Global Competition in Microprocessor Industry

by

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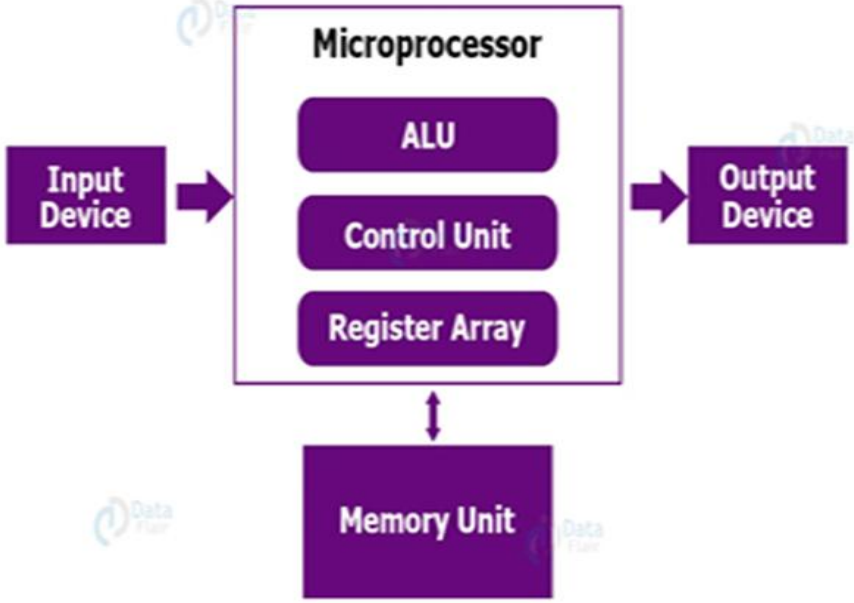
MICROPROCESSOR TECHNOLOGY

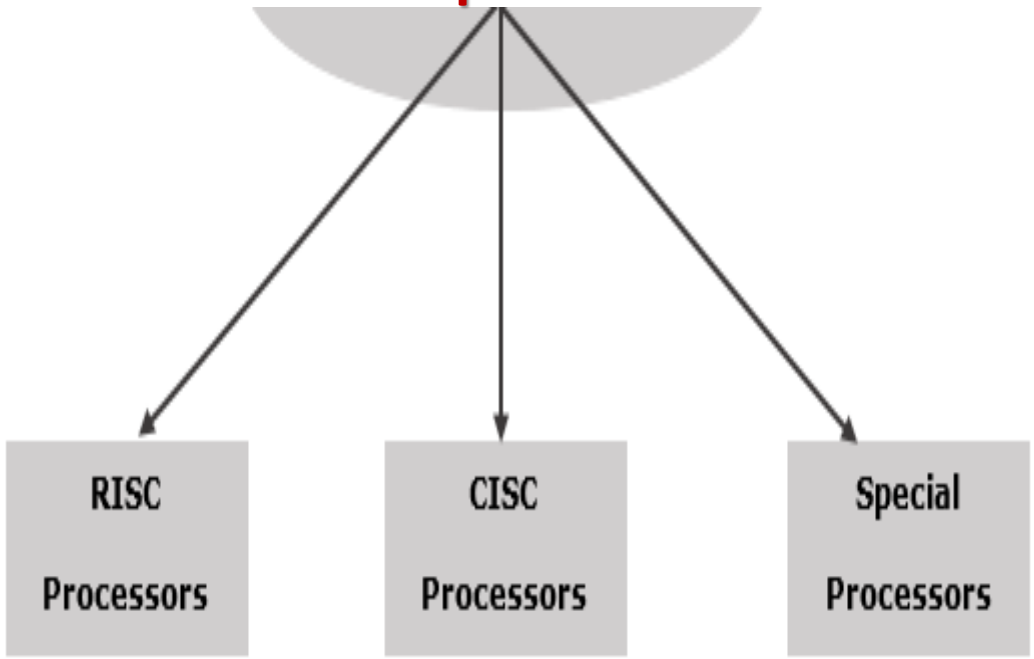
Microprocessor

Any of a type of miniature electronic device that contains the arithmetic, logic, and control circuitry necessary to perform the functions of a digital computer's central processing unit.

