ICT and IoT for Accounting Practitioners

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Introduction

- “An accounting information system (AIS),” according to Wikipedia [1], is a system of collecting, storing and processing financial and accounting data that are used by decision makers.
An accounting information system is generally a computer-based method for tracking accounting activity in conjunction with information technology resources.
Introduction (Cont.)

- The resulting financial reports can be used internally by management or externally by other interested parties including investors, creditors and tax authorities.
Accounting information systems are designed to support all accounting functions and activities including auditing, financial accounting and reporting, managerial/management accounting and tax.
The most widely adopted accounting information systems are auditing and financial reporting modules.
Some organizations performed their own accounting processes in the year 1812, i.e. over 200 years ago.

During the period from the year 1941 to 1945, IBM produced more than 5,000 accounting machines to be used in military logistics.
As of the year of writing this paper, i.e. the year 2016, most accounting has been computerized and some large corporations are using cloud computing for their accounting.
Introduction (Cont.)

- This paper presents timeline of Accounting, ICT, and IoT; Computerized Accounting Information Systems; Trends of Accounting Information Systems; Internet of Things and Accounting, and Accounting Information Systems and Security.
2. Timeline of Accounting, ICT, and IoT

- From the document
  “200 Years of Accounting History Dates and Events” [2],
- “Timeline of Communications and Information Technology” [3],
“Timeline of communication technology” [4],
“History of Computers: A Brief Timeline” [5],
and “TIMELINE OF THE INTERNET OF THINGS” [6],
a partial list of dates and events for Accounting,
ICT, and IoT may be given as follows:
30,000 BC - In ice-age Europe, people mark ivory, bone, and stone with patterns to keep track of time, using a lunar calendar.

14,000 BC - In what is now Mezhirich, Ukraine, the first known artifact with a map on it is made using bone.
Prior to 3500BC - Communication was carried out through paintings of indigenous tribes.

3500s BC - The Sumerians develop cuneiform writing and the Egyptians develop hieroglyphic writing.

200 BC - Chinese abacus
Timeline of Accounting, ICT, and IoT (Cont.)

- 1305 - The Chinese develop wooden block movable type printing.
- 1405 - Johannes Gutenberg finishes a printing press with metal movable type.
- 1455 - Germany / Netherlands
  Johannes Gutenberg and Laurens Coster independently invent movable type.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1520 - Ships on Ferdinand Magellan's voyage signal to each other by firing cannon and raising flags.
- 1623 - Germany
  Wilhelm Schickard builds the first mechanical calculator.
- 1630 - England
  William Oughtred invents the slide rule.
Timeline of Accounting, ICT, and IoT (Cont.)

1642 - France

Blaise Pascal invents a digital machine capable of adding and subtracting. Pascal imagines computers that can solve any logical problem.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1673- Germany
  Gottfried Wilhelm Leibniz completes a mechanical calculator that can add, subtract, multiply, divide, and calculate square roots.
1792 - Claude Chappe establishes the first long-distance semaphore telegraph line.

1801- In France, Joseph Marie Jacquard invents a loom that uses punched wooden cards to automatically weave fabric designs. Early computers would use similar punch cards.
Timeline of Accounting, ICT, and IoT (Cont.)

- **1812** - Textile mills began to perform many accounting processes inside the mills that had previously been performed outside by independent craftsmen.

- **1816** - France
  
  Joseph Nicephore Niepce invents still photography.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1817 - A book on cost accounting was written in France.
- 1818 - USA
  John Bennett conducted double entry bookkeeping instruction in New York.
1822 - England

English mathematician Charles Babbage conceives of a steam-driven calculating machine that would be able to compute tables of numbers. The project, funded by the English government, is a failure. More than a century later, however, the world’s first computer was actually built.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1831 - Joseph Henry proposes and builds an electric telegraph.
- 1832 - An electromagnetic telegraph was created by Baron Schilling in Russia, and in 1833 Carl Friedrich Gauss and Wilhelm Weber invented their own code to communicate over a distance of 1200 m within Göttingen, Germany.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1835 - Samuel Morse develops the Morse code.
- 1837 - USA

  Samuel Morse invents the electromagnetic telegraph and Morse code.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1839 - France
  Louis Daguerre improves still photography using silver iodine.

- 1842 - England
  Ada Lovelace, Countess of Lovelace, documents Babbage’s work and designs programs for the Analytical Engine.
  She is credited as the first software engineer.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1843 - Samuel Morse builds the first long distance electric telegraph line.
- 1844 - Charles Fenerty produces paper from a wood pulp, eliminating rag paper which was in limited supply.
1844, Samuel Morse sends the first morse code public telegraph message "What hath God wrought?" from Washington, D.C. to Baltimore.

1847 - England
George Boole invents symbolic logic, which applies mathematical theory to logic.
This lays the foundation for all-purpose digital computing.

1856 - USA

Italian-born Antonio Meucci develops the first working electromagnetic telephone, but fails to properly market his invention.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1861 - The first income tax law in the U.S. was passed.
- 1872 - England
  Eadweard Muybridge shoots motion studies using a series of still photographs.
Timeline of Accounting, ICT, and IoT (Cont.)

- **1872 - France**
  Emile Baudot invents the printing telegraph, which automatically translates electrical pulses into alphanumerical characters.

- **1876 - Alexander Graham Bell and Thomas A. Watson**
  Exhibit an electric telephone in Boston.
1876 - USA

Alexander Graham Bell and Elisha Gray each attempt to patent the telephone on the very same day. Bell is eventually awarded the patent.
1877 - Germany & USA

The dynamic microphone is independently developed by E.W. Siemens in Germany, and the team of Cuttris and Redding in the US.

