ARTICLE

The other path to the web: the forgotten role of videotex and other early online services

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Abstract

Accounts about the origins of the web generally start with a US Department of Defense project that began in the late 1960s, which subsequently expanded to include universities and research laboratories, then later evolved into a service for the public in the mid-1990s: ARPANET–NSFNET–the internet–world wide web. However, the content that eventually populated the web as well as how the public learned to interact with online content had a long history of development via videotex and other online services. These are largely forgotten, except by a few scholars who have kept the history alive. What was learned in the extensive research about these services is very relevant to the current new media environment. Also, it can inform us at a theoretical level about the diffusion of innovations and at a policy level about the role of government in developing new media services.

Key words

computer conferencing • diffusion of innovations • early web • electronic banking • email • videotex

There is more than one version of the story about how online services emerged. The most widely-told version, which is decidedly US-centric, attributes their germination to the US Department of Defense and a set of projects that it funded, beginning in the late 1960s, that led to the ARPANET (Advanced Research Projects Agency Network) computer network, which evolved into the internet – the infrastructure that allowed the world wide web to emerge. This article focuses on another path of development, which takes place in Europe, Japan and North America and which is not as well known. Although the technological concept underlying it was very different, this other path evolved into the online universe that we inhabit today. It includes developments in videotex, email, computer conferencing, electronic banking and bulletin boards (Aumente, 1987; Hiltz, 1993). The story of this path takes nothing away from the contributions of those who developed the technological underpinnings of the modern day web. The approach in this article highlights many applications which have been largely forgotten, in part because many were not successful, but which contributed in a major way to our understanding of user interfaces, advertising, content, shopping, online games, graphics, communications and the needs and wants of ordinary people – key elements in the array of online services that emerged in the late 1990s and early 2000s. Their history also contains lessons about the diffusion of innovations (Rogers, 1995), the role of government in technology development (Robinson, 1995), and how social context affects media use (Flichy, 1999). For 'netizens' who are even aware of them, the early online services, including videotex, were a largely irrelevant prelude – a collection of rather expensive failures, together with a few rather humdrum successes. One of the aims of this article is to show how incorrect this view is: in fact, these earlier services made extremely important contributions to the subsequent, amazingly rapid take-off of the web. Further, its aim is to help ensure that the history of these services, and the research surrounding their development, are recognized in the more general corpus of research and theory about computer-mediated communication (CMC; Soukop, 2000).

When the netizen community treats the pre-web era, it generally focuses on the development of ARPANET and NSFNET (National Science Foundation Network), online networks funded by the US government and utilized largely by computer scientists. Important as these advances were, they did not include much development of content, graphics, online games, shopping, search, advertising, direct marketing, business models or understanding the needs of non-technologists who have to pay for the online services that they receive. Knowledge in these areas came from another set of online services that had a wider range of users and uses. The end-user services provided over the other networks fell into seven groups:

- database services for businesses that were later offered to consumers;
- computer conferencing;
- email services;
- electronic banking;
- computer bulletin boards;
- online services for education groups and other non-profit organizations; and
- ideotex, which aggregated many different types of services.

In the 1980s and early 1990s, videotex received much more attention than ARPANET in the popular press and academic journals (outside computer science and information technology fields). A search for articles in 27 national and regional newspapers from 1980 to 1992 (in the Proquest database) turned up 493 articles with the key words 'ARPANET, NSFNET or internet' but 1066 with the key word 'videotex'. Adding electronic banking or computer conferencing to the list of key words would have yielded even more lopsided results.

These services are largely forgotten (America Online (AOL) being the exception), overtaken by the enormous success of the web from the mid-1990s onwards. Why not leave them dead and buried? There are a few reasons. These services contributed significantly to the base of knowledge that made the web successful. They contain many lessons about how new media succeed or fail: the lessons of failure are just as important as the lessons of success. Also, they can inform us at a more theoretical level about why new technologies are adopted or rejected and how they interact with existing media habits (Carey and Moss, 1985; Rogers, 1986). Further, these services were researched extensively (Aumente, 1987; Fidler, 1997). The context for their development is informative as well, especially in the case of videotex: government policies to support development for reasons of international prestige and trade (Mosco, 1982); corporate investment for fear of being left out (Noll, 1985); existing technologies in homes to access new services (Arlen, nd); and the skill levels of the general public in using new media (Reeves and Nass, 1996).

This article turns now to a selective review of field trials and services of early online media, and some of the lessons that they provided for later web applications and new media development generally.

