History of Communications Media

Class 8

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What We Will Cover Today

- Computers
- Internet
- Cell Phones

Origins of Computers

- Persons who made the computer possible
  - Gottfried Leibnitz – binary numbering system
  - Charles Babbage – the “analytical engine”
  - Herman Hollerith – the punch card
  - Lee De Forest – the audion tube
  - Claude Shannon – the idea that relay circuits could perform arithmetic, logical, and comparison functions

The First Computers

- John V. Atanasoff – first working model of a data processing unit and computer memory at the Univ of Iowa
- Alan Turing – Colossus, the first working digital computer, created to crack Nazi codes
- J. Presper Eckert & John Mauchly – ENIAC, developed at the Univ of Pennsylvania in 1946 to do ballistics calculations

Computers

- Computers have gone through five major computer ages – each of which differed in their basic technology and capabilities
  - 1st Generation – vacuum tubes
  - 2nd Generation – transisters
  - 3rd Generation – integrated circuits
  - 4th Generation – microprocessors
  - 5th Generation – advanced microprocessors & the Internet

First Computer Age

- 1940-56: Vacuum Tubes
  - Used vacuum tubes for circuitry and magnetic drums for memory
  - Very expensive and took up large rooms
  - Programmed in machine language
  - Input was on punch cards and paper tape
  - Output displayed on printouts
  - UNIVAC I, UNIVAC 1103, and IBM 704

Second Computer Age

- 1956-1963: Transistors
  - Used transistors for circuitry and magnetic core for memory
  - Programmed in assembly language and early versions of COBOL and FORTRAN
  - Input and output as in 1st Computer Age
  - IBM 1401

Third Computer Age

- 1964-1971 Integrated Circuits
  - Used integrated circuits (small transistors on silicon chips) for circuitry
  - Users could interact via keyboard and monitor as well as with punch cards
  - Users interfaced with an operating system which allowed the computer to run different applications at one time
  - IBM 360 series & 370 series
    - IBM 360s & 370s were scalable

A Note on the Impact of the Integrated Circuit

- Once invented, the IC proved useful to other industries besides the computer industry
  - While the computer industry was the largest user of ICs, demand for them was also extensive in other industries
- In 1994, IC sales by industry were as follows:
  - Computers – 47.9%
  - Industrial & Instrument Manufacturers – 10.3%
  - Communications – 14%
  - Consumer Electronics – 21.9%
  - Automotive – 4.9%
    - This was the largest growth area in the 1980s
  - Government & Military – 1.0%

A Note about 2nd & 3rd Generation Computers

- Computers were divided into three categories
  - Mainframes - a large digital computer serving 100-400 users and occupying a special air-conditioned room
  - Minicomputer - a medium-scale, centralized computer that supported multiple users. It was roughly the size of a refrigerator and fell between the early microcomputer and the mainframe in terms of memory size and disk space
  - Dumb Terminals - a terminal which can display and input data; but which lacks any significant local programmable data processing capability

Fourth Computer Age

- 1971-1991: Microprocessors
  - Microprocessors are ICs that incorporate most or all of the functions of the CPU on a single chip.
    - Before the microprocessor, the CPU was built with many chips
- Microprocessors made possible the Personal Computer (PC)

Origins of the PC

- Had its origins in the computer hobby culture
  - Its members were engineers who worked in either the computer or electronics industries .
  - The culture included the Homebrew Computer Club of Silicon Valley
- In 1977 when Apple, Commodore, and Tandy introduced the first commercial PCs
- The success of Apple and Commodore led IBM to enter the PC market

Origins of the PC - 2

- The PC market really took off when IBM introduced its "open architecture" PC in October 1981
  - It had an Intel 8088 microprocessor and a Microsoft MS-DOS operating system
- IBM's entry into the PC market had profound consequences
  1. It revealed a mass market for computers. Before, the market had been institutional – corporations, government offices, universities, businesses, etc
  2. By making its PC an open system, IBM enabled existing and startup companies to enter this new market
     - By 1986, over 200 companies were producing IBM PC clones. Among the new entrants were Dell, Compaq, Gateway, and Hewlett Packard
     - Conversely, it reduced PC manufacturers with proprietary operating systems to minor niche status

