Modernizing Text and Data Networks in the Early 1980s

Ossi Väänänen and Olli Mertanen

Turku University of Applied Sciences, Turku, Finland
`ossi.vaananen@turkuamk.fi,`
`olli.mertanen@turkuamk.fi`

Abstract. During the decades before the beginning of 1980s, there were just a few ways to transmit messages in electrical format. As personal computers were not available on everyone's desk and minicomputers were not meant for everyday working tasks, document creation was mostly manual. In early 1980s, people started to realize for the first time that the society around them had changed due to the increasing amount of computers and communication facilities. In this paper, some views have been presented from the perspective of young engineers at that time concerning the fast change in text and data networking that took place in the 1980s. The value of the paper is mostly in writing down these views and memories with some source reference material.

Keywords: Data communication, Telex, Network coverage.

1 Introduction

During the decades before the beginning of 1980s, there were just a few ways to transmit messages in electrical format. As personal computers were not available on everyone's desk and minicomputers were not meant for everyday working tasks, document creation was mostly manual work involving pen and paper tools very much. Handwritten texts were brought to the text handling centers for typing and messages to telecommunication centers for communication [16].

The foundation for telecommunication was on the Public Switched Telephone Network (PSTN) and similar networks for text transmission such as telex. New systems like teletex and fax-transmission and very first data networks used the same kind of circuit switched network technology as PSTN. There was a strong tendency to develop the computing and communication facilities and find more effective and cost saving systems to provide increasing productivity and profitability to industrial companies. The increasingly fast development of microelectronics and the extensive industrial growth in business created great pressure for renewing the ways to process larger amounts of data in computers and to communicate effectively between companies, authorities, and individual private persons.

The authors of this article were working in pioneering data communication and computer companies like Philips and Ericsson in the early 1980s. As information flow was manageable in those days, it was somewhat easy to follow the cutting edge of technological innovation and reach a substantial awareness of the current technological

structures. Computer and communication branch was easily at hand and you could make acquaintance with nearly everybody who was holding remarkable positions in at least local market place.

M.Sc. Ossi Väänänen is currently a research project manager and senior lecturer in Turku University of Applied Sciences. He is preparing his dissertation work on wireless learning environments. Dr. Tech. Olli Mertanen is currently working as vice rector in Turku University of Applied Sciences and is among the main drivers in many implementations of current and past day technologies.

2   Background

At the end of the 1960s and during the 1970s most of the communication happened in analogue networks; computers were just taking first steps towards mass handling of data and communication with each other. Anyway, there were remarkable developments done in communication environments as the coverage of PSTN and telex for text messaging were quite extensive in developed countries like Finland [8].

The usage of transistors and other electronic microcircuits was increasing in the 1960s but took more speed in the 1970s towards the 1980s. The fast development of microelectronics gave an irreplaceable present to the rest of the computer and communication industry; microprocessors. With the processors, the development of distributed multiprocessor systems started, and nothing could hinder the designing of complicated computer and communication systems. Microprocessors paved also the way towards personal computing [12].

3   The Technology of the Text Messaging

Most of the first text messaging networks were PSTN like transmission networks. The communicating parties were tied together either by having a permanent line or by switched circuit between them. Permanent circuitry was expensive and they only used them by large authority organizations or big industrial companies, but the switched network technology made the communication cheaper and available to all relevant business customers.

Telex network was a fruit of old traditional type of telecom infrastructure, fulfilling the basic text communication needs, though. Telex addressing was based on the telephone number type of addresses to customers individually. Despite of the limiting character set they offered an officially accepted trustworthy way to transmit short messages between organizations.

The transmission endpoints were distant typewriters communicating with each other on the separate network. In the early 1980s, these teletype writers using paper tape punchers and readers were already quite old-fashioned tools. The new versions of the machines had gradually started to get small displays, memory facilities, and floppy disk stations thanks to first microprocessors. They coded the small character set with 5 bits allowing about sixty different characters, which was a limiting experience even at that time. Furthermore, a relatively large amount of personnel was part of telex centers to type and print out telex messages manually. In larger organizations

there were several (even twenty to thirty) separate telex lines and machines to take care of the increasing communication need. In 1985, there was still something like 1.5 million telex terminals world wide of which around 7000 were in Finland [15].