PRESTEL AND MINITEL

The development of videotex began in the UK during the late 1960s, initiated by the British Post Office, which at the time provided both postal and telephone services. The concept was first called 'Viewdata' and was intended to provide homes and businesses with on-demand access to a centralized database. The architecture for the service was designed by Sam

Fedida, who many consider to be the father of online services for the general public. As the term Viewdata implies, it was intended to provide access to a broad range of information presented as numbered pages of alphanumeric characters and very simple graphics. Pages were to be requested and received via the dial-up telephone network, using a purpose-designed terminal. Since the latter was very expensive, it was soon superseded: a device was developed for purchase or lease by residential users, enabling them to access the service over a regular telephone line and display the information on a regular television set. Communication was not part of the original planning, although the early service allowed the user to transmit a simple pre-formatted message along the lines of: 'I am running late. Expect me at [fill in time].'

Viewdata was tested in three cities during 1978, then under the commercial name Prestel was launched in London during autumn 1979 under the direction of Alex Reid. It was developed as a common carrier, in the sense that anyone could provide information via the service. Those who did, paid for their information products to be stored on Prestel's central computer system; subject to a few limits, they could set their own price for any of their pages of information retrieved by a user and were credited with revenue from users' page charges minus a percentage retained by Prestel.

Prestel faced many difficulties. The terminal was expensive for households (£8 to £10 per month to rent) and while the transmission speed was fast for the time, it still took several seconds for one page to 'paint' on the TV screen. Pricing was complex and expensive, with separate fees to buy or rent the terminal, make a phone call to the Prestel computer (sometimes, a long-distance call), a per-hour usage charge and a per-page charge (set by the information provider) which varied by provider and type of information. In addition, Prestel tied up two key services: the telephone and the television. It was intended as a service for homes and businesses. Given the obstacles just noted, early usage was overwhelmingly by business (approximately 90% of usage) in the early 1980s. By the mid-1980s, the ratio of businesses to consumer usage was 60:40.

Early research identified a number of the challenges facing Prestel. Users wanted flat-rate pricing; they would not tolerate a long-distance call to reach the Prestel computer; the top 10 information providers received more than half of all page views; tree-and-branch navigation (where you choose items from a first-level menu, then view a second and possibly a third or fourth menu before getting to the desired page) was problematic for many users; and people wanted to communicate with others through Prestel (Reid, 1980).

Prestel responded to the challenges, but it took time. They added email, created software so that users with a personal computer (PC) could access the service, introduced flat-rate pricing for consumers, added home banking, shopping and more entertainment services, developed directories and indexes

to help with navigation, provided a gateway for users to other online databases (a forerunner of the web), introduced a private Prestel service for the internal use of companies (much like today's intranets) and initiated a range of education services (Hooper, 1985). By the mid-1980s, there were more than 1000 'information providers' – a term that began with Prestel and was later changed to 'service providers' as new kinds of service were added. They also placed more emphasis on marketing to businesses, where they now believed there was greater opportunity. Although a few services were successful, notably a service for smaller travel agents who could use the Prestel service to book tickets for clients, overall usage did not grow as fast as British Telecom (the successor to the British Post Office in relation to telecommunications, hence the owner of Prestel) had hoped, and the service was phased out.

Prestel provided many lessons for other videotex services that followed and the development of web services. Not all of these lessons were widely applied. It was clear that consumers would not buy or rent a terminal that could access only videotex; clearly, a PC was preferable. People wanted to communicate and have fun more than they wanted access to large amounts of serious information (Dutton, 1985). Much work was needed to improve navigation and a flat-rate subscription to a service was much more attractive than per-use charges (Sutherland, 1980). Prestel did inspire others to test videotex. More than a dozen countries used Prestel technology to conduct their own trials, notably the Bildschirmtext service in Germany.

Videotex developments in the UK did not go unnoticed in France. The French were in the process of upgrading their telephone network and needed applications that would boost its use. They were burdened also by an inefficient paper telephone directory and sought an alternative. The hope of creating a technology that could be sold to other countries and reshape the French image in the telecommunication technology community provided further motive to develop a videotex service. The French rolled out their Minitel videotex service in 1983. It utilized a small, stand-alone terminal with a 9" black-and-white screen, which had the advantage of not requiring use of the television set (the proper name of the service was 'Télétel', but it soon came to be known as 'Minitel', which was actually the name of its terminal).