Block Diagram of Microprocessor



Microprocessor



Types of Microprocessor – RISC & SISC

RISC

Emphasis on software

Small number of fixed length instructions

Simple, standardised instructions

Single clock cycle instructions

Heavy use of RAM

Low cycles per second with large code sizes

CISC

Emphasis on hardware

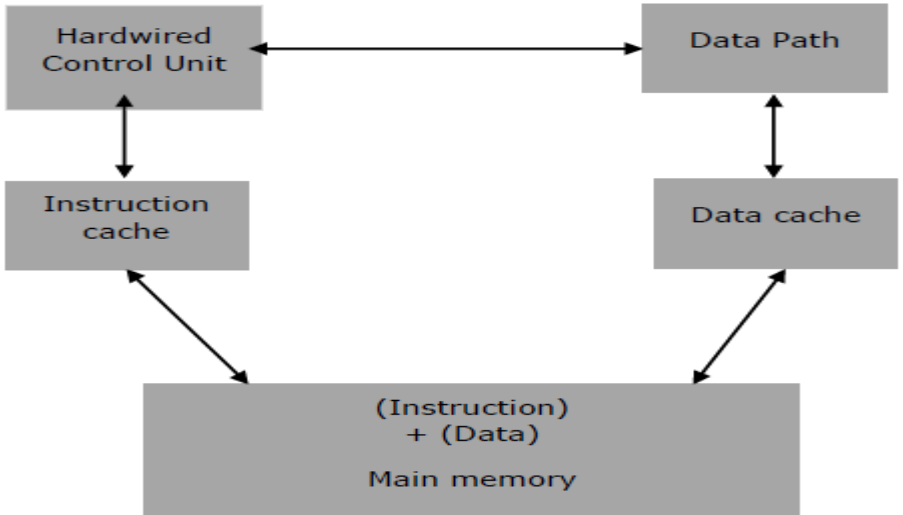
Large number of instructions

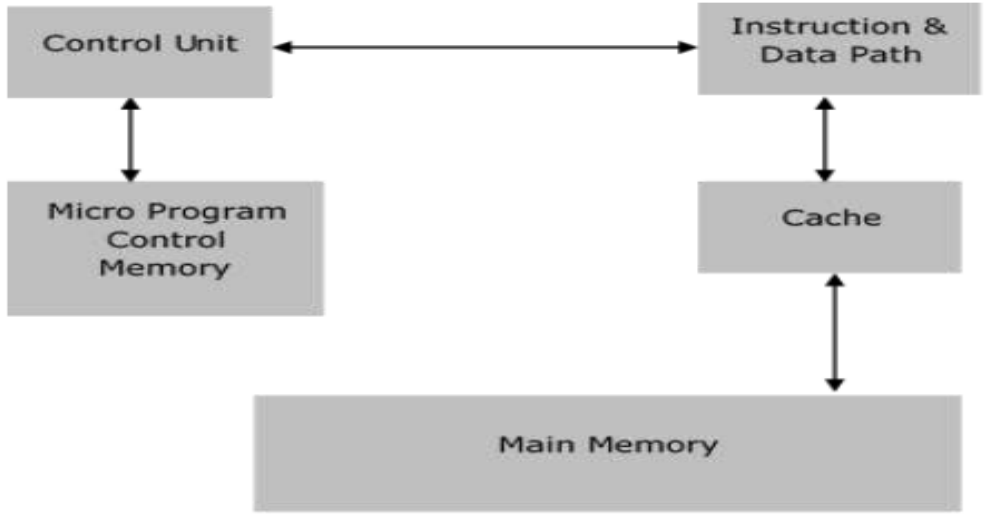
Complex, variable-length instructions

Instructions can take several clock cycles

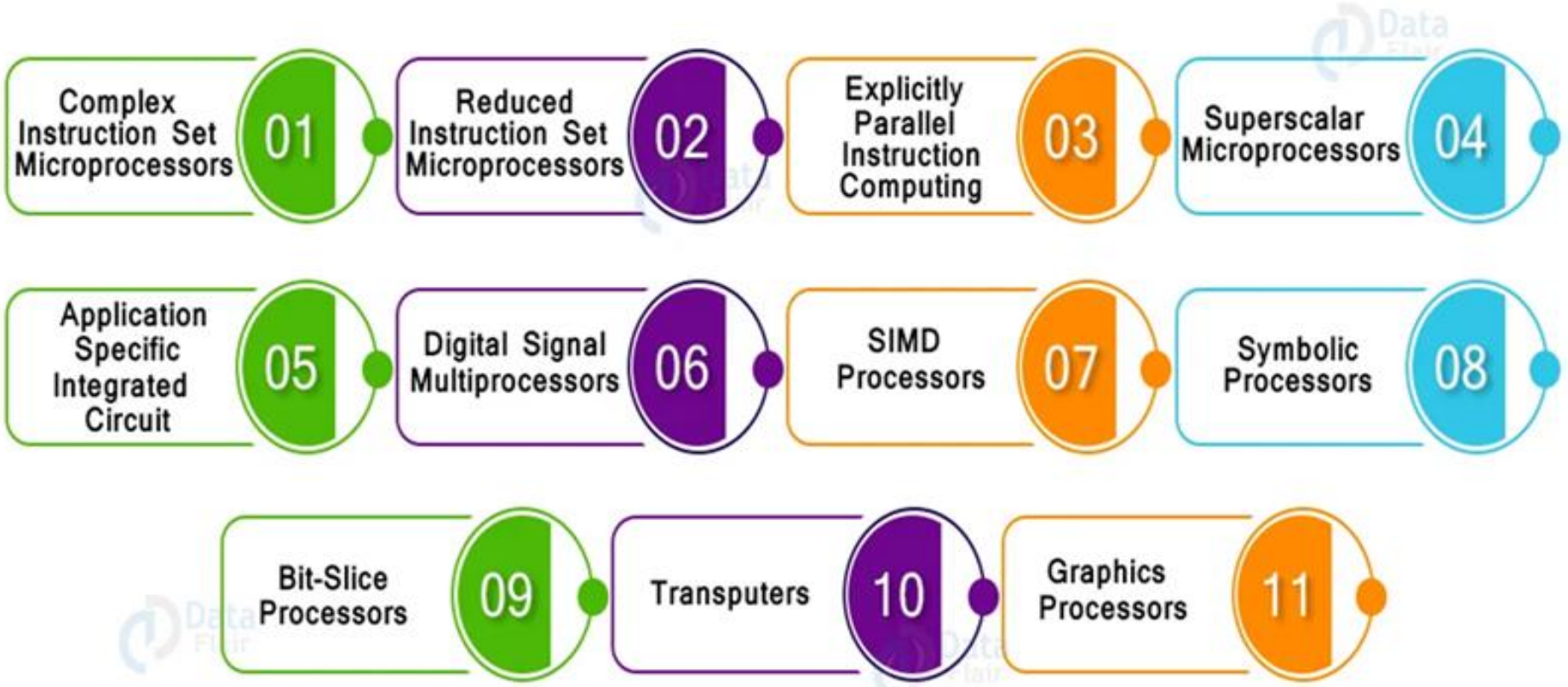
More efficient use of RAM

Small code sizes with high cycles per second





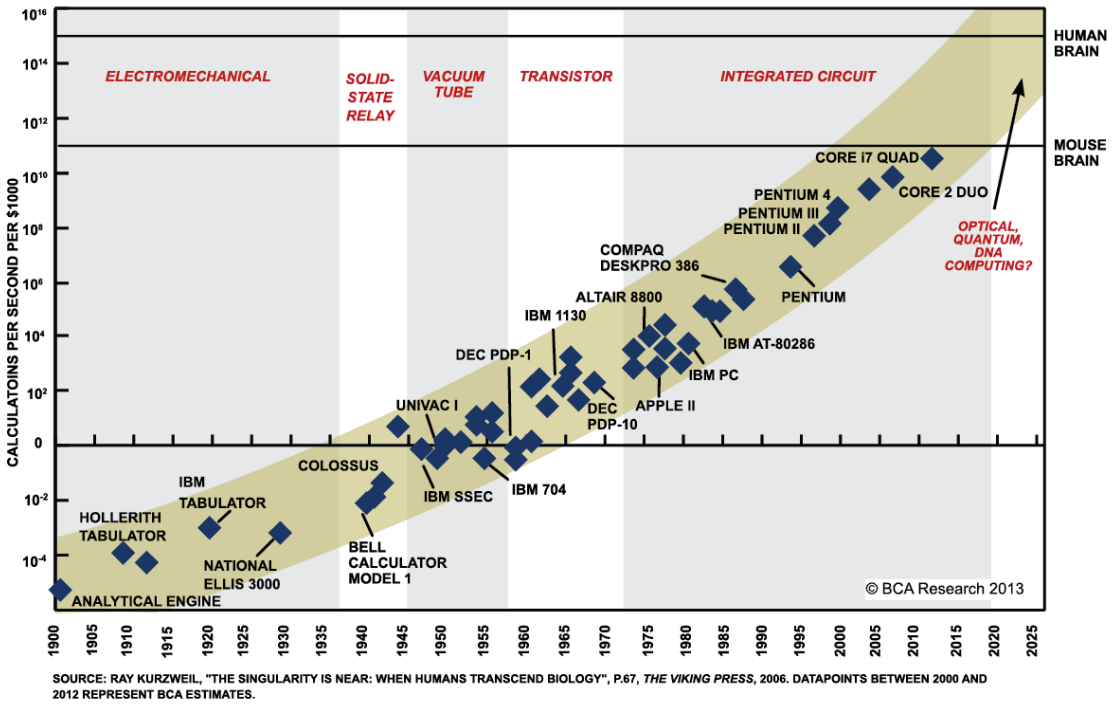
Types of Microprocessors



Uses & Applications of Microprocessors

- **Instrumentation:**
  - Frequency counters
  - function generators
  - frequency synthesizers
  - spectrum analyses
  - medical instrumentation.
- **Control:**
  - Home appliances
- **Communication:**
  - Telephone industry
  - digital telephone sets
  - telephone exchanges
  - television
  - satellite communication
  - railway & air reservation
  - LAN and WAN
- **Office Automation and Publication:**
  - Word processing
  - spread sheet operations
  - storage
  - publication.
- **Consumer:**
  - Calculators
  - Accounting system
  - Games machine
  - Complex Industrial Controllers
  - Traffic light Control
  - Data acquisition systems
  - Multi-user, multi-function environments
  - Military applications
  - Communication systems

Technological Developments History of Microprocessor & Moore's Laws



SOURCE: RAY KURZWEIL, "THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY", P.67, *THE VIKING PRESS*, 2006. DATAPOINTS BETWEEN 2000 AND 2012 REPRESENT BCA ESTIMATES.