1877 - Thomas Edison patents the phonograph.
1878 - USA

Oberlin Smith invents a device which records sound on a spool of magnetic wire, but does not attempt to promote the idea.

This is the forerunner of the modern tape recorder.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1878 - France
  Emile Reynaud invents the Praxinoscope, the first practical motion picture projector.

- 1879 - USA
  Edison demonstrates the carbon-filament incandescent light bulb.
1881- After 1880, predetermined standard rates were developed using time and motion study for labor and a bill of materials for raw materials.

1882 - The Institute of Accountants & Bookkeepers was formed in New York.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1883 - The accounting firm of Barrow, Wade, & Guthrie was founded in New York.
  An accounting course was offered at the Wharton School of Finance & Commerce.

- 1883 - USA
  Edison accidentally discovers the principle of the vacuum tube.
1884 - Germany
Paul Nipkow patents the idea of a scanning disc, the basis of mechanical television.

1884 - USA
George Eastman popularizes flexible photographic film and portable still cameras.
1884 - USA

Herman Hollerith invents a statistical tabulation machine using punched cards.

He founds a company which is later known as International Business Machines, or IBM.

1885 - The Society of Incorporated Accountants and auditors registered under the Companies Act.
Timeline of Accounting, ICT, and IoT (Cont.)

- **1887** - The American Association of Public Accountants (AAPA) is created

- **1888** - USA

  Working for Edison, William K. L. Dickson begins development of the Kinetograph motion picture camera.

  Films are shown using a peephole viewer called the Kinetoscope.
1890 - Practical Book-keeping Adapted to Commercial and Judicial Accounting:
With Sets of Books and Accounts.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1890 - Herman Hollerith designs a punch card system to calculate the 1880 census, accomplishing the task in just three years and saving the government $5 million. He establishes a company that would ultimately become IBM.
1891- The accounting firms Price Waterhouse & Company, and Barrow, Wade, & Guthrie established Offices in Chicago.

1892 - Frederick Ives invents first complete system for natural color photography.
1893 - USA

Edweard Muybridge uses his Zoopraxiscope to project images of human and animal locomotion at the Chicago World’s Fair.

1893 - USA

Nikola Tesla receives over 40 US patents on alternating current, which allows wired transmission of electricity over great distances.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1894 - The American Association of Public Accountants (AAPA) passes a resolution advancing its first standard - related to the balance sheet.
- 1895 - The accounting firm Haskins & Sells was founded in New York.
1896 - New York Governor L. P. Morton signed the first CPA bill into law. The title C.P.A. was to be obtained by professional examination administered by New York University.

1897 - The first State Society of CPAs was founded in New York.
1899 - Christine Ross becomes the first female CPA.

1901 - The Incorporated Public Accountants of Massachusetts attempts to establish and maintain the Incorporated Public Accountant or I.P.A. designation.
1902 - The Federation of Societies of Public Accountants was formed in the U.S. The firm of Ernst & Ernst was formed in Cleveland.

1903 - Du Pont Powder Company is founded, developed a centralized accounting system and began using return on investment.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1904 - The first International Congress of Accountants was held in St. Louis. Cost accounting was being taught in the University of Pennsylvania and New York University.
1905 - The Federation of Societies of Public Accountants merges with the American Association of Public Accountants. The first issue of the Journal of Accountancy is published based on an earlier journal of the Illinois Society of CPAs.
1906 - The U.S. Census Bureau calls a conference on uniform municipal accounting adopting a tentative schedule of standard accounts.

1907 - The Treasury Department changed from single entry to double entry bookkeeping.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1908 - Cole wrote Accounts - Their Construction and Interpretation.
  The "Where got - Where gone" statement was introduced.
  Harvard Business School was founded.

- 1909 - A first U.S. corporation excise tax is levied on corporate income.
  Charles Kettering invents an accounting machine for the National Cash Register Company.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1910 - Cole, W. M. Accounting and Auditing.
  Cree Publishing Company.
- Church, A. H. Organisation by production factors.
- A competent accountant could expect to earn $2,000 per year.
Timeline of Accounting, ICT, and IoT (Cont.)

- **1912** - Keister, D. A. and H. C. White. Keister's Corporation Accounting and Auditing: A Practical Treatise on Higher Accounting...
  The Burrows Brothers Company.
- **1912** - Pennsylvania C.P.A. examinations of November.
1913 - The Federal Reserve banking system is created. The 16th Amendment is ratified permitting federal income tax. Arthur Andersen and Clarence DeLany found Andersen, DeLany & Company. It becomes Andersen & Co. after DeLany leaves.
1914 - The Federal Trade Commission and General Accounting Office are created. Booz forms a management consulting firm that becomes Booz, Fry, Allen, and Hamilton in 1936.
1916 - The AAPA changes its name to the American Institute of Accountants (AIA).
The Association of Collegiate Schools of Business is founded.
The American Association of University Instructors of Accounting is founded in Ohio.
Annual membership dues were $3.00.
1917 - The AIA approves eight rules of professional conduct and provides state boards with a written test for accountants. The first AIA examination was given. The Revenue Act of 1917 imposed the first excess profits tax.
Timeline of Accounting, ICT, and IoT (Cont.)

Timeline of Accounting, ICT, and IoT (Cont.)

  The Hoover system of modern bookkeeping - easy to learn and practical to use. A. W. Shaw Company.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1921: The first Accountant's Index is published.
  Contains 1,578 pages.
  - John Cromwell become the first black CPA.
  - New Mexico passes CPA legislation,
    the last state to do so.
- The American Society of Certified Public Accountants is founded in Washington.

