of the Internet, hypertext and the mouse into what has become the World Wide Web. He created a system that gives every web page a standard address called the universal resource locator (URL). Each page is accessible via the hypertext transfer protocol (HTTP), and the page is formatted with the hypertext markup language (HTML). Each page is visible using a web browser. Its features include:

The early browsers included Gopher, developed at the University of Minnesota, and Mosaic, developed at the University of Illinois. These were replaced in later years by Netscape which dominated the browser market until Microsoft developed Internet Explorer. Microsoft gave away its browser for free and bundled it in its windows operating system, and thereby led to the dominance of Internet Explorer. The browser wars are discussed in Chap. 7.

The development of the graphical browsers led to the commercialisation of the World Wide Web. Today, there are many browsers available (e.g. Mozilla Firefox, Google Chrome and Safari). Most of these browsers are available free of charge to the user, and users are unlikely to be interested in purchasing a browser given that there are existing high-quality open-source browsers such as Firefox available free of charge.

5.5 Review Questions

1. Discuss the invention of the personal computer and its impacts on society.
2. Discuss the invention of the mobile phone and its impact on society.
3. Discuss the invention of the World Wide Web and its impact on society.

5.6 Summary

The 1980s and 1990s were a time of fundamental change in the computing field. The industry moved from a world dominated by mainframe computers to a world dominated by networks of personal computers. The invention of the World Wide Web was a revolution, and it has transformed consumer and business behaviour leading to a world that is, in effect, a global village. The speed of microprocessors improved dramatically during the period, and there were large increases in memory and storage of personal computers.

The development of the personal computer meant that computers were now affordable to ordinary consumers as well as business. This led to a consumer market for home computers and for software applications to run on these computers.

The introduction of the mobile phone was a paradigm shift from communication between places to that between people. By the late 1980s, mobile phone technology was being introduced worldwide by companies such as Motorola and Ericsson.

The analog mobile phone networks allowed voice communication only. The quality of the voice communication was poor as it was susceptible to static and noise. Further, there was no protection from eavesdropping using a scanner, but these problems were addressed by later generations of mobile phone technology. Text messaging and more advanced features only became available in the later GSM system.