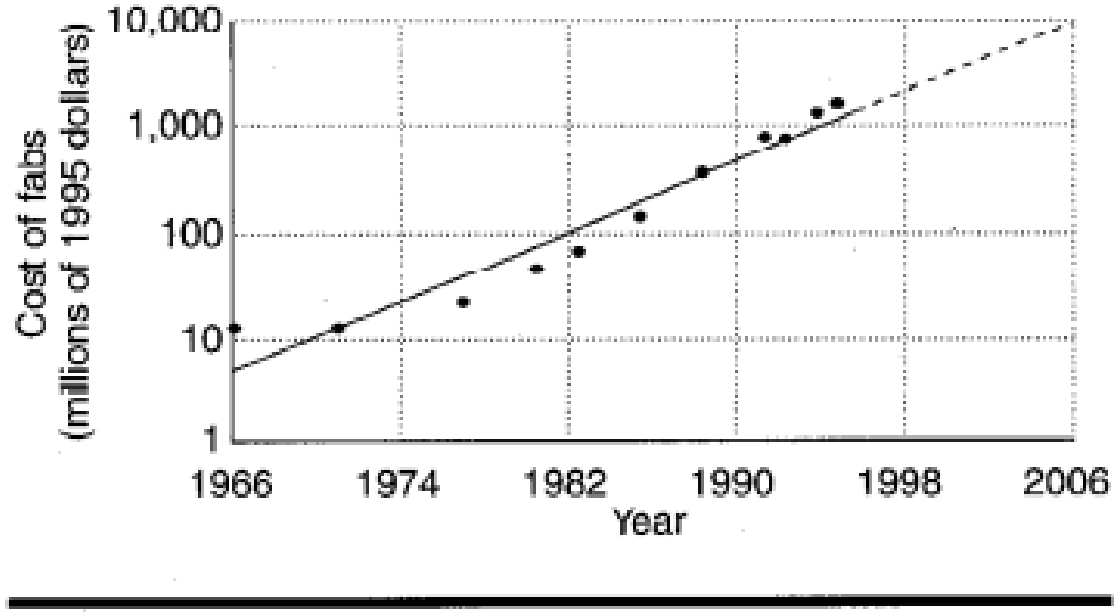
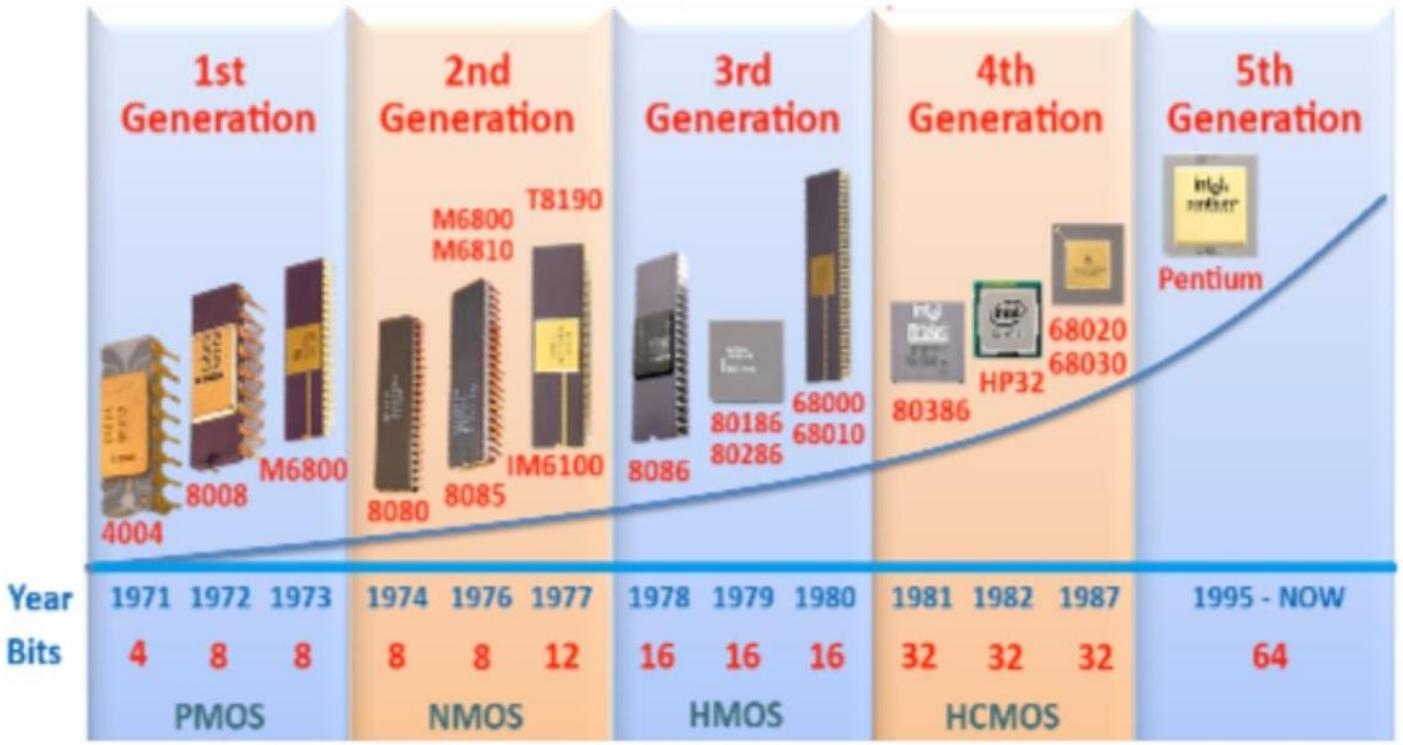


Chart showing Moore's law 2.