- The Federal Budget and Accounting Act passes creating the General Accounting Office. Today it's called the Government Accountability Office and The Office of Management and Budget.

- The Revenue Act of 1921 permitted the use of the lower of cost or market as a means of pricing inventory.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1922 - The AIA bans contingent fees and most advertising by public accountants and their firms.
  - The ban on advertising lasted until 1978.
  - The Puerto Rico Institute of Accountants was formed.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1923 - The District of Columbia, Alaska, and Hawaii pass CPA laws.
- The American Management Association was founded.
- 1924 - The Board of Tax Appeals was established by the Revenue Act of 1924.
1926 - Nikola Tesla in an interview with Colliers magazine:

"When wireless* is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket."
1927 - General Electric offered a Business Training Course (BTC) emphasizing accounting topics.
This later became the Financial Management Program.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1928 - New York passed a law requiring a CPA candidate to be a college graduate to sit for the exam after January 1, 1938.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1929 - The stock market crashes and the great begins.
- Depression The Dow didn't cover until 1954.
- The AIA set rules of professional conduct.
- 1930 - The NACA "Topical Index" was published.
1931 - The Ultramares case defines the accountants' liability in cases of negligence and fraud.

1932 - The New York Stock Exchange requires listed companies to have audits.
- The Revenue Act of 1932 imposes a gift tax.
Timeline of Accounting, ICT, and IoT (Cont.)

1832 - Baron Schilling of Russia invents an electromagnetic telegraph. One year later, Germans Carl Friedrich Gauss and Wilhelm Weber invent a code to communicate over a distance of 1,200 meters.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1933 - The American Woman's Society of CPAs is founded. A survey finds 105 female CPAs.
- 1934 - The New York Stock Exchange requests the AIA's advice on financial statement formats.
- 1935 - The Social Security Act was enacted establishing payroll deductions by employer and employee.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1936 - The American Society of Certified Public Accountants merges with the AIA (Association of International Accountants).
  - First use of the phrase "generally accepted accounting principles" appears in an AIA report "Examination of Financial Statements".
- The American Association of University Instructors of Accounting was renamed the American Accounting Association (AAA).

- The AAA's Tentative Statement of Accounting Principles Underlying Corporate Financial Statements was published.
1936 - Alan Turing presents the notion of a universal machine, later called the Turing machine, capable of computing anything that is computable. The central concept of the modern computer was based on his ideas.
1937 - J.V. Atanasoff, a professor of physics and mathematics at Iowa State University, attempts to build the first computer without gears, cams, belts or shafts.

1937 - The SEC issued its first accounting release.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1938 - The Institute's Committee on Accounting Procedure (CAP) became the first U.S. accounting standard setting body in the private sector.
- 1939 - The AIA's Committee on Accounting Procedure publishes the first Accounting Research Bulletin.
- The Institute of Internal Auditors is formed.
1940 - The American Accounting Association published William Paton and A. C. Littleton's Introduction to Corporate Accounting Standards. This establishes historical cost valuation and the matching principle (cost attach idea) in the accounting literature.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1941 - Wartime wage and price controls require extensive cost calculations.
- The Institute of Internal Auditors is formed.
- AAA revised its 1936 Statement of Accounting Principles Underlying Corporate Financial Statements.
Timeline of Accounting, ICT, and IoT (Cont.)

- **1941** - Atanasoff and his graduate student, Clifford Berry, design a computer that can solve 29 equations simultaneously. This marks the first time a computer is able to store information on its main memory.
- **1943** - The U.S. began income tax withholding.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1944 - The National Conference of Lawyers and Certified Public Accountants was formed to foster better relationships between the professions.
1945 - The GAO Corporate Audits Division is created to oversee government audits.

- During the period from 1941-1945 IBM produces more than 5,000 accounting machines used in Washington for military logistics.

- The Corporate Audits Division of the General Accounting Office was formed.
1946 - The American Institute of Accountants published Contemporary Accounting.

1946 - Mauchly and Presper leave the University of Pennsylvania and receive funding from the Census Bureau to build the UNIVAC, the first commercial computer for business and government applications.
1947 - William Shockley, John Bardeen and Walter Brattain of Bell Laboratories invent the transistor. They discovered how to make an electric switch with solid materials and no need for a vacuum.
1948 - The National Committee on Municipal Accounting is reactivated and renamed the National Committee on Government Accounting. It publishes 18 pronouncements on state and local accounting over the next 20 years.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1949 - The first AAA Regional meeting was the Southeastern Region held at Georgia Tech in Atlanta, GA.

- 1949 - The barcode is invented when Norman Joseph Woodland draws lines in the sand of a Miami beach. He obtained a patent three years later and changed the retail industry forever.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1950 - The Accounting Hall of Fame is established at The Ohio State University.
- 1950 - Alan Turing, the pioneering British computer scientist, asked: "Can machines think?"
1951 - The first fully electronic computers are used in England. The UNIVAC 1 is delivered to the Census Bureau and some large corporations. - The Federal Government Accountants Association was formed.
1953 - The CAP publishes the first codification of GAAP in Accounting Research Bulletin
- Thomas Coleman Andrews is the first CPA to head the Internal Revenue Service.
1953 - Grace Hopper develops the first computer language, which eventually becomes known as COBOL. Thomas Johnson Watson Jr., son of IBM CEO Thomas Johnson Watson Sr., conceives the IBM 701 EDPM to help the United Nations keep tabs on Korea during the war.
1954 - The FORTRAN programming language is born.