The French government decided to subsidize millions of terminals, distributing the $167 device free of charge to households that agreed to give up the paper telephone directory. With free terminals, the government believed it could overcome the resistance to videotex which had been encountered elsewhere (Mosco, 1982). The online telephone directory was free; other services cost approximately $10 per hour. By early 1990, 5 million free terminals had been distributed to French homes. Businesses could rent terminals, and many did. The ratio of home terminals to business terminals

was 2:1 in the early 1990s (very much higher than in the UK). Many reports about the French Minitel service declared it a huge success, in large part as a result of the high penetration of terminals in homes and the large number of services offered (several thousand by the early 1990s). However, other observers were uncertain about its success, claiming that there was never a clear public accounting of total investment costs, operating costs and profits (Noll, 1985). Usage of the service was generally low, fewer than 3 minutes per day in the early 1990s, although this did grow over time. As is typical of many services, usage was concentrated: 10 percent of terminals accounted for 50 percent of usage. The government said that the savings on printed directories more than paid for the subsidized terminals, but paper directories were not eliminated. People could choose Minitel or a paper directory, so the only savings were in printing and distributing the paper directories which otherwise would have gone to Minitel homes.

Minitel usage mirrored that of Prestel in many ways. Communication services and professional applications were popular. There was a wide range of additional services, including news, banking, mail order and travel booking. One of the most popular services was 'messageries roses', a chat area for sexual role-playing. By the late 1990s, usage of Minitel began to decline, as many users migrated to the web. Minitel clearly proved that government subsidies could drive terminals into homes and promote usage; the electronic telephone directory was an anchor service. However, the model was not directly replicated in other countries. The US government subsidized ARPANET and NSFNET, but not through a free terminal program and not for the general public. Some have compared Minitel to the supersonic Concorde: an impressive technology that was widely admired, but one which required heavy government subsidies.

In the USA and other countries, there was much interest in Prestel and Minitel; delegates from corporations and government agencies visited the UK and France on a regular basis to observe and learn. Later, this article will treat a series of videotex trials and services in the USA that were built in part on the European models, but first it will turn to two online services that preceded videotex.

DATABASE SERVICES AND COMPUTER CONFERENCING

Online databases can be traced back to the early 1960s (Williams, 1985). They were made possible by the time-sharing of mainframe computers, greater storage capacity and telecommunications networks, which could provide economical connections between terminals in distant locations and a computer that stored a database. Most of the early terminals were adapted from devices that were designed for other purposes, for example time-sharing terminals, communicating wordprocessors and teletypewriters. Later, the PC became the

terminal of choice for accessing online databases. The earliest databases stored scientific information, as well as journal articles and bibliographic information in science and medicine. Online databases expanded to include law cases, journal and newspaper articles, stock quotes and airline guides, among many other types of information (Dunn, 1985). They mirrored modern-day web information services in some ways, but differed in the means to access them and the way in which the data were presented. Access was often through complex logical combinations of search terms (Boolean searches) and the information was presented typically as a series of records. Because of this complexity and high cost (typically $100 per hour), database searches were done by librarians at corporations or universities, and by other information specialists who understood search processes and could minimize time on the computer. Over time, the search process was simplified and many non-specialists were able to conduct searches.

By the mid-1980s, there were more than 2500 databases provided by more than 1300 organizations (Aumente, 1987). There were more than 1 million users, mostly in businesses, universities and government organizations. In the 1980s, a number of database operators decided to offer their service to consumers and small business by linking them to mainstream videotex services. They correctly anticipated consumer interest in searching for an old newspaper article, a current stock quote or the schedules of airlines flying from one major city to another, which are common web information services today. However, they misjudged what consumers were able and willing to pay. In their minds, if businesses were willing to pay $100 per hour to access this information, surely consumers would view $12 per hour for access in the evening (when the databases were not being accessed by businesses) as a bargain? However, there was little consumer interest at this price level. Nonetheless, online databases in this era created the initial designs for information services that would appear later on the web (Aumente, 1987).

The development of computer conferencing was concentrated in the USA. Although the term has fallen out of favor (some prefer the more generic term 'CMC'), its constituent services are very much present on today's web in the form of email, forums, person-to-person and group chat, blogs, newsletters and shared documents. Some of the names were different in the early days of computer conferencing, for example, today's chat was called 'synchronous conferencing', weblogs (blogs) were called 'electronic journals' (although some of the latter were more formal than today's blogs) and shared documents were called 'notebooks', but the content was quite similar. Computer conferencing grew out of work by the Office of Emergency Preparedness in the late 1960s (Vallee, 1984). It then developed along a few paths, including systems for research communities run on ARPANET, proprietary systems for businesses and university-based systems run on

commercial time-share networks, and computer conferencing built into videotex services such as The Source (Johansen, 1984).