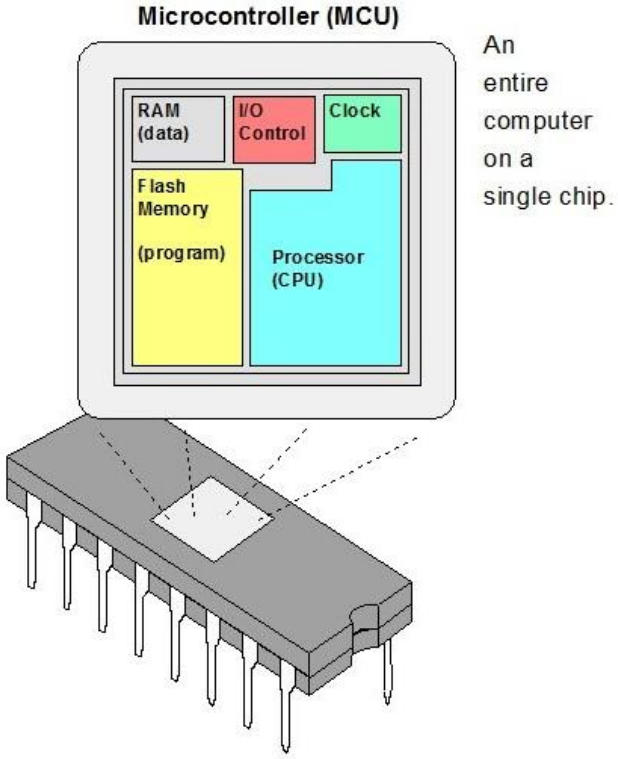
Generations of Microprocessors

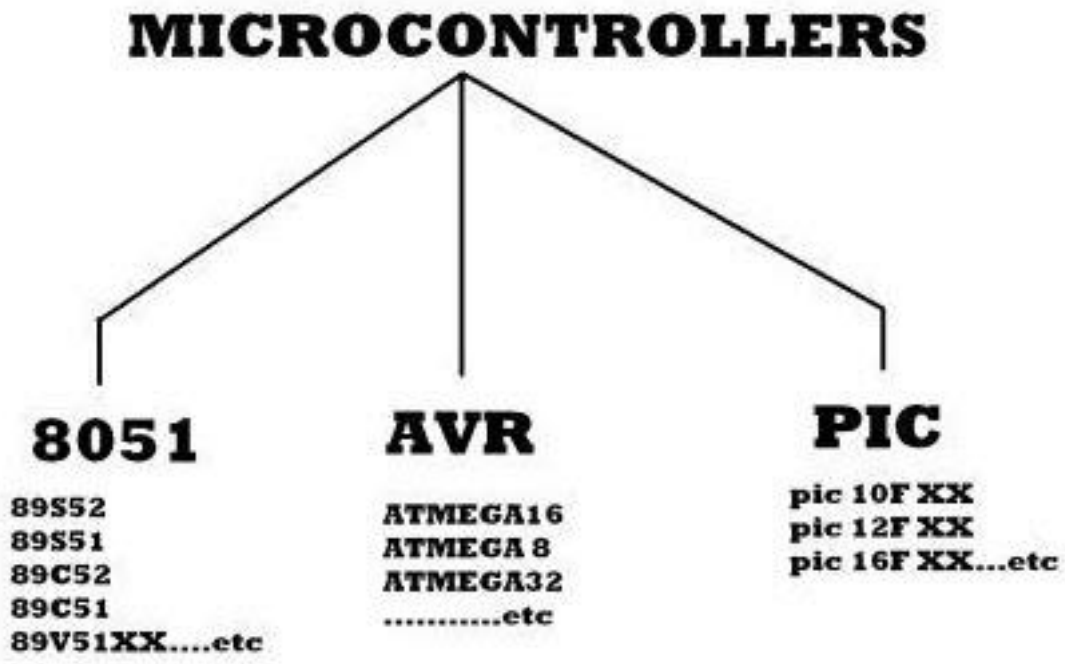
- First Generation (P1)
- Second Generation (P2)
- Third Generation (P3)
- Fourth Generation (P4)
- Fifth Generation (P5)
- Fifth Generation (P5)
- Sixth-Generation (P6)
- Seventh-Generation Processors
- Eighth-Generation Processors