1955 - A cigarette-sized analog device becomes the first wearable mobile computer. Edward O. Thorp creates it with 12 transistors to predict roulette outcomes.
1956 - The Commission on Standards of Education and Experience for CPAs recommends a five-year accounting degree as qualification to become a CPA (The Perry Report).
1957 - The first computer time-sharing systems were developed.

- The American Institute of Accountants (AIA) became the American Institute of Certified Public Accountants (AICPA).
1958 - First issue of The Journal of the Academy of Management was published.

1958 - Jack Kilby and Robert Noyce unveil the integrated circuit, known as the computer chip. Kilby was awarded the Nobel Prize in Physics in 2000 for his work.
 1959 - The Accounting Principles Board replaces the CAP (The Committee on Accounting Procedure) as the Institute's authoritative financial accounting body.
1962 - The first issue of CFO Magazine was published.
1963- First issue of the Journal of Accounting Research is published.
1964 - Douglas Engelbart shows a prototype of the modern computer, with a mouse and a graphical user interface (GUI). This marks the evolution of the computer from a specialized machine for scientists and mathematicians to technology that is more accessible to the general public.
1965 - Congress passes a law allowing CPAs to represent clients before the IRS.
- The American Accounting Association recommends that accounting professors should have doctorates.
1966 - The AAA issues A Statement of Basic Accounting Theory (ASOBAT) that proposes evaluating accounting information based on its relevance, verifiability, freedom from bias, measurability and user orientation.
1966 - Karl Steinbuch a German computer science pioneer said "In a few decades time, computers will be interwoven into almost every industrial product"
1967 - The AICPA and the Carnegie Corp issue Horizons for a Profession recommending a common body of knowledge for accounting students and a five-year education requirement.

- The Department of Defense creates ARPANET, eventually linking computers across the country and leading to the creation of the Internet.
1968 - The National Committee on Governmental Accounting publishes authoritative GAAP for state and local governments

1969 - The National Association of Black Accountants is organized in New York City.
1969 - 19 years after Alan Turing's question, the internet was developed.

1969 - The birth of the internet stems from ARPANET, which connects UCLA and Stanford universities.

1970 - The newly formed Intel unveils the Intel 1103, the first Dynamic Access Memory (DRAM) chip.
1970 - The Stanford Car is unveiled, becoming the first "smart car" Built for lunar exploration, it is controlled remotely and features a wireless video camera.

1971 - The American Accounting Association calls for an alternative to the Accounting Principles Board.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1972 - The American Association of Hispanic Certified Public Accountants (Now ALPFA) becomes the first national Latino professional association in the U.S.
- National Association of Accountants (NAA) established Certificate in Management Accounting.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1973 - Mario Cardullo patented the first passive RFID tag.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1974 - The AICPA (American Institute of Certified Public Accountants) appointed the Cohen Commission on Auditors' Responsibilities.

1976 - Congress's Moss and Metcalf committees recommend increased federal regulation of the auditing profession and a government takeover of standard setting.
1977 - Radio Shack's initial production run of the TRS-80 was just 3,000. It sold like crazy. For the first time, non-geeks could write programs and make a computer do what they wished.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1978 - Accountants rejoice at the introduction of VisiCalc, the first computerized spreadsheet program.

- 1978 - The SEC's Accounting Series Release 250 requires companies to disclose the ratio of non-audit to audit fees.

- The Cohen Report indicates that there is an "expectations gap" between what auditors do and what the public expects them to do.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1979 - The SEC's Accounting Series Release 264 attempts to restrain the provision of non-audit services to audit clients. Both ASR 250 and 264 were rescinded.
- The Osborne 1 portable CP/M based computer was introduced with a 5 inch screen, two floppy-disk drives, 64K of RAM and it could fit under an airplane seat.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1980 - NBC TV “If Japan Can, Why Can’t We?”
  A lecture on quality basics
  Inspection does not build quality.
  Quality is already made before you inspect.
- 1981 - The first issue of
  “Auditing: A Journal of Practice and Theory”
  was published.
1982 - The SEC begins developing an electronic disclosure system.

- Lotus 1-2-3 revolutionizes accounting for small and midsize businesses.

- Kaypro Corporation began designing a personal computer named the KayComp.
- This became the Kaypro II, a CP/M based computer set in an aluminum case, with 64K of RAM, and two 5¼-inch floppy disk drives. It weighs 29 pounds and originally sold for $1,795. The 9 inch screen or CRT was larger than the Osborn's 5" screen.
1982 - First connected Coke vending machine, set up at Carnegie Mellon University's School of Computer Science. Students wanted to check from their desks if the machine was loaded with their favorite chilled soft beverage.
1983 - Apple’s Lisa is the first personal computer with a GUI. It also features a drop-down menu and icons. It flops but eventually evolves into the Macintosh. The Gavilan SC is the first portable computer with the familiar flip form factor and the first to be marketed as a “laptop.”
Timeline of Accounting, ICT, and IoT (Cont.)

- 1983 - The first issue of
  “Issues in Accounting Education” was published.
  - The first issue of the
    “Journal of Accounting Education” was published.
- 1984 - Domain Name System is introduced
1985 - The first issue of IMA Cases was published.

1985 - Microsoft announces Windows, its response to Apple’s GUI.

Commodore unveils the Amiga 1000, which features advanced audio and video capabilities.
1986 - Compaq brings the Deskpro 386 to market. Its 32-bit architecture provides as speed comparable to mainframes.
1986 - The Tax Reform Act of 1986 was signed into law
- The IRS launches a pilot program for the electronic filing of tax returns.
- Intel delivers the 386, the first 32-bit PC processor.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1987 - The AICPA celebrates its 100th anniversary.
  - The AICPA introduced the Personal Financial Specialist credential.
  - The first issue of Accounting Today was published.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1988 - The AICPA approves the 150 hours of education for new members requirement after the year 2000.
- The Cost Accounting Standards Board was dissolved in 1980 and permanently re-established in 1988.
1989 - The first issue of Behavioral Research in Accounting is published.