Early computer conferencing systems included Forum (which evolved into Planet), developed by the Institute for the Future; Confer, developed at the University of Michigan; Electronic Information Exchange Service, developed at the New Jersey Institute of Technology; and Participate, a service on The Source videotex service. The core concept was to use computers for communication (Johansen et al., 1979). We take this for granted today but it was by no means obvious in the early 1970s, when computer conferencing emerged. Some simply did not see a connection between computers and communication.

Computer conferences were used by academics, members of research organizations, business people and government workers. Later users included professionals such as nurses, students and some consumers. They were used for coordinating work, person-to-person email, exchanging information on topics and distance learning (Hiltz, 1993). Today's online web courses evolved, in part, from distance education services utilizing computer conferencing.

There has been a great deal of research published about computer conferencing, much of it relevant to the development of web services. Researchers found that many people read the content in computer conferences but rarely or never posted any messages: they were called 'lurkers'. Email was very popular and almost addictive for some. A number of the computer conferencing systems allowed users to create anonymous pen names to hide their identity and, for some, to develop an alter ego, a feature that has become so important on the web. Computer conferencing allowed people to mobilize quickly and take political action. In one famous incident, computer conferences were used to organize a protest movement against Lotus Marketplace after it announced plans to launch a 'clipper chip' that contained the names, addresses and spending habits of 120 million Americans (Gurak, 1998), foreshadowing the political role of blogs and forums on the web.

Early obstacles to computer conferencing included high cost (e.g. the Electronic Information Exchange Service cost $75 per month plus per-hour connection fees) and the lack of terminals in many businesses, schools and homes. Prices were reduced over time and the PC became the ubiquitous terminal of choice. Computer conferencing produced a number of spin-offs such as stand-alone email services and bulletin board systems (BBS; Hafner, 2001). It continued to evolve and is now woven into the fabric of many web services.

ASCII and graphical videotex services in the USA
The term 'videotex' generally referred to services transmitted over a telephone line, providing a broad variety of services and intended for multiple

groups of users, including consumers. There are many ways to classify videotex services. We will divide them into two groups: American Standard Code for Information Interchange (ASCII) videotex services, which used simple text with no graphics and were generally monochrome; and graphical videotex services, which had both color and graphics. The latter presented information in screen-size pages, using tree-and-branch menu systems for navigation. The former generally presented information as blocks of text of variable length through which the user had to scroll; navigation, which did not employ a tree-and-branch system, was reasonably efficient for the technically experienced but not user-friendly for others.

The most well known ASCII videotex services were CompuServe and The Source. CompuServe began as a time-sharing service for businesses on mainframe computers in 1969. Usage was primarily during the day. In 1979, CompuServe launched a videotex service to generate usage of the mainframes in the evening for approximately $10 per hour. The company offered the service in the daytime but at a much higher price (more than $20 per hour). The service consisted of news, games, email service, forums and chat. It also contained a dating service and an auction component. Early users were a mix of business and household users, and overwhelmingly male. The primary service was email.

The Source was launched in 1979. It was similar in design, applications and user groups to CompuServe. The Source introduced private networks within the service, similar to today's intranets, allowed people to sell items and provided key word searches. Among its popular forums was 'Dial a Date', which was similar to later dating services on the web. It was purchased by Reader's Digest in 1980, then acquired by a private venture capital group in the mid-1980s, by which time it had 60,000 subscribers. CompuServe acquired The Source in 1989 and absorbed its user base. By 1990, the combined service had nearly 600,000 subscribers. In the mid-1990s, CompuServe was one of three major videotex operators (AOL and Prodigy being the others) that opened up its service to the web. The early obstacles to rapid growth for both CompuServe and The Source were price, transmission speed and scarcity of terminals in homes.

Viewtron and Gateway were two prominent graphical videotex services in the early and mid-1980s. They were similar in the technologies they used, services and outcomes. Viewtron was a partnership between AT&T, which provided the technology, and Knight Ridder newspapers, which managed the service and provided much of the content. There were also dozens of information providers. It began as a small trial in Coral Cables, FL and then was launched as a service for the public in southern Florida in autumn 1983; eventually, Viewtron was made available on a national basis. When first launched, it employed the 'Sceptre' terminal, developed specifically for

Viewtron by AT&T to access the service; content was displayed on television sets. The terminal cost $900 but the price was quickly reduced to $600, below AT&T's cost to manufacture it; alternatively, subscribers could rent the terminal. The service was relatively fast for that time (1200 bps) and could display good graphics. As with Prestel, the service tied up both a telephone line and a TV set. Moreover, high-end graphics slowed down the service significantly. Viewtron offered a robust range of services including news, banking, travel, games, email, chat and forums. In the Gateway service, AT&T partnered with Times Mirror, another newspaper company, to offer a videotex service in southern California, which was launched in 1984.

