

TIMELINES in GLOBAL STUDIES

A History of Global Information Networks

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Prehistoric

- Oral traditions and memory systems, petroglyphs, proto-writing
- c. 3200 BCE: The invention of writing

500 BCE-1300s CE: Pre-modern Information Networks

- 500 BCE-300 CE: Silk Road trade routes carry goods, scripts, and ideas across Eurasia
- 100 BCE-900 CE: Buddhist monastic circuits in Asia spread texts via palm-leaf manuscripts
- 200s-900s: Chinese woodblock¹ printing emerges (Tang dynasty), the world's first printed books
- 750-1258: Islamic Golden Age; translation of Greek, Persian, Indian works into Arabic in Baghdad
- 900s-1300s: Arabic numerals and paper technology from China reach Europe

1300s-1700s: Early Modern Information Networks

- 1300s-1400s: Moveable-type printing press enables mass reproduction of texts
- 1300s-1600s: Cross-regional textual exchange of ideas across Renaissance Europe
- 1500s: Early financial information systems (bourses, courier networks, merchant newsletters)
- 1600s: State information infrastructures (censorship, postal inspection, gazettes)
- 1650s: Proto public spheres (coffeehouses, salons)
- 1660s-1700s: Learned societies formalize scholarly correspondence and proceedings (more later)
- 1700s: Postal monopolies and scheduled postal coach services dominate continental correspondence

1600s-1700s: Print Revolution

- Advancements in mathematics, physics, biology during the Scientific Revolution (1543-1687)
- Rise of rationalist and scientific ideas in the Age of Enlightenment (1687-1789)
- Long-distance knowledge exchange among Enlightenment intellectuals (Republic of Letters)
- Print Revolution spreads Enlightenment ideas through pamphlets, journals, encyclopedias
- 1600s-1700s: Periodical press (gazettes, newspapers), synchronize publics across cities
- 1740s-1790s: Encyclopedia projects codify and standardize knowledge for the general public²

¹ East Asian method of printing on textiles and later on paper, dating to the second century AD.

² Denis Diderot and Jean le Rond d'Alembert's *Encyclopédie* (1751-72, France) was the most influential, accompanied by works like Ephraim Chambers' *Cyclopaedia* (1728 Britain).

1660s-1700s: Institutionalizing Knowledge Production

- 1660s: Founding of learned societies in Europe as formal hubs of empirical inquiry and reason³
- 1660s-1700s: Learned societies formalize scholarly correspondence and proceedings
- 1710s: Copyright and press laws (early legal frameworks for information markets and IP)
- 1720s-1750s: Proceedings and learned meetings consolidate into early academic conferences
- 1730s: Modern research universities⁴ institutionalize science within higher education frameworks
- 1740s-1790s: Academies and scientific societies spread across the globe, extending European models
- 1750s-1790s: Scientific journals emerge from knowledge networks, standardizing peer review
- 1760s-1790s: Formal institutions and proceedings create a framework for knowledge production
- 1760s-1800s: Early bibliometrics (citations, indexing, catalogs) begin quantifying scholarly impact

1769-1860s: First Industrial Revolution

- 1769: James Watt's steam engine drives industrial mechanization
- 1770s-1790s: First factories in history appear in Britain's textile and iron industries
- 1770s-1830s: Ironworks, textile mills, and railways expand industrial infrastructure
- 1800s: Mass urbanization; the birth of wage labour and urban working classes
- 1820s: Statistical bureaus and censuses institutionalize data for governance
- 1830s-1850s: Cheap postage and printing make books, letters, and political leaflets affordable for all⁵
- 1850s: Coal mining becomes the dominant energy source powering industry

1790s-1860s: The Telegraph

- 1790s: Optical pre-electric telegraph networks link capitals at near-real-time (weather/war/markets)
- 1830s-60s: Electric telegraph spreads commercially; Morse code becomes a universal standard
- 1830s-60s: Rail timetables and telegraphs standardize and synchronize time and space nationally⁶
- 1858: First transatlantic undersea cables
- 1866: First reliable instantaneous intercontinental communications in history

1826-1910s: Early Photography and Photojournalism

- 1826-27: First permanent photograph in history, with heliography (Nicéphore Niépce, France)
- 1830s: Uniform postal rates and rail-post enable the mass circulation of printed matter
- 1839: The birth of practical photography with the daguerreotype (Louis Daguerre, France)
- 1840s: Global news agencies (Reuters, AP) wire "world news" across newspapers
- 1850s: Wet-plate and albumen prints allow mass photographic reproduction in illustrated magazines
- 1860s: Portable field cameras enable on-site reportage and early war photography
- 1874: Universal Postal Union standardizes cross-border mail systems
- 1870s: Dry-plate processes replace wet plates, allowing faster exposure and easier transport⁷

3 Royal Society was founded in London in 1660 as a chartered body for empirical inquiry. Académie des Sciences was established in Paris in 1666 under royal patronage to advance natural sciences and state science (i.e., cartography, navigation, engineering, military technology, resource management).