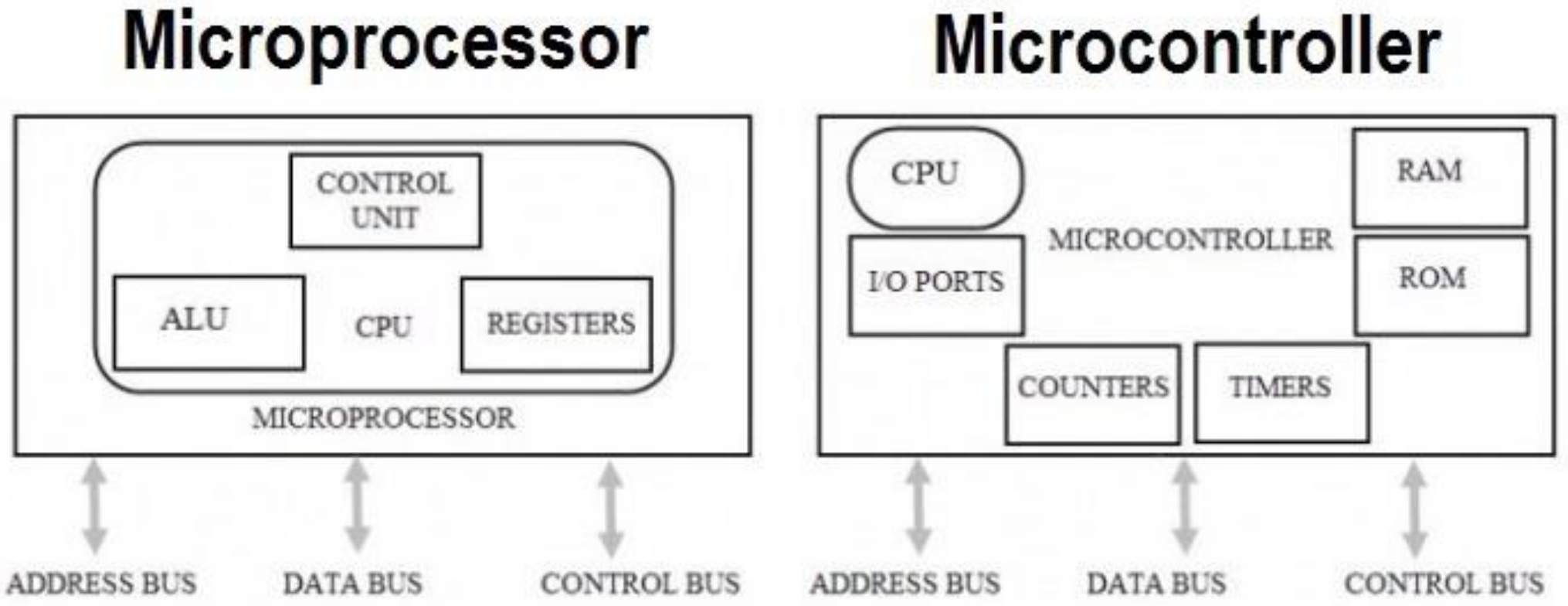
Microcontroller

An integrated circuit that contains a microprocessor along with memory and associated circuits and that controls some or all of the functions of an electronic device (such as a home appliance) or system.