Both services became laboratories for advertising. They contained banner adverts and advertising 'sites' a decade before the world wide web. They also struggled with the technological limitations of slow modems – elaborate graphics took a long time to transmit – and began the process of graphical optimization, where complex graphics are reduced to simpler forms and smaller files (Nisenholtz, 1982).

Viewtron encountered strong resistance to buying or renting a terminal that had only one function: to access its videotex service. At that time, PCs were beginning to enter large numbers of households, so the project team scrambled and created software that allowed PCs to access Viewtron; they also reduced prices to subscribers and introduced a flat rate. This helped to increase the subscriber base, but it was not enough to sustain the service. Their research revealed that consumers were more interested in communication than information – email and chat were the most heavily used services, as already had proved to be the case in Europe. There were some tantalizing clues in the Viewtron research about what would work in a future web environment. For example, an eBay style auction, 'Bidquick', was surprisingly popular and a Viewtron advert slogan in 1985 captured what would become a core appeal of the web: 'What you want, when you want it' (quoted in Fidler, 1997). By 1986, Viewtron had cost the two partners more than $50 million and they decided to shut it down. Gateway followed a very similar path, and was shut down in the same month as Viewtron.

Viewtron and Gateway demonstrated the importance of using the PC as a terminal to access videotex and the value of communication in online services. Both projects began with an electronic newspaper supplemented by other services and finished with a communication and games service that included news and shopping. They also made significant advances in online advertising by mixing content and banner advertising on the same screen, a model we take for granted on today's web.

The Prodigy videotex service began as a trial in 1982. CBS Publishing and AT&T formed a partnership, Venture One, to test videotex technology, services, user behavior and business models (Smith, 1985). The trial, in

Ridgewood, NJ, explicitly tested stand-alone terminals against PCs and found that PCs were the more viable alternative. The trial service, Reach, was not an electronic newspaper, but an entertainment, communication, transaction and information service. In the closed trial environment, the team was able to experiment with many approaches without press or industry scrutiny. Reach introduced a number of innovations:

- services for young children;
- fast-track access to services (the equivalent of today's internet 'favorites');
- information personalized for each user;
- information about 'best prices';
- local community information; and
- opinion polls.

They also learned the importance of a 'helpline' for subscribers. Following the trial, AT&T dropped out and CBS formed a partnership with IBM and Sears Roebuck. The partnership took four years to plan and, in 1988, to launch Prodigy. In the interim, CBS shifted its corporate strategy and dropped out. Harry Smith managed the venture. His name is not well known in the various histories of online services, but his business model for Prodigy later would become the core model for the web as we know it: i.e. a service with low, flat-rate pricing supplemented by advertising and transaction revenue. Prodigy was created as a consumer service for households with a PC. If a household did not have a modem to connect the PC to the service, Prodigy would include it in a low-priced start-up kit.

Prodigy reintroduced many of the innovations that were identified in their New Jersey trial, such as banner adverts and customized information (e.g. a personalized stock portfolio). It expanded the search facility to include key word search, paths (favorites) and jump (allowing a user to move quickly to another part of the service). Prodigy had a friendly graphical user interface in 1988 and used caching (downloading and storing graphics on the user's PC) to reduce access time to pages. The team also developed local access nodes, so a user could reach Prodigy with a local phone call from most major markets; it also pioneered broadband, with 1.3 million digital subscriber Line (DSL) subscribers by 2000. In 1993, Prodigy opened an email gateway to the internet and in 1995, it created its own web browser, becoming the first of the large videotex services to offer web access.

Prodigy has received very little credit for these innovations. Although it reached a few million subscribers at its peak, it was far outpaced by its rival, AOL, and it could not turn a profit. The business model was correct for the long term, but inadequate for the short term. Advertising revenue grew too slowly and merchandisers came on board the service at a tepid pace. Prodigy

also developed a large staff to create information, driving up operating costs. The company was sold and resold, and eventually absorbed by telecommunications giant SBC (now AT&T).