4 The University of Göttingen (1734), building on Enlightenment reforms at Halle (1694), is considered the first modern research university, integrating teaching and empirical research in a secular framework and later inspired the Humboldtian model institutionalized at the University of Berlin (1810), which later shaped universities worldwide.

5 For example, Britain's Penny Post reform of 1840 allowed letters to be sent anywhere in the country for a single penny--a major shift from the earlier costly, distance-based rates.

6 Before railways, every town kept its own local time. To run trains safely and coordinate distant schedules, companies began synchronizing clocks via telegraph signals sent from the Greenwich Observatory, which kept precise astronomical time for navigation. This "railway time" later became national, and in 1884, Greenwich Mean Time became the global standard.

7 Wet plates had to be prepared and developed immediately while still wet, making photography slow and messy. Dry plates came ready to use and could be stored, making taking photos much easier and faster.

- 1870s-1910s: Mass-circulation newspapers and illustrated weeklies consolidate national publics
- 1880s: Halftone printing and roll film make photographs integral to newspapers and magazines
- 1890s-1910s: Photojournalism becomes widespread in newspapers and illustrated weeklies
- 1900s: Portable roll-film cameras (e.g., Kodak Brownie series) democratize amateur image capture

1870s-1914: Second Industrial Revolution & the First Globalization

- 1866: Siemens dynamo enables industrial-scale electricity generation; a new revolution
- 1870s: Steel, electricity and oil transform industrial production
- 1870s-1910s: Resource extraction in colonies intensifies to meet industrial raw material demand
- 1870s-1914: First integration of world economies through trade, mass migration, the gold standard
- 1880s-1900s: Assembly lines, Taylorism, and Fordism drive mass production
- 1880s: Internal combustion engines revolutionize transport (cars, early airplanes)
- 1884: International time zones (Greenwich) synchronize railways, telegraph, and markets
- 1890s: Organized labour movements expand across industrial nations
- 1900s: International standardization bodies (precursors to ISO, ITU) align technical formats

1876-1940s: The Telephone

- 1876: The invention of telephone by Alexander Graham Bell
- 1880s: Urban business adoption in major US and European cities
- 1890s-1910s: Expansion to middle-class homes in industrialized nations
- 1890s-1930s: Manual switchboards and then automatic exchanges scale switched networks
- 1900s-1930s: Standardized phone numbers and network links make long-distance calling possible
- 1920s-30s: Rural and transnational networks extend access (shared local lines, intercity cables)
- 1930s-40s: Undersea cables, multi-channel transmission; many simultaneous transcontinent calls
- 1940s: Near-universal household adoption in industrialized nations

1890s-1945: The Radio and Proto-Computing

- 1890s-1900s: Wireless telegraphy links ships and empires
- 1910s: Voice transmission emerges alongside Morse signaling
- 1914-1918: Radio intercepts and encryption shape WW1 communications
- 1920s: National radio networks create mass broadcast media
- 1930s-40s: Shortwave links continents (BBC, VOA, RFE); news and wartime propaganda go global
- 1940s: Foundations of computation: war-time cryptography/codebreaking (e.g., Alan Turing)
- 1940s: Newsreels and live radio form a synchronized global infosphere

1920s-1960s: Broadcast Television

- 1920s-30s: Experimental TV and early standards (mechanical to electronic)
- 1940s-50s: National TV networks create synchronized mass culture and live events
- 1950s-60s: Videotape revolutionizes recording, editing, and replay of broadcast content.
- 1960s: Color TV and global satellite relays internationalize real-time televised spectacle

1947-1950: After the Transistor: First Computers

- 1947: Transistor replaces bulky vacuum tubes, makes all electronics small, fast, reliable
- 1950s: Mainframes (the first big computers)
- 1956: On-device magnetic disk storage allows computers to store and retrieve data directly⁸
- 1958-1960s: High-level programming languages (FORTRAN for science, COBOL for business)⁹

⁸ This made computers far more practical, no longer reliant on slow punch cards or magnetic tapes, data access dropped from minutes or hours to mere seconds.

⁹ These languages standardize how humans instruct computers, enabling software development across industries.