A Note about the PC

- PCs went through multiple PC eras with each era reflecting a new microprocessor chip and often a new operating system
  - The Intel eras were based on the 8088, 80286, 386, 486, Pentium, and successive chips
  - The Microsoft operating systems were DOS, and the various versions of Windows, starting with 3.0 up to the present XP and Vista
  - In each era, the memory, speed, and capabilities of the computer increased and both the size and especially the cost of the computer decreased

A Note about the PC - 2

- IBM's commitment to the mainframe eventually caused it to lose control of the PC market
  - While IBM's XT (based on the 8088 chip) and AT (based on the 80286 chip and introduced in 1984) were great successes, IBM held back on a computer with a 386 chip in order to protect sales of its lower end mini-computers
  - Result: Compaq Computer came out with the first 386 chip-based PC in 1986 lost both its control of PC architecture and its ability to dominate the PC industry

A Note about the PC -3

- Other consequences of IBM's entry into the PC market
  3. It made Intel and Microsoft the dominant players in the PC industry
  4. It created a demand for new types of packaged software that could be used by non-techie users in offices and homes
     - Prior to packaged software, software applications were generally created for existing installation computers by in-house or contract software programmers who wrote custom-made code

A Note about the PC - 4

- Other consequences of IBM's entry into the PC market
  5. The appearance of PCs on a multitude of desks within corporate, government, and university offices led to the creation of internal enterprise networks or intranets to link these computers
     - By 1983, start-ups Novell and 3Com were providing software for Local Area Networks (LANs). Others soon followed

Fifth Computer Age

- 1991 – present: era of the Internet
  - Desktop and laptop PCs, home modems, and the World Wide Web
  - Graphical User Interfaces
  - Web browsing software
    - 1993 – Mosaic
    - 1994 – Netscape Navigator 1.0
    - 1996 – Internet Explorer 3.0
  - Beginnings of e-Commerce & e-Government
  - Internet both a broadcasting (websites & streaming video) and narrowcasting (e-mail) medium

Computers

- Each Computer Age has had a differential impact on society
  - The first two Computer Ages of computers had limited impact on society because of their limited capabilities, large size, high expense, and inability to communicate
    - Resided in large corporate and governmental entities where they handled tabulation and payroll functions

Computers

- The third Computer Age had a little more of an impact because it did have some limited communication with dumb terminals
  - This had impact on such areas as travel reservations, remote data input and output, and banking transactions
- The fourth Computer Age had an ever-increasing impact as micro processing capability increased, costs decreased, and increasing numbers of people acquired computers

Effects of the Personal Computer

- Altered the dynamics and structure of office work
  - Replaced typewriters and their clerk-typists
  - Supplemented centralized paper record files with online desktop files
  - Thanks to spell check, eliminated typing errors and misspellings in documents
  - Replaced card index files and standardized paper case files with local databases

The Internet & the PC

- While each Computer Age has had a differential impact on society, it is the Internet, however, that made the PC such a revolutionary technology
  - Made the PC part of worldwide network
  - Made possible the near-real-time dissemination of text, audio, still imagery, and video
  - Allowed any PC or computer to communicate with any other computer regardless of platform

Internet as the 5th Computer Age

- 5th Computer Age – 1991 – present: Internet
  - Desktop and laptop PCs, home modems, and the World Wide Web
  - Graphical User Interfaces
  - Web browsing software
  - Beginnings of e-Commerce & e-Government
  - Internet both a broadcasting (websites & streaming video) and narrowcasting (e-mail) medium

The Internet

Origins of the Internet - 1

- 1958 – Creation of the Defense Advanced Research Projects Agency (DARPA)
  - Internet grew out of DARPA's attempt to link DoD and contractor computers into a network so that information could be easily shared
- 1969 - Creation of the ARPANET
  - Based on packet switching & a network of nodes
    - Grew from 4 computers in 1969 to 15 in 1971 and nearly 2,000 by 1985

Origins of the Internet - 2

- 1985 – Funding of the network was assumed by the National Science Foundation and the name changed to the INTERNET
- 1989 – The NSF abandoned its support of the net and allowed commercial Internet service providers (ISPs) to offer Internet access to paying customers
    - By 1995, the Net encompassed 44,000 local networks, 160 countries, and an estimated 50 million users

Origins of the Internet - 3

- Origins of the Internet – 3
  - 1989 – Tim Berners-Lee of CERN developed three breakthrough techniques that made possible the World Wide Web
    - Hypertext Markup Language (HTML) – to format and layout pages of text on the Internet
    - Hypertext Transfer Protocol (HTTP) – a system to link documents
    - Uniform Resource Locators (URLs) – a scheme to address and thereby locate specific nodes of information