AOL came late to the videotex arena, and was by some standards unremarkable compared to rivals such as Prodigy. Yet it left its competitors in the dust and at one point had more than 30 million subscribers worldwide. In the mid-2000s, AOL lost considerable ground as subscribers migrated to broadband internet service providers, but it was a remarkable success story through the early 2000s.

AOL was started in 1985 under the name Quantum Computer Services. It provided online games and BBS for PCs. In 1989, it changed its name to America Online. Two years later, the same year in which Steve Case became chief executive officer, it launched a videotex service. Case came from a marketing background and this strongly influenced the development of America Online. Just as millions of 'non-techies' were buying PCs, the company positioned itself as a service for people who were unfamiliar with computers. It was simple to use and had content categories that appealed to the mass public. The emphasis was on communication services, not information. It provided an email service for the masses. Early pricing was a flat $9.95 per month for up to five hours of usage and $2.95 per hour thereafter.

AOL employed a simple but effective marketing strategy: it mailed out tens of millions of diskettes with the software needed to access the service and a free trial offer. To manage costs, it used volunteers to monitor forums, chatrooms and conferences. It expanded the service over time through dozens of acquisitions, both technology and content acquisitions. When the web came along, AOL hesitated at first to make it available to its subscribers, but soon opened the doors to the websites that it selected (a 'walled garden' approach) and then to the entire web. It also changed its pricing to a flat $19.95 per month for unlimited access. By 1996, AOL had 5 million subscribers in the USA. It was both a proprietary videotex service, with content and services that it controlled, and the largest internet service provider in the USA. It expanded internationally and acquired millions of subscribers. In 1998, AOL purchased CompuServe and absorbed its subscriber base. Then, at the height of the internet bubble, the company used its enormous market capitalization to purchase one of the largest communication companies in the world: Time Warner. The merger was not advantageous for either company, but the history of AOL/Time Warner in the first decade of the century is another, much longer story.

Email and electronic banking
Email and electronic banking were core components in many of the general videotex services, but they were also stand-alone, proprietary services. That is,

a person could subscribe to a service that focused primarily or exclusively on email or electronic banking.

There is some dispute about the origins of email. It really had no single inventor. Some historians argue that the first electronic mail system was the automatic telegraph, developed by Wheatstone in England (circa 1855) and Edison in the USA (circa 1874). In 1931, AT&T introduced teletype machines in which typed messages could be sent over telephone wires and printed at the receiving end. The first electronic mail system using a computer was probably the MIT mailbox, developed in 1965 by Noel Morris and Tom Van Vleck. The motivation to create electronic mail was to enable users of mainframe computers to communicate with the system operator. This expanded to include other users of the mainframe, people using a mainframe at another location, and eventually everyone who had access to a computer. By the early 1970s, there was already a literature about electronic mail (Day, 1972).

Email developed over multi-application computer networks, videotex systems and stand–alone email services that concern us here. As opposed to public email services, to which anyone could subscribe and use to communicate with any other subscriber to that service, stand–alone corporate email services were offered primarily by businesses for use by their employees in communicating with one another. By 1983, there were more than 70 commercial email providers in North America and many more corporate email systems. The commercial providers had nearly 500,000 accounts; an estimated 750,000 office workers were using email.

Some of the larger public email services included Western Union Easy Link, ITT Dialcom, MCI Mail and Sprint Telemail. The average email message cost approximately 25 cents to send, nearly the same as a first class letter. By the end of the 1980s, there were just under 2 million users of public email services in the USA and more than 6 million office workers using email.

One of the early limitations of email services was that they did not interconnect with each other. So, an MCI Mail subscriber could not communicate with a Sprint Telemail user. By the late 1980s, they began to interconnect with each other as well as with videotex services and NSFNET. There were also many etiquette and social convention issues that needed to be worked out over time: for example, some users 'flamed', that is, sent an angry email response to a message they misinterpreted. Research about email indicated that it substituted for some voice messages (there was little substitution for first–class mail) but its larger impact was to increase the amount of communication in organizations or among users. Junk emails were not as prevalent as today, but some spam was being sent over email services by the early 1980s. Eventually, public email services declined as people moved over to the internet; corporate email services became domains on the web.

Electronic banking trials began in the late 1970s in both the UK and the USA (Prestel had limited home banking). Some banks chose to join one of the general videotex services; others set up their own proprietary home banking services. With low penetration of PCs, banks tried two other options. One was to display banking information sent over a telephone line on a TV set. This was not successful because of a perceived lack of security and privacy. The second option was a 'screen phone' which could send and receive data, displaying it on a four-inch screen built into the telephone. It was not widely adopted. Banks had to wait for households to adopt PCs and home banking grew slowly.