- The first issue of the Journal of Management Accounting Research is published.

- Tim Berners-Lee creates HyperText Markup Language or HTML.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1989 - Tim Berners-Lee proposes the World Wide Web
- 1989 - The House of the Future, built in the Netherlands, provides a visionary insight for consumers into how the future may look. The house focused on interaction between man and machine (involving voice recognition).

- IRS e-file goes live.

1990 - Tim Berners-Lee, a researcher at CERN, the high-energy physics laboratory in Geneva, develops HyperText Markup Language (HTML), giving rise to the World Wide Web.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1990 - AT&T develops the first active badge system, using infrared signals to communicate someone's location.
- 1991 - The first web page was created by Tim Berners-Lee
1991 - Mark Weiser's Scientific American article on ubiquitous computing called ‘The Computer for the 21st Century’ is written. The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it’.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1992 - The first issue of Advances in Management Accounting is published.
- 1993 - The Pentium microprocessor advances the use of graphics and music on PCs.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1993 - The first webcam is created to monitor a coffee pot.
- 1993 - The first smartphone is shown to the public, although the term "smartphone" doesn't become widely used until 1995.
1994 - The "Forget-Me-Not" is first demonstrated. It's a wearable device that uses wireless transmitters to record interactions with people and devices while storing the information in a database.

1994 - Bluetooth is invented as an alternative to RS-232 data cables to connect keyboards and phones to computers.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1994 - Steve Mann creates WearCam.
- 1994 - PCs become gaming machines as "Command & Conquer," "Alone in the Dark 2," "Theme Park," "Magic Carpet," "Descent" and "Little Big Adventure" are among the games to hit the market.
1995 - The AICPA launches the CPA Vision Project to define the future of the profession.

- Windows 95 launches turning what was a shell on top of DOS into a complete operating system. This effectively kills MS-DOS.

1995 - The Internet goes commercial with Amazon and Echobay (Ebay)
1996 - More AICPA members are employed in industry than in public accounting firms.
- The CFM exam was established and was offered until 2006.
- First issue of Review of Accounting Studies is published.

1996 - Sergey Brin and Larry Page develop the Google search engine at Stanford University.
1997 - Microsoft invests $150 million in Apple, which was struggling at the time, ending Apple’s court case against Microsoft in which it alleged that Microsoft copied the “look and feel” of its operating system.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1997 - The AICPA offers the first exam for the Accredited in Business Valuation credential.
  - DVD players and discs go on sale.
- 1997 - Paul Saffo's prescient article "Sensors: The Next Wave of Infotech Innovation"
  (Via: Geoffrey Barrows)
Timeline of Accounting, ICT, and IoT (Cont.)

- 1998 - Google is incorporated
- 1998 - The IRS is restructured and modernized.
  - PricewaterhouseCoopers was created by a merger.
  - The Digital Millennium Copyright Act exempts internet sites from copyright liability provided that they comply with DMCA takedown notices.
1998 - An MIT project known as "inTouch" presents a "tangible telephone" for long distance tactile communication.
1998 - the INTEGER Millennium House, the first smart home, has its first public demonstration. It features intelligent heating, security systems, irrigation, closed-circuit TV and automatic locks. Except for security, the systems all automatically turn off when the house is empty.
1999 - The AICPA council recognizes The Federal Standards Advisory Board as a body entitled to establish GAAP standards for federal government entities.
- The first issues of Management Accounting Quarterly and Strategic Finance are published.
- The first 802.11 standards for wireless networking are adopted the Wi-Fi Alliance is founded to promote and certify products.
Timeline of Accounting, ICT, and IoT (Cont.)

- 1999 - The term Wi-Fi becomes part of the computing language and users begin connecting to the Internet without wires.
- 1999 - Neil Gershenfeld was speaking about similar things from the MIT Media Lab in his book When Things Start to Think and when establishing the Center for Bits and Atoms in
Timeline of Accounting, ICT, and IoT (Cont.)

- 2000 - Starting off what is now becoming a meme, LG announces its first Internet refrigerator plans.

- 2000 - The AICPA introduces the Certified Information Technology Professional designation.
  - The first issue of International Journal of Accounting Information Systems is published.
  - The first issue of the Journal of Forensic Accounting is published.
2000 - GPS becomes widely used by the public. Although the technology has been available since the 1980s, a bill signed by President Clinton forbade the military from scrambling satellite signals and allowed for accurate use by civilians.
Timeline of Accounting, ICT, and IoT (Cont.)

- 2001 - The International Accounting Standards Committee is renamed the International Accounting Standards Board.
- Enron restates its earnings back to 1977 and files for bankruptcy.
- Arthur Andersen collapses due to its association with Enron.
- The first issue of Accounting and the Public Interest is published.
- The first issue of Advances in Environmental Accounting & Management is published.
- Windows XP merges Windows 2000 and ME into a unified 32-bit operating system.
Timeline of Accounting, ICT, and IoT (Cont.)