Personal data communication was in its infancy. They used PSTN for some individual needs with analogue modems providing slow communication links to central office computer centers and banking services. Both personal computers and the slow communication lines were extremely expensive to use at usual homes.

4   The Technology of the Data Networking

The data networking first began with some add-on technologies applied on the top of the PSTN network. Modems were particularly popular providing first slow communication links between central computers. On the other hand, they used the modem lines as part of the computerized system architectures like IBM´s SNA and Digital's Decnet. Data terminal concentrators connected remotely to mainframe computers via the modem lines.

The first attempts to communicate electronically between organizations began. Organizations had an urgent need to exchange bigger amounts of data between them and they searched with compulsion for automated methods to accomplish this task. The transferable data was punched to a paper tape at the sending computer centre and then transmitted via the telex network. The receiving data centre punched the resulting paper tape with a telex machine and inserted then the data to their computer. Thus, telex was probably the first solution for Electronic Data Exchange between organizations [1]. Of course, for years they had to use additional manual methods in the form of punched cards and card readers and manual posting of the tapes to the other end.

In the Nordic countries, they launched the first common Nordic Data Network at the beginning of 1980s and in 1981 in Finland. The network consisted of a circuit switched (datex) and packet switched (datapak) data communication service. Telecom operators were independently running the network and it was seen as a datacom "cloud" by the customers. For the first time the customers did not know how things worked inside the cloud. Terminal connected to channel unit or concentrator and reached the central computer by using multiplexed communication channels. On the edge, the user terminals had a standardized network interface and they used network terminals to connect them physically.

This was one of the first times to enjoy the fruits of standardization in data communication. However, it caused the customers some headache because they did not allow outsiders to carry their critical secret data. The 1970s was also the time where we saw the start of large standardization efforts of ISDN, which lasted longer than anybody expected and which did not reach its maturity until the 1990s [3,4,5].

5   Industry Applications as Driving Forces

The clear driving force and enabler of the innovations was the development of microelectronics. The use of microprocessors first occurred as individual small

computers; however, soon an internal communication bus between different units tied them together. Multiprocessor systems were born. The architecture was clever because each processor unit could be dedicated to do its own specialized task and each was communicating with other unit when necessary internally via the system bus [13].

The new technology allowed for bigger and more challenging system designs for the new architecture. For example, an idea of removing bottlenecks in telex centers with huge amount of manual machines came about; multiprocessor equipment with several telex lines and many attached workstations was created. Thus, one multiprocessor switch could handle centrally the traffic of many old fashioned terminals. Messages were stored on system hard disk units. Core system units like memories and other critical units were duplicated in the new system architecture for reliability. Fewer people could take over the communication administration. The system sales strategies were also changed. Modern cost calculation methods and models helped the sales and extensive public marketing with leaflets and newspaper announcements were used to soften the customer companies [14].

The telecommunication operators were offering new data networking services with enthusiasm. They offered customers both circuit or packet switched services and they used the communication mainly to connect remote terminal and concentrators to the central mainframes. As the communication industry developed and the multiprocessor technology proceeded the vendors came up with wide area privately owned telecommunication system solutions. This alternative consisted of privately owned datacom nodes or switches using operator lines between them with no other services. The investment was profitable to many big companies at that time as the communication costs were high in comparison to turnovers and amount of transferred data.

Besides the wide area communication, local area communication was reaching its revolutionary breaking point. Local area networks (LANs) were born. LANs were based on the idea of providing a faster communication channel from personal computers to mainframe computers at the premises and they gave access to shared resources like communication lines, memories, and printers. Some competing solutions and operating systems were built providing a variety of features for computing and networking. The main solutions were Ethernet and Token ring networks with some minor alternatives.

Forerunners in computing and communication were the big international vendor companies like IBM, Digital, Honeywell and Philips and the main industrial customers from branches like banking, forestry, and metallurgy. These companies implemented substantial amounts of computers terminals and communication lines. For the first time, daily business operations moved over to computer-based systems. They handled documents and data in electrical format, saved them to computer memories and made rapid transactions between organizations possible. Some people talked even about paperless office.

Banks were acting as drivers in many technological areas. The bank systems involved the biggest computer centers; they were using substantial amounts of computer terminals at large central sites. Soon the demand for increasing distribution of data handling to small office branches required new means for data communication between central computers and terminal systems. Networking the branches was quite a challenge. Although the branches were small, they were technologically complex; devices as automatic teller machines used diverse networking protocols.