Banks believed that electronic banking had many advantages. For example, they thought that people would place a high value on controlling the 'float' in an electronic payment (i.e. the ability to specify when to pay the bill, thereby getting interest on the money up until the last moment before it was transferred). Most people did not care; others found out that the money did not transfer precisely when they requested, so they had to allow a few days' buffer between request and actual transfer, reducing the value of minimizing the float. Banks also thought that people would welcome the elimination of checks and saving on postage, but many customers liked checks or were too set in their ways to change. However, simple tasks such as checking an account balance or transferring funds between accounts had a high appeal.

Besides the low penetration of PCs into households, there were a number of other obstacles to rapid growth. One was the popularity of audiotex banking in the 1980s. Many banks set up automated systems to allow people to inquire about their balance, or transfer funds between accounts over the telephone. Millions of customers used audiotex banking and felt that this was sufficient for their needs. Another obstacle was gender. In the 1980s and early 1990s, 90 percent of those online were male, but in most US homes, women managed the bill-paying and household finances. However, the most important obstacle was price. Banks believed that electronic banking could become a profit center, so they charged a service fee of $10 to $15 per month for their service. However, the households that were most likely to become early adopters of home banking were generally wealthy, had significant assets in their banking accounts and did not pay anything for bank services. Why should they pay for electronic banking when it was actually saving the bank money by requiring fewer people to provide service to customers?

The uptake of proprietary electronic banking services grew only modestly through the mid-1990s. At that point, Citibank dropped its fee for home banking and others followed. The pace of adoption picked up significantly: by 1998, more than 7 million households were doing some form of banking online. The lessons from the proprietary electronic banking services were clear. People wanted security, simplicity, convenience, control of their accounts and strong customer service – all at no cost. Banks could earn profits from online

services, but they would have to do so by reducing labor costs in back offices, selling new services and charging transaction fees.

Non-profit online services and bulletin board systems

Throughout the early years of online media, non-profit organizations played a prominent role in developing content and communication services. They employed a range of systems to deliver these services, including mainframe or minicomputers owned by the organization, existing videotex services and small BBS on PCs. Many applications were education-related but they also provided access to public records, help in learning how to use computers, specialized content such as health information and community forums.

Online services from non-profit organizations demonstrated that many groups previously lacking access to online media could benefit from them. They also expanded the range of applications that people wanted, for example access to government records, and provided important clues for the development of future web services, for example services that fostered communities of interest. There was a high turnover of these applications. Some were started with funding from an outside source and could not secure continuing funding after the initial grant period; others obtained continuing funding from government, a university or end-users. Some aimed too high technologically and raised the financial hurdle to sustainability, once end-users had to pay for the service.

BBS were the poor people's computer conferencing. In most cases, they involved a single PC equipped with special software and a modem. The PC's owner kept it on 24 hours a day and let others dial in to post and read messages. Most were free, although some charged $5 to $10 per month. Typically, they were dedicated to a single topic and related sub-topics. Many were devoted to discussion about a brand of computer but the range of topics was very wide, including religion, hobbies, sports, pornography and education. Most were operated by an individual but many schools, social organizations and some businesses also operated BBS. BBS were a craze in the late 1980s and early 1990s, much like the Citizens' Band Radio craze a decade earlier. In the late 1980s, there were at least 5000 BBS operating in the USA (*The BBS Bible*, 1989); they were also popular in Australia and the UK. By the early 1990s, some estimates of BBS put their number in the USA as high as 40,000, with millions of users. Most BBS users were computer hobbyists or people who had a strong interest in a topic. They showed the same types of behavior as people participating in the more high-end computer conferences. Many read but did not post (lurkers) and some were passionate, almost addicted, to the process of posting and reading. Most BBS allowed users to create 'handles' and post anonymously, which encouraged some uninhibited (and on occasions unwanted) behavior.

There were a number of limitations to BBSs. A user had to dial the BBS directly, which in some cases involved a long-distance call. The operator of a BBS had to tie up a PC and a telephone line. BBSs were not interconnected and generally there was no private email among users of a BBS. Popular BBSs might have a few thousand users, making it difficult to get through, especially in the evening. When successful, a BBS fostered a community among its users, much like modern social networking sites on the web, and demonstrated the importance of social context in the development of successful new media services (Flichy, 1999). Much of the content on BBS foreshadowed the contemporary blog.