- 2001 - Apple unveils the Mac OS X operating system, which provides protected memory architecture and pre-emptive multi-tasking, among other benefits. Not to be outdone, Microsoft rolls out Windows XP, which has a significantly redesigned GUI.
2002 - The FASB and the International Accounting Standards Board agree to remove differences between international standards and U.S. GAAP.
- Electronic signatures are allowed for e-filed returns.
- WorldCom's accounting fraud is discovered and the company files for bankruptcy.
- The Sarbanes-Oxley Act is passed creating the Public Company Accounting Oversight Board (PCAOB) to set public company auditing standards.
- The first issue of the Journal of International Accounting Research is published.
- Tablet PCs appeared
- Arthur Andersen LLP is convicted of obstruction of justice and the firm unravels.
2002 - The Ambient Orb created by David Rose and others in a spin-off from the MIT Media Lab is released into the wild (and is still on the market) with NY Times Magazine naming it as one of the Ideas of the Year. The Orb monitors the Dow Jones, personal portfolios, weather and other data sources and changes its color based on the dynamic parameters.
Timeline of Accounting, ICT, and IoT (Cont.)

- 2003 - The first 64-bit processor, AMD’s Athlon 64, becomes available to the consumer market.
- 2004 - Mozilla’s Firefox 1.0 challenges Microsoft’s Internet Explorer, the dominant Web browsers. FaceBook, a social networking site, launches.
2005 - The IoT hit another level when the UN's International Telecommunications Union ITU published its first report on the topic. "A new dimension has been added to the world of information and communication technologies (ICTs): from anytime, any place connectivity for anyone, we will now have connectivity for anything."
Connections will multiply and create an entirely new dynamic network of networks – an Internet of Things“

- 2005 - YouTube, a video sharing service, is founded.
- Google acquires Android, a Linux-based mobile phone operating system.
2006 - Apple introduces the MacBook Pro, its first Intel-based, dual-core mobile computer, as well as an Intel-based iMac. Nintendo’s Wii game console hits the market.

2007 - The iPhone brings many computer functions to the smartphone.
2008 - A group of companies launched the IPSO Alliance to promote the use of Internet Protocol (IP) in networks of "smart objects" and to enable the Internet of Things. The IPSO alliance now boasts over 50-member companies, including Bosch, Cisco, Ericsson, Intel, SAP, Sun, Google and Fujitsu.
Timeline of Accounting, ICT, and IoT (Cont.)

- 2008 - The FCC voted 5-0 to approve opening the use of the 'white space' spectrum
- 2008 - The number of connected devices surpasses the number of people in the world.
Timeline of Accounting, ICT, and IoT (Cont.)

- 2009 - Microsoft launches Windows 7, which offers the ability to pin applications to the taskbar and advances in touch and handwriting recognition, among other features.
- 2010 - Apple unveils the iPad, changing the way consumers view media and jumpstarting the dormant tablet computer segment.
Timeline of Accounting, ICT, and IoT (Cont.)

- **2010** - Chinese Premier Wen Jiabao calls the IoT a key industry for China and has plans to make major investments in it.
- **2011** - Google releases the Chromebook, a laptop that runs the Google Chrome OS.
- **2011** - The creation of the IoT-GSI Global Standards Initiative, which offers a unified approach for developing technical standards and supporting IoT on a global scale.
Timeline of Accounting, ICT, and IoT (Cont.)

- **2012** - Facebook gains 1 billion users on October 4.
- **2015** - Apple releases the Apple Watch.
  Microsoft releases Windows 10.
- **2015** - AT&T releases its first Cybersecurity Insights report.
- **2016** - AT&T releases its second "Cybersecurity Insights" report, which focuses on securing IoT.
It may be said that there are three ways to do accounting. They are:

2) By use of Accounting Machine.
3) Computerized.
In case of using a manual accounting system, the document “What is a manual accounting system?”[7], states that a manual accounting system is a method of keeping financial records with a written ledger of transaction, without using accounting machine or computer.
The advantages of the manual accounting system are that it costs less, and is more secure because it cannot be hacked thru the computer system.
The main disadvantages of the manual accounting system are that it is
1) prone to mistakes with no software to confirm calculations,
2) prone to destruction by fire or flood,
3) take more time to get requested document in an audit,
4) the bookkeeper in the manual accounting system has to be more knowledgeable in accounting principles than the bookkeeper who use software in the computerized accounting system.
Manual accounting method may be best for small business but not for large organizations.
In case of using Accounting Machine, the main advantages [8] are:

1) The work done in accounting machine is neat and accurate.

2) The entries done by this machine are legible and tidy.

3) The machine reduces fatigue and mental strain.
4) It ensures quick balancing of ledgers and accounts are kept up-to-date and presented to management.

5) It enables to save time and labor and also avoid monotony in work.

6) It ensures quick presentation of final account to share holders.
In case of using Computerized Accounting System, nine advantages have been cited [9]. They are:

1) Accuracy: With a fully tested and reliable hardware and software, the result would be accurate;
2) Automation: All accounting processes are automated in Computerized Accounting System without the time-consuming processes in the manual system;

3) Cost-effective: there are many online computerized accounting systems available in the market to choose from to make it cost-effective;
4) Data Access: With Online Computerized Accounting System, data can be accessed anywhere and anytime;

5) Reliability: A financial statement prepared by a fully tested computerized accounting system is reliable;
6) Speed: With Computerized Accounting System, accounting statements and reports can be generated at a click of a button;

7) Security: data and reports can be backup securely on backup computer systems;
8) Cost-effective: there are many computerized accounting system for the user to choose to make it as cost-effective as desired;

9) Visual: with computerized accounting system, users can chooses the format of presentation to suit their preferences.
It may be said that “Computerized Accounting Information System (CAIS)” is a computerized method of recording and accessing information about the accounting activities that take place in a business or organization.
Documentation and related activities that used to be done with paper and pencils are done with computer hardware and sophisticated software, and that the fundamentals of the accounting functions remain the same.
From the document “Newest Trends In Accounting Information Systems” [10] there are six basic fundamental components of AIS:

1) The first component of AIS is the people. They include managers, sales persons, accounts receivable employees, accounts payable employees, auditors, and customers.
2) The second component of AIS is the procedures and instructions to handle the accounting data including collection, storage, retrieval, and processing.