Circuit switched technology provided first means to connect remote terminals and computers together. As all permanent circuits and systems provided also a permanent cost, they made the first attempts to use packet switched systems. The idea was that while being able to share effectively the communication lines by high amount of users, organizations could save a lot of money. The data was packaged in standardized form such as X.25 and was transmitted to the destinations based on the individual packet addresses. The strange idea of forcing different users' data to the very same communication line at the same time was thus implemented. Furthermore, other vendor specific protocols for application specific mainframes and new LAN protocols were increasing the complexity [9].

High demands and expectations were directed towards the new system designs for banking and other industry branches. As technology was new, many problems in product development arose. Particularly the complicated multiprocessor system software with all its different modules created huge challenges for engineering skills and the time schedules for product delivery. Key customers bought many innovations nearly before the systems software designers and production personnel had heard about them. In fact, many designs were buried before they were really born at all.

Any the zeal to make use to new innovations was increasing rapidly and the ways to shape organizations and ways of working were changing accordingly [10]. Telefax and electronic mail were known also in early 1980s and soon databases and teletext appeared. Fax is a form of transmitting images via the telephone network; electronic mail is based on storing and transmitting messages to offline users. Teletext was one-way communication media used together with TV-broadcasting where the page-formatted information was retrieved from supplementary equipment integrated to a TV-set. One of the next waves was the videotex in which the text information was refined with some graphics. Some companies tried their first e-business and news distribution with videotex services on telephone and TV networks but many of them did not live for very long.

6   Future Views during the 1980s

In early 1980s, people started to realize for the first time that the society around them had changed due to the increasing amount of computers and communication facilities. This was changing the lifestyle and in homes, people had their first personal computers and microprocessor driven household machines. Advertisements were distributed to homes based on computerized database registers and visual world got first television and film animations. Banking and dealing with public authorities was more and more based on computer driven data handling, providing electronic accounting, data form editing, and bank transfer.

Future anticipations included views where everything was electronic and automated including money, post, newspapers, department stores, and offices. The worst fears were as bad as changing the work tasks totally and making them extremely difficult. The change would mean at least the necessity of learning constantly new things, having assignments with ultimate requirements of precision and the complex future work would provide less human contacts and lack any personality. Even wider views were presented e.g. by Daniel Bell in the 1970s, when he pointed out the criti-

cal change of society because of the changing role of information and knowledge, human roles and industrial production structures [2]. Many guesses turned out to be true but were also strongly exaggerated as we can see now [6].

New worries rose also for the first time as areas like data security and work ergonomics were lacking all basic knowledge at that time. Personal information including political, religion, conviction, health, creditability, criminal records, and punishments seemed to be compromised due to new ways of data handling [11]. People realized that the machines capable of storing substantial amounts of data would represent a major thread for their personal integrity. One could retrieve data in a non-visual form without physical access to the data storage; therefore, it was impossible to monitor what happened with traditional methods. In addition, there was some discussion of access rights to the intimate personal data of individuals. Nobody in fact understood that future internet would transmit simultaneously e.g. over 30 million people´s messages, not to talk about billions. And that even every child would have access to all kinds of data in the world [7]. In many countries, some form of legislation was set up quickly; but, for example, in Finland political contradictions prevented such legislation until the mid 1980s.

7 Conclusions

The 1980s started in a world where telecommunication spread widely in western countries and other developed areas. They used PSTN and telex for basic communication needs and the first local and wide area data networks were in the making. Teleoperators were managing most of the wide area communication services offered by them.

In early 1980s, the communication environment started to change due to increased variety of solutions offered for local and wide area networking; privately owned solutions were soon available. Complex multiprocessor system designs were utilized for the first time and the engineering staff was having hard times in trying to get the real time processing to work properly. Old solutions became better by refining their feature sets and many new solution evolved and ambitious efforts were made to standardize future networking solution. People started to use personal computing, communication, and home electronics for the first time and they felt some hesitation towards the future effects of IT to their foreseeable future.

In this paper, we have presented some views from the perspective of young engineers concerning the fast change in text and data networking that took place in the 1980s. The value of the paper is mostly in writing down these views and memories with some literature references. By now, we know that the development during the past few decades was quite amazing and was not foreseeable at those days. Even the wildest ideas presented in science fiction during that time belong now to our every day life!