Origins of the Internet - 4

- 1993 – Development of Mosaic – the first web browser by Marc Andriessen
- 1994 – Development of Netscape Navigator – an upgraded version of Mosaic
- 1996 – Development of Internet Explorer by Microsoft

Intellectual Effects of the Internet - 1

- Made anyone with Internet access both a potential publisher and broadcaster
- Changed how people access and get information
  - Enabled people to obtain information not available in most news media outlets or libraries
  - Enabled people to seek out controversial issues and topics that are ignored by the mass media
    - Abolished information gatekeepers
- Fostered the rapid circulation of information, rumors, and misinformation

Intellectual Effects of the Internet - 2

- Led to the migration of intellectual content from the printed page to the web
  - Many academic journals and other publications are now published only online
  - Many publications now have an online as well as a printed version
    - News magazines such as *Time* and *Newsweek*
    - Newspapers such as the *New York Times, Washington Post,* and *Los Angeles Times*

Intellectual Effects of the Internet - 3

- Allowed the reader to intervene in the text of a book or article by:
  - Altering the visible format of the text
  - Linking to related information (such as a definition, a picture of an object, an extended discussion of a point, or a related subject) in other texts
  - Making annotations and comments on the text
- Brought the incipit back to life in the form of the URL
  - It thus returned printed text to the status of the Medieval manuscript

Economic Effects of the Internet - 1

- Enabled formerly local markets to become national and even international markets by
  - Diminishing the costs of acquiring needed market information
  - Allowing auction sites such as e-Bay to turn local flea markets into a worldwide community of potential buyers and sellers

Economic Effects of the Internet - 2

- Ended the economics that result from poor matching of supply and demand
  - Poor matching of supply and demand reflected both the limited shelf space for storing physical media and the need for a local audience or market
  - The Internet allowed for virtual stores with infinite shelf space and real-time information about sales trends to emerge
    - Thus, virtual stores like Rhapsody and Amazon.com made it profitable to sell long-tail items

Economic Effects of the Internet - 3

- Facilitated commerce by reducing transaction costs
  - Permitted disintermediation
    - Enabled airlines to dispense with travel agents
    - Gave rise to direct sell websites like Expedia, Priceline, & Travelocity
  - Reduced paperwork costs
    - Airlines reduced the costs of processing an airline ticket from $8 to $1 by substituting e-tickets for paper tickets

Economic Effects of the Internet - 4

- Facilitated the rise of offshore banking
  - Online banking permitted banks and financial institutions to establish themselves in countries with minimal or no regulations
- Facilitated the rise of global back offices
  - Enabled sites in Third World countries to perform such functions as transaction data entry, payroll and bill processing, insurance claims processing, etc

Economic Effects of the Internet - 5

- Allowed banks to replace tellers with online banking and automated teller machines
  - Allowed people to purchase airline tickets, books, and other online
    - Hurt brick-and-mortar bookstores
    - Drove travel agents out of business by allowing people to book their own trips
  - Replaced the newspaper ad with online ads at Craigslist, eBay, and other similar websites

Economic Effects of the Internet - 6

- Altered the economics of information production & dissemination
  - Eliminated such large fixed costs of information production as printing presses & TV studio equipment
  - Eliminated the marginal costs of paper & ink
  - Eliminated the costs of transmission & distribution
  - Eliminated or reduced many traditional sources of revenue for information content producers
    - This has greatly affected newspapers and magazines by eliminating subscription sales and diminishing advertising revenues

Social Effects of the Internet - 1

- Fostered Exhibitionism
  - Allowed people to turn their lives via camcorders and the Internet into web spectacles
- Allowed people to assume virtual identities
- Facilitated access to Pornography
  - Porn pioneered the use of streaming video, Java-based methods of video transmission, and encryption for secure credit card purchases
  - Accelerated the decline of sex magazines

Social Effects of the Internet - 2

- Created bonds between ordinary citizens of different states
- Enabled individuals with specialized or ideosyncratic interests to find each other, communicate with each other, exchange information, and coordinate their activities