1950s-70s: The Space Race & Global Science Networks

- 1957: USSR's Sputnik becomes the first human-made satellite, marking the dawn of the space age
- 1957: Laika, a stray dog from Moscow, becomes the first living being from Earth to travel to space
- 1961: Yuri Gagarin becomes the first person in space
- 1962-73: Soviet spacecraft Venera reaches Venus, and sends data back to Earth
- 1960s: NASA and Soviet space programs push rapid advances in rocketry, materials, computers
- 1969: Apollo 11 Moon-landing televised live worldwide, creating the first truly global shared event
- 1970s: Space technology powers new tools: weather satellites, GPS, global TV broadcasting

1950s-70s: The Foundations of the Digital Age

- Integrated circuits (many transistors on one chip; birth of microelectronics; smaller computers)
- Information theory (measure and send data efficiently; math rules for messages, noise, compression)
- Cybernetics (digital systems controlling themselves using feedback, key for robotics and AI)
- Systems engineering (designing complex digital ecosystems where all parts work together)

1960s-2000s: Early Satellites

- 1962: US satellite Telstar 1 made the first live transatlantic TV broadcast, linking US and Europe
- 1965: INTELSAT: an int'l satellite organization that built a global system for TV, phone, data
- 1970s-80s: Satellites in orbit link with ground relay towers to connect cities nationwide¹⁰
- 1978-90s: US military launches the Global Positioning System (GPS); later opened for civilian use¹¹
- 1980s-2000s: Satellites start providing global weather and mapping data¹²

1960s-1980s: Toward the Internet

- 1960s: Packet-switching: sending data in small pieces instead of one continuous stream¹³
- 1969: ARPANET, the ancestor of the internet, connects universities for information sharing¹⁴
- 1970s: Email (the first digital communication tool)
- 1970s: Ethernet (connected local computers, forming the basis of office networking)
- 1977: Public-key cryptography: separate keys for locking and unlocking data (online security)¹⁵
- 1980s: TCP/IP, DNS (standardized protocols that unified all networks into one internet)
- 1980s: Fiber-optic cables replace copper, massively increasing bandwidth
- 1988: TAT-8: first transatlantic fiber-optic cable system

10 This advancement created the backbone for national television, long-distance calling, and early data transmission, replacing older wired or radio-only systems.

11 GPS was a Department of Defense project (code-named NAVSTAR) built for military navigation and missile guidance. After the 1980s, civilian access was expanded, making it the global standard for timing, mapping, and navigation.

12 Systems like Landsat and NOAA started supplying continuous images and measurements of Earth's surface and atmosphere, supporting forecasting, navigation, resource management, and environmental monitoring.

13 Packet-switching breaks information into small, individually routed chunks/packets that travel independently across a network and are reassembled at their destination. This makes communication faster, more reliable, and scalable.

14 ARPANET was the first packet-switched computer network. It began as a US Department of Defense project under the Advanced Research Projects Agency (ARPA), which was renamed the Defense Advanced Research Projects Agency (DARPA) in 1972. Today, DARPA remains a civil-military hybrid organization that funds high-risk, high-reward research and development in military and dual-use technologies.

15 This invention made modern online security possible by allowing people to exchange encrypted information without first sharing a secret key--a breakthrough that underpins secure web browsing, online banking, and digital signatures today.

1970s-1990s: Shipping Containers & Supply-Chain Informatics

- 1970: The International Organization for Standardization (ISO) formalizes container dimensions
- 1970s: Barcodes (UPC) and digital ordering systems (EDI) automate retail & warehouse operations
- 1990s: "Just-in-time" production links factories and suppliers into global supply chains
- 2000s: RFID, AIS ship tracking, and satellite logistics knit real-time, end-to-end visibility

1990s: The Internet

- 1991: HTTP/HTML and the web's client-server paradigm standardize web publishing
- 1991-93: Unicode/UTF-8 enable a multilingual web and global text interoperability
- 1993: CERN releases the World Wide Web into the public domain
- 1993: Mosaic, the first popular browser; 1994: Netscape; 1995: Internet Explorer
- 1994-96: SSL/TLS; cookies; HTTPS
- 1995: Rise of personal homepages (Geocities); early search engines (Yahoo, Altavista)
- Banner ads define this first stage of ad-supported web

1994-2000: dot-com boom

- 1994: Yahoo; Amazon, eBay (1995); Google (1998)
- 1996: Hotmail; Yahoo Mail (1997)
- 1996: ICQ; AIM (1997); PayPal (1998); Napster, Blogger (1999)
- 1998 Tencent (later WeChat); Alibaba (1999); first major companies of the Chinese internet
- 2000: dot-com crash

2004-2010: Web 2.0 & Social Media

- Precursors to social web: Wikipedia (2001), Friendster (2002)
- Web 2.0 started around 2003-04 with MySpace and Facebook on desktop
- In 2007, iPhone fuels Web 2.0 by merging the internet, touch interface, and apps into one device
- Platforms: MySpace (2003), Facebook (2004), YouTube (2005), Twitter/X (2006), Tinder (2012)
- Devices: iPhone (2007), iPad (2010)
- Crowdwork¹⁶ and microwork¹⁷ (Amazon Mechanical Turk, 2005)
- Influencer economies with user-generated content (UGC) monetized by targeted ads (AdSense)