3) The third component of AIS is the data applicable to the financial operation of the business.
4) The fourth component of AIS is computer hardware.
5) The fifth component of AIS is the software
6) The sixth component of AIS is Security.
There are four main subsystems of AIS:

1) The transaction processing systems (TPS) to gather and store data and information about the financial transactions.

2) The general ledger system (GLS) to summarize accounting cycle activities.
3) The financial reporting system (FRS) to produce reports about the financial status of the business.

4) The management reporting system (MRS) to provide details organizational performance and health.
It may be said that the most talk-about trend related to AIS is Cloud Computing.

From Wikipedia [11], “Cloud computing is a type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand."
It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., computer networks, servers, storage, applications and services) which can be rapidly provisioned and released with minimal management effort.
Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third-party data centers that may be located far from the user—ranging in distance from across a city to across the world.
Cloud computing relies on sharing of resources to achieve coherence and economy of scale, similar to a utility (like the electricity grid) over an electricity network.”
There are 4 main service models in Cloud Computing. They are:

1) Infrastructure as a service (IaaS).
2) Platform as a service (PaaS).
3) Software as a service (SaaS).
4) Mobile "backend" as a service (MBaaS).
From the document

“3 Biggest Trends in Accounting Technology for 2016” [12], the 3 biggest trends in the year 2016 for Accounting are:
1) Cloud accounting will be more and more popular.
There was a survey in the year 2016
with the result that 4 out of 10 accounting
software packages are using cloud.
2) Optical Character Reader (OCR) will be used more and more in reading the input documents in accounting systems.

3) Accounting managers will have to provide training for the accounting staff members to use cloud accounting and OCR, as well as re-distribute the work load.
5. Internet of Things and Accounting

From the paper "Internet of Things Applications in Smart World, City, Home, Government, Business, Education, and Others." [13],

“Internet of Things (IoT) is the network of all kinds of things embedded with sensors, electronics, software, and etc.
The first two examples of sensors are shown in Figures 1 and 2.

Figure 1. A Sensor the size of your finger tip.
(Source: http://www.libelium.com/top_50_iot_sensor_applications_ranking/)
Figure 2. Samples of various Sensors
(Source: http://www.libelium.com/top_50_iot_sensor_applications_ranking/)
Two examples will be mentioned here.
The first example is from Libelium.com which mentioned more than 50 applications.
The second example is from Beecham Research which mentioned IoT applications in 9 groups:

1) Buildings
2) Energy
3) Consumer and Home
4) Healthcare and Life Science
5) Industrial
6) Transportation
7) Retail
8) Security and Public Safety
9) IT and Networks
Supposed everything concerning you has been equipped with sensors and connected to the Internet. Starting in the morning when you move yourself to get up from bed.
The mattress notices your movement and recognize that you are getting up.

So, the mattress send several messages, e.g. the first message to the bedroom lighting switches to turn the light on from the bedroom to the bathroom.
The second message to the bathtub to prepare water at the temperature you like.

The third message to the television set in the bathroom to turn TV on with the channel you usually watch in the morning.
While you are in the bathtub, the fourth message is sent to the robot in the kitchen to prepare your breakfast.

The Internet checks your schedule at the office and compares it with the time you are in the bathroom.
The Internet may display message on your TV screen that you will be late for the first appointment at the office and send message to your secretary to postpone the first meeting, and so on so forth.”
From the document

“What does The Internet of Things IoT have to do with the accounting profession? Everything!!” [14], sample impacts of IoT on accounting mentioned in the document are:
1) Banks and payroll are feeding data directly into the system.

2) Salespeople are creating invoices directly from their iPhones.

3) Invoices are being inputted directly from iPhones by people purchasing goods.
4) IoT is outputting amazingly accurate accounts with no input from the accountant.

5) SMEs are now demanding advice that doesn't just mark compliance time but helps them shape their business for the future.
6) SMEs now have access proactive, sophisticated advice -- putting them on a level playing field as their larger counterparts.

7) The accountants need to step up and offer proactive advice using this data to drive profitable growth for their clients and therefore drive increased value for their practice.
8) Accountants, and providers in all professions need to find new ways to be part of the new service-driven world.”
From the article “The end of the accounting profession as we know it?” [15], the author interviewed “Daniel Susskind” who is an Oxford lecturer.
Some of his comments Susskind said about his paper entitled “Will Robots Replace Accountants?” to be presented at a Conference on 29 September 2016 are:

1) Professionals will use increasingly sophisticated technologies to enhance their traditional ways of working.
Some of his comments Susskind said about his paper entitled “Will Robots Replace Accountants?” to be presented at a Conference on 29 September 2016 are:

1) Professionals will use increasingly sophisticated technologies to enhance their traditional ways of working.
2) Technology does not simply streamline and optimize that traditional approach. It actively displaces the work of traditional professionals.”
3) Increasingly capable systems and machines will begin to take on more of the roles that are usually associated with traditional professionals.
4) On eBay, every year about 60 million disputes arise and those disputes are resolved online without any traditional lawyers using what is called “an e-mediation platform”. That is 40 times the number of civil claims that are filed in the entire English and Welsh justice system.
From another article “#IoT Empowering Accounting Professionals and their Clients”[16], the following advantages of IoT were given:

1) As a small business owner, an accountant can use IoT to manage their mileage tracking and expense reimbursement.
2) IoT can be used by a client to manage their vehicle assets.