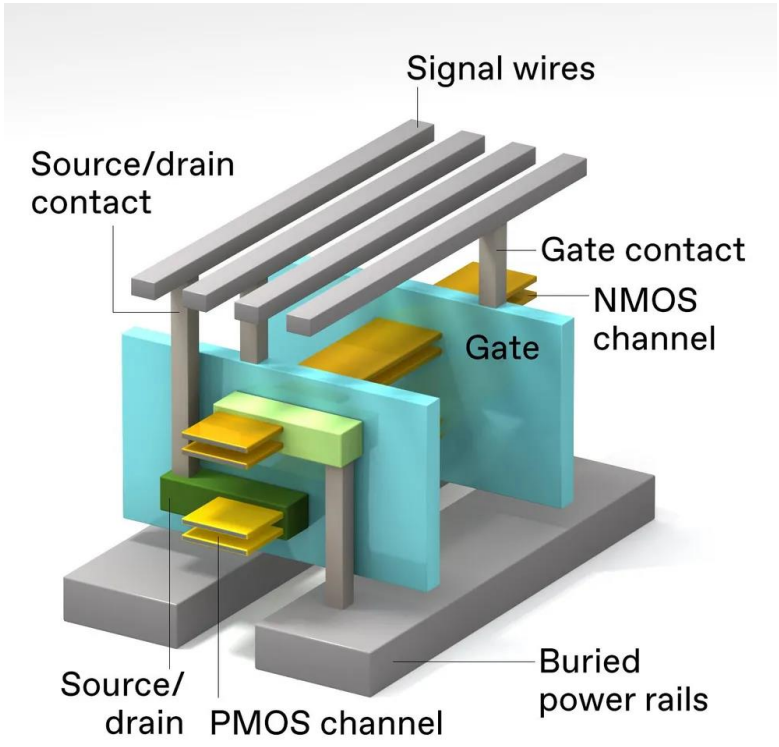


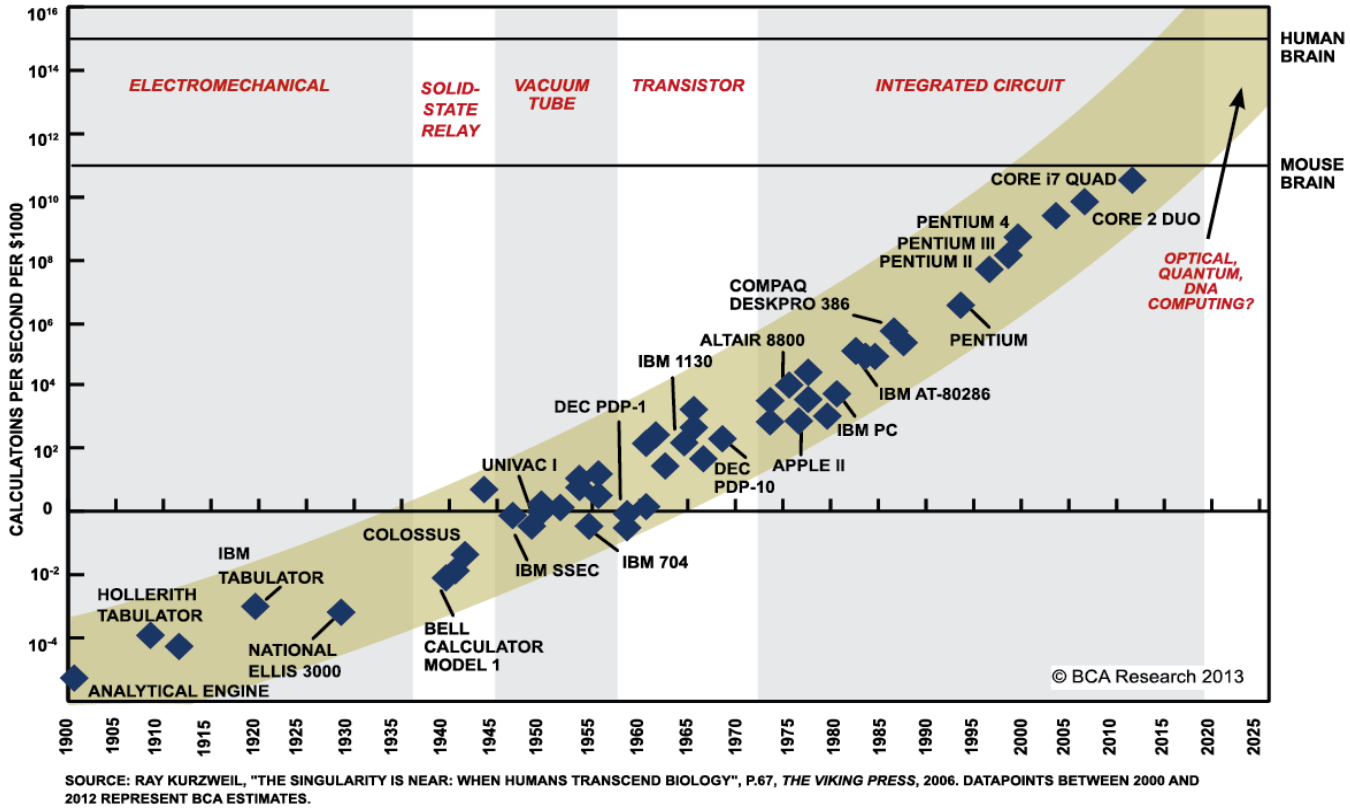
Microprocessor VS Microcontroller



Future Trends & Technologies in Microprocessors

- Carbon Nanotubes
- 3D-Stacked CMOS