Social Effects of the Internet - 3

- Affected the nature and quality of human interaction
  - Transmits much less non-verbal information than face-to-face communication
  - Replaces high quality relationships in the real world with low quality virtual relationships
  - Permitted human relationships to transcend the limitations of geographic proximity
    - People who don't know their next door neighbors now have online chats with people on other continents

Political Effects of the Internet - 1

- Facilitated political mobilization
  - Enabled narrow coalitions and interest groups to use the Internet to find and mobilize sympathizers via targeted websites and email responses
- Enhanced the power of small sub-groups (such as dissenters or terrorists) vis-à-vis the State
  - Such groups can use the Web to obtain critical information, mount propaganda campaigns, solicit funds, recruit new members, and plan and coordinate actions

Political Effects of the Internet - 2

- Enhanced the power of networked small groups and individuals vis-à-vis state and large corporate bureaucracies by
  - Greatly reducing the information-gathering costs that previously favored large organizations over small ones
  - Enabling the superior coordinating and quicker decision-making capabilities of small entities vis-à-vis larger ones to exert their effects

Military Effects of the Internet - 1

- Changed the role of the combat camera operator
  - Before: Shot film for historical record and stock imagery
  - After: Shot digital imagery for near-real time dissemination to combat commanders, intelligence personnel, and public affairs officers
- Turned wars and insurgencies into contests of competing imagery as well as of competing combatants and weaponry

Military Effects of the Internet - 2

- Permitted the remote training of personnel in-the-field by the use of digital imagery, audio-visual production, and multimedia
  - Before: Trainers found out about a desired film or video via a published catalog, got film or video from a base VI facility, and since they got it days or weeks after order, had to plan ahead for it to use it in their course
  - After: Trainers can resort to on-line catalogs, order it over the web, and receive either a digital VI product over the web or a physical VI product via mail

A Note on Search Engines

- The ever larger numbers of web pages placed on the Web created a need for search engines so that users could find desired items
- Thus, the emergence of several search engines
- Problem: a typical search brings too many hits

Google

- Linked user search terms to relevant ads
- Created an algorithm for rank ordering search results so the most important results ranked at the top of the queue
- Pioneered in machine translation
- Popularized the idea of digitizing all of the world's books
- Was a major player in the development of the concept of "cloud computing"

A Note on Blogs

- A “Blog” is a contraction of the term “web log”
- It is a website maintained by an individual who posts regular entries
  - These are usually news on a particular subject, commentaries on current events, personal online diaries, or rants
  - They allow readers to post comments on what has been blogged

A Note on Wikis

- A “Wiki” is a website that allows the easy creation and editing of any number of interlinked web pages
  - It is in effect a collaborate website of collaborately composed pages
- The most famous wiki and one of the ten most accessed web items is “Wikipedia” – the online encyclopedia
  - It s website is http://www.wikipedia.org

A Note on Social Networking Sites

- Social networking sites
  - Focus on building online communities of people who share interests or something else in common
  - Provide means to connect with friends, former classmates, or old acquaintances (usually via self-descriptive pages about oneself)
  - Provide a recommendation system by which links to others can be established
  - Two noted social networking sites are Facebook, MySpace, and Twitter

The Cell Phone

The Cell Phone

- Was anticipated in science fiction before becoming a product
  - Dick Tracy's wrist watch radio
  - Captain Kirk's beeping communicator
- Catered to people's desire to have portable, wireless phone service
- As time has gone on, the cell phone has acquired web access, photographic, and video capabilities
  - The laptop computer is slowly migrating to the cell phone

A Note about Cell Phones

- Cellular Telephone systems consist of
  - A large number of both receiver cells and low-power transmitters that relay local calls from one cell to another
  - A signal strong enough for the local phone company to relay it anywhere
- In 1985, there were 91,600 mobile phone subscribers in the U.S.; in 2000, there were 85,000,000; in 2005, there were 207,900,000

Effects of the Cell Phone - 1

- Did away with the phone booth and the public pay phone
- Made place irrelevant in terms of being able to receive a phone call
- Permitted live continuous contact between news organizations and reporters in the field
- Made possible the creation of IEDs that could be exploded remotely by the bomber setting off the bomb by a phone call

Effects of the Cell Phone - 2

- Broke down the line separating personal private space from public social space
  - Created the phenomenon of “absent presence” – being in a social space while completely ignoring one’s surroundings
- Contributed to traffic accidents
- Affected public opinion polling accuracy and sampling techniques