DISCUSSION AND CONCLUSION

By the mid-1990s, the internet community of academics, students and some corporations began to merge on the world wide web with the videotex community of consumers and businesses. Many trends were favorable. There were more PCs in households, more people had learned to use computers at school or work, and there were more clues about what ordinary people wanted from online services. There is much revisionist history about this period. In some accounts, Bill Gates and Microsoft are said to have been enthusiastic early supporters of the web, but in fact they were early cynics who came late to the party (Auletta, 1997). Telephone companies also claimed later that they saw the future of online services and embraced them, but during this period, telephone companies were more interested in interactive television than the web. Indeed, many local telephone companies viewed the growth in the number of home users and the average length of online sessions as a threat, since such usage placed a heavy demand on local telephone switches and provided very little revenue (Sewell, 1997).

In the widely accepted histories of online services, the web is viewed as a huge success and earlier online services are considered failures. The reality is not so simple. Some earlier online services were successful commercially, for example AOL for consumers and Lexis/Nexis for businesses; some were successful in providing services that users wanted during the interim before the web emerged, for example BBS; and some achieved important service goals with the help of government or foundation subsidies, for example Minitel in France and SeniorNet (Furlong, 1989) in the USA. The web was never a service; it was a platform for services, some of which were successful and some not. Nonetheless, it was the web, not proprietary videotex systems, that became the platform for a widely-used, worldwide array of online services.

Some of the advantages of the web are clear in hindsight. It had an open architecture which allowed anyone to offer services, and a common protocol that allowed information to flow across computer networks. No one owned

the web, so there was no gatekeeper who could restrict what was offered. The web itself was free. People paid an access provider to link them to it; service providers on the web could charge for content if they wished. The web also benefited from very favorable tax treatment in the USA, intended to help the growth of the internet sector of the economy, and decidedly optimistic scenarios that it would herald a new information age to benefit all (Robinson, 1995).

Earlier online services had some of these features but not others. Ownership of a proprietary online system was a key distinction for many of the earlier videotex services. The company or partnership of companies (in the USA, often a telephone company and an information company such as a newspaper) hoped to become the owner of a network that would move to a position of dominance for online services. Arguments were put forward on the basis of the 'network effect': that sooner or later videotex would become a mass market service to the home. The group that controlled a national delivery network, broadly accepted by consumers and businesses, would be in a strong position to attract and control other service providers which would want to use the network. The problem with this strategy was that in some cases, it led to restrictions on who could offer a service in a given area (e.g. only one bank) and reduced the depth of the offer to the public. Also, rivals were motivated to start competitive online services, often with different standards, rather than to join a consortium which could exploit synergy among service providers.

In addition to correcting the historical record, knowledge of the early history of online services can inform our understanding of critical mass – the growth in users and usage of a service to the point where growth becomes self-sustaining (Rogers, 1995) – and the crucial part played by the US government in connection with this. The operators of early videotex services were in a totally different position from their subsequent web counterparts. ARPANET and NSFNET were heavily subsidized by the federal government, which sustained them for more than 20 years. In the absence of such a subsidy or a pre-existing base of users, the challenge of building up to a critical mass was significant for videotex. In some cases, videotex operators appear to have worked out what was really needed to develop a critical mass (emphasis on communication services, use of the PC as the terminal, etc.), but the knowledge came too late: their parent companies or investors were unwilling to invest more.

The web, by contrast, did not need to create a critical mass from the ground up. Because of videotex and the internet, it was already in place: services had been developed by videotex groups such as AOL and Prodigy, and it was relatively easy for their service providers to expand onto or migrate over to the web. Most importantly, since communication would

become the core driving force on the web, there was a critical mass of people who were communicating online already and could expand their network now through the internet – a network of networks. This attracted new users and, in time, more content and service providers.

By the late 1980s, there was a considerable amount of research about what worked and what did not work in early online services, across a number of countries (Dutton and Blumler, 1989), and what infrastructure was needed in homes (principally, a PC and modem) for successful adoption (Steinfeld et al., 1989). Much of this research was available in academic journals and business publications (Aumente, 1987; Arlen, nd; Rice, 1984; Tydeman et al., 1982), so even although the field was expanding rapidly, drawing in many who were new to it, there was no need to repeat earlier mistakes and every reason to take advantage of the positive lessons that had been learned (Noll, 1997). Unfortunately, many did not read the research; some thought that any knowledge from earlier online services was irrelevant in the new environment; for others, a collective amnesia took hold. Many mistakes were repeated and many opportunities lost. Much of what had been learned from previous experiences was passed down through people who worked on earlier applications and later moved on to new projects. Those lessons are as valuable today as they were when online services were new.

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