- Coding jobs will be increasingly AI-dependent
- Peer-To-Peer Streaming And GPU Processing In Data Acquisition Systems





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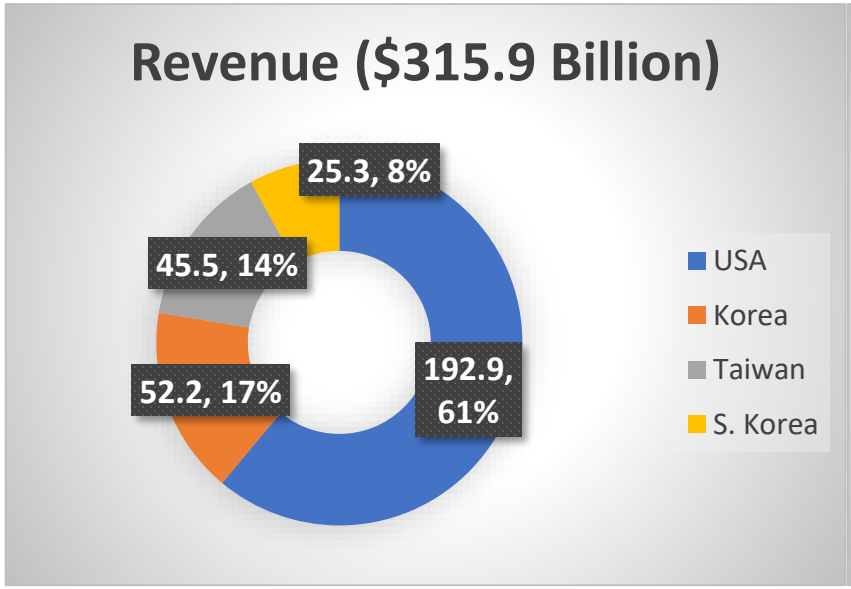