References

[1] Auvinen, S.(toim.): EDI/OVT-ratkaisut liiketoiminnan menestystekijöinä (EDI-solutions as success factors in business), Suomen kuljetustaloudellinen yhdistys RY, Loimaan kirjapaino, Helsinki (1992)

[2] Bell, D.: The Coming of Post-industrial Society: A Venture in Social Forecasting. Basic books, New York (1973)

[3] Berndt, W.: The significance of standardization in the field of telecommunications for innovation, competition and world trade. In: 1986 Yearbook of the Deutsche Bundespost, preprint. Bad Windsheim (1986)

[4] Groebmair, K.: Integrierte Kommunikation: ISDN-Systems furs Buro (Integrated communication: ISDN-systems for the Office), Siemens Nathan International, Munchen (1985)

[5] Haglund, H., Kanervisto, J., Wirzenius, A.: ISDN näkökulmia (ISDN-views and scenarios), Tiedonsiirron yhteistyöelin: raportti 1/88, Kouvolan kirjapaino, Helsinki (1988)

[6] Henten, A., Kristensen, T.M.: Information society visions in the Nordic countries. Telematics and Informatics 17 (2000)

[7] IT-kommisionen: Informationsteknologien, Vingar åt människans förmåga (Information technologies. Wings for human capabilities), SOU (1994)

[8] Magnus, K., Lennart, S.(Red.): Världens största maskin, Människan och det globala telekommunikations systemet (The greatest machine in the world. People and the global telecommunication system), författarna och Carlsson Bokförlag (1995) ISBN 91 7798 990 2

[9] Marttila, H., Lautanala, K.: Tiedonsiirtopalvelujen valintaopas (The guide for telecommunication services selection), Tiedonsiirron yhteistyöelin, raportti 1/87, Painovalssi, Helsinki (1987)

[10] Mertanen, O.: Tietoverkkojen käyttömahdollisuudet keskisuurten ja suurten organisaatioiden dataliikenteen hoitamiseksi (The telecommunication network utilization alternatives for middle sized and big organizations), Licentiate thesis, Tampere University of Technology, Tampere (1985)

[11] Naisbitt, J.: Megatrends: Ten new directions transforming our lives, London, Futura (1984)

[12] Seppo, P.: Tietotekniikan artikkelisanakirja (Information technology article glossary), Tietoportti Ky (1985) ISBN 951-99683-5-0

[13] Queyssac, D.: Mikrotietokoneet 1 (Microcomputers 1). Infopress, Jyväskylä (1978)

[14] Riikonen, J., Kontinen, K., Lilius, R., Tuominen, P.: Toimistorutiinien päällekkäisyys (The routine overlap in offices), Suomen itsenäisyyden juhlavuoden 1967 rahasto: sarja B, no: 70, Kyriiri, 1982, Helsinki

[15] Sihvo, L.: Tekniikan käsikirja 3 (The technology handbook 3), Sähkötekniikka, K.J. Gummerus osakeyhtiö Jyväskylä (1968)

[16] Tuovinen, J.: Sähköpostin käyttömahdollisuudet ja vaikutukset yrityksissä (The utilisation of elecronic mail and the operational effects in enterprises), Nokia Campus –julkaisu 2/1988, Vientipaino, Helsinki (1988)

Glossary of Terms

Data communication: The transmission of machine readable code on a communication network.

Data processing system: Data processing system is a permanent set up of computer equipment for processing a relevant set of information handling tasks.

Microprocessor: The microprocessor is an electronic component where all logical operations are placed in one physical circuit that is microscopic in size.

Memory: Memory is data storage were machine readable code is saved for future use for short or longer times. The memory can physically as well be a magnetic tape or electronic memory circuit inside a computer.

Network Access: The network access is the way to connect the computer into the network. The network access can be wired or wireless referring to the physical form of the networking media.

Network coverage: The network coverage is the exact area where the signal from the nearest network station can be received. The coverage area is dependant on many things like the transmission power of the signaling system, locations of the neighboring stations and the physical structure of the network.

Online banking terminal: Equipment meant for public use to automate the personal banking operations with help of the bank personnel.

Telex: Text formatted data sent to a remote teletype terminal on a separate telex network. Very limited character set and the use of paper tape punch characterized the communication operation.