3) IoT simplifies the tax-time accounting and reporting for the tax preparer year after year.
6. Accounting Information Systems and Security

The document “Accounting Information Systems & Security” [17], states the followings:

1) Accounting systems contain confidential information.
2) Confidential information should be kept safe and secure at all times.
3) The consequences of unauthorized access can be devastating from identity theft problems to loss of irreplaceable data.

4) When accounting data is changed or deleted on purpose or by chance, it creates havoc in the accounting department, calling into question the reliability or accuracy of all data.
5) Physical Security.

5.1) A small business should safeguard its computer systems against losses and theft.

5.2) Keep systems and servers in a safe place not exposed to the elements.

5.3) Doors of the room with accounting computers must be locked, limiting unauthorized access.
5.4) Cables connecting accounting equipment must be safe and away from people tripping on them or rodents destroying them.

5.5) Keep cables and switches in a locked environment.

5.6) If there are wireless connections for network or Internet access, follow security protocols.
5.7) It is relatively easy to hack into wireless systems. If you use laptop computers, consider purchasing software that tracks the whereabouts of the computer. In 2008, a laptop computer was stolen every 53 seconds from restaurants, airport lounges and hotel rooms.
6) Authentication.

6.1) Enforce the use of User names and password

6.2) Enforce a password change, e.g. every 90 days.

6.3) Enforce of limited access to only certain sub-accounting systems, and/or certain reports for each employee.
7) For Virus and Malware Protection:

Enforce the use of anti-virus software, firewalls and other security measures.

8) Backup.

8.1) Back up data and save the backup in a safe place outside the premises so that if there are fires, floods or other losses, data is safe and can be restored.
9) System Repair.

When your system needs to be fixed, you may be opening your files and confidential information to those who repair the system.
Texas requires special licensing for those who repair computers, with penalties for those who skirt this law.

When a computer system used for accounting is sold or given to another party, it may still contain confidential information in its hard drive.

Get your system cleaned up by a professional before donating or selling it.
From the report “Reducing the Threat Levels for Accounting Information Systems: Challenges for Management, Accountants, Auditors, and Academicians” [18], the U.S. Department of Homeland Security (DHS) developed the color-coded security alert system:

1) Red for a “severe” threat to national security,
2) Orange for a “high” threat,
3) Yellow for an “elevated” threat,
4) Blue for a “guarded” threat, and
5) Green for a “low” threat.
From the article “Top 10 Problems in Computerized Accounting System” [19], the top 10 problems are:

1) Theft of Computer Time:

   It is very easy to steal computer time, e.g. to play games and to communicate with your friends.
2) Manipulation of Programs: There have been cases of computer programs manipulated, modified or deleted.

3) Theft of Data: When someone takes your property, it is easy to recognize but someone takes your data, he copied it without your knowing at all.
4) Stealing Software: Similar to the case of copying your data, someone can easily copy your software without your knowledge.

5) Controlling Access: Physical and electronic access control techniques including keyboard locks, automatic logs, restricted access to systems and limited after-hour use.
Accounting
Information Systems and Security (Cont.)
6) Passwords: Passwords should be used at all levels of system and should be changed frequently.

7) Backup Copies: It is necessary to backup all software and data.

8) Security for Backup: Backups should be kept in secure place.
9) Network Control: Should not allow unauthorized access to your computer network.

10) Data Encryption: All data should be encrypted so that when accessed, the penetrator would not understand the meaning of the data.
There are implications to all parties concerned:

1) Implications for Management:
Managers must provide reasonable assurance regarding the reliability of financial reports.
2) Implications for Accountants and Auditors:

Accountants must be knowledgeable of security threats and appropriate control techniques in order to protect their own information systems and to advise businesses about security risks.
Auditors must plan and perform the audit to obtain sufficient evidence that audit risk will be limited to a level that is, in his or her professional judgment, appropriate for expressing an opinion on the financial statements with “reasonable assurance.”
3) Implications for Academics: Educators must provide students with a framework for understanding the need for IT security and the importance of working with others to develop policies, processes, and technology to address the threats.
7. Concluding Remarks

- An accounting information system (AIS) has been used manually in the year 1812.
- Then, during the period from 1941-1945, IBM produced more than 5,000 accounting machines to be used in military logistics.
As of the year of writing this paper, i.e. the year 2016, most accounting has been computerized and some large corporations are using cloud computing and Internet of Things (IoT) in accounting.
This paper presents timeline of accounting, Information and Communication Technology (ICT), and IoT; Computerized Accounting Information Systems; Trends of Accounting Information Systems; Internet of Things and Accounting; and Accounting Information Systems and Security.
Concluding Remarks (Cont.)

- With the very fast progress of applications of the Internet and Internet of Things in accounting, all parties concerned should search the Internet regularly to find documents on new development to study and consider how to apply them for the benefit of himself, his organization, his country, and eventually, the world.
References


8. Arkupal Acharya. “What are the main advantages of accounting machines?”


References (Cont.)

20. Aicpa.org. “PROPOSED DESCRIPTION CRITERIA FOR MANAGEMENT’S DESCRIPTION OF AN ENTITY’S CYBERSECURITY RISK MANAGEMENT PROGRAM”.

http://www.aicpa.org/InterestAreas/FRC/AssuranceAdvisoryServices/DownloadableDocuments/ExposureDrafts/ASEC_ED_Criteria_Cyber_Engagement.pdf

Thank You