2008-2020s: Blockchain Technology and Cryptographic Networks

- 2008: "Satoshi Nakamoto" publishes the Bitcoin whitepaper
- 2009: Bitcoin network launches, enabling decentralized consensus via proof-of-work
- 2010: First exchange (bitcoinMarket.com) and real-world transaction ("10,000 BTC pizza")
- 2015: Ethereum introduces smart contracts, enabling decentralized applications (dApps)
- 2017-2020s: Layer-2 scaling; proof-of-stake; stablecoins expand transaction/design space
- 2020-2022: DeFi protocols create programmable finance¹⁸
- 2021: Non-Fungible Tokens (NFTs) standardize digital ownership (ERC-721); virtual land
- 2020s: Central bank digital currency (CBDC) pilots test state-run programmable money

2008-2020s: App & Gig Economies

- With the Apple App Store (2008), gig work on mobile labour platforms started to emerge
- Massive adoption of smartphones made these new economies possible
- Machine learning, deep learning, neural networks, GPU acceleration
- The entire system is enabled by GPS, app stores, and integrated mobile payment systems
- Recommendations by big-data algorithms dominate content discovery

16 Crowdwork: online work distributed to large groups of people through digital platforms.

17 Microwork: a type of crowdwork where tasks are quick and repetitive, like labeling images.

18 DeFi: a blockchain-based system that lets people use financial services without banks or intermediaries.

- In-app payments/subscriptions reshape monetization
- Streaming and creator economies: Spotify, Netflix, Twitch, Patreon (2013), Substack (2017)
- Platforms: Airbnb (2008), Uber (2009), DoorDash (2013), Upwork (2015), OnlyFans (2016)
- Emerging issues: Net-neutrality¹⁹ and platform governance²⁰

19 Net-neutrality: internet providers treat internet traffic equally, and do not slow down, block, or charge extra for specific websites or services.

20 Platform governance: how digital platforms set and enforce rules for how users, content, and data are managed and controlled.

2010s-2020s: Later Satellites

- 2010s: CubeSats make satellite technology widely accessible²¹
- 2015: The shift from state to corporate space networks²²
- 2019-2020s: Low-Earth-orbit satellites offer real-time global broadband connectivity²³
- 2020s: Reusable rockets make continuous satellite renewal economically viable

2010s-2020s: Machine Learning, Neural Networks

- 2012: ImageNet breakthroughs make deep learning mainstream by excelling at image recognition
- 2014: Breakthroughs in big data algorithms, deep learning and GPU computing
- 2017: Transformer architectures unlock large-scale language modeling (LLM)
- 2018-2020s: Specialized AI hardware (GPUs, TPUs) supply chains become geostrategic bottlenecks

2020s: The Rise of AI

- chatGPT (December 2022), other LLMs and AI tools
- AI Art: DALL-E, Midjourney, Stable Diffusion
- Hidden recommendation algorithms determine what users see on their feeds
- Algorithms operate in closed systems and subtly shape attention, taste, public opinion, culture
- The rise of vertical content
- Competing platforms/algorithms: TikTok, Instagram Reels, YouTube Shorts
- Convergence of creator, gig, and AI labour markets
- Environmental, ethical, and cognitive costs of digital infrastructures become visible themes
- Emerging issues: predictive policing, mass surveillance, big-data profiling, algorithmic control

2020s: 5G and the Internet-of-Things

- The step up from 4G to 5G (from smartphones with apps to instant, always-on AI devices)²⁴
- Cars talk to each other, robots work in factories, doctors perform remote surgeries
- Smart cities
- Emerging issues: Digital ID, AI takeover

21 CubeSats are tiny, modular satellites built by universities, startups, and defence labs. They made satellite deployment cheap and frequent, extending the information network into orbit.

22 Firms like SpaceX, OneWeb, and Amazon began building multi-satellite systems to deliver global internet access, reduce reliance on terrestrial cables, and ensure continuous connectivity across oceans, remote regions, and conflict zones.

23 Thousands of low-Earth-orbit satellites make near-instant data exchange possible from nearly anywhere on Earth, extending the scope of global data infrastructures. Competing networks include: Starlink, OneWeb, Kuiper, Guowang.

24 Brief summary of mobile networks from 1G to 5G:

1980s: 1G; analog cell phones (walkie-talkies with a phone number)

1990s: 2G; GSM technology replacing analog with digital (cell phones with SMS)

2000s: 3G; cell phones with cameras browse the web and send/receive emails (Blackberry devices)

2010s: 4G; smartphones with broadband capabilities (smartphones with apps)

2020s: 5G; always-on intelligent devices communicating with each other, low latency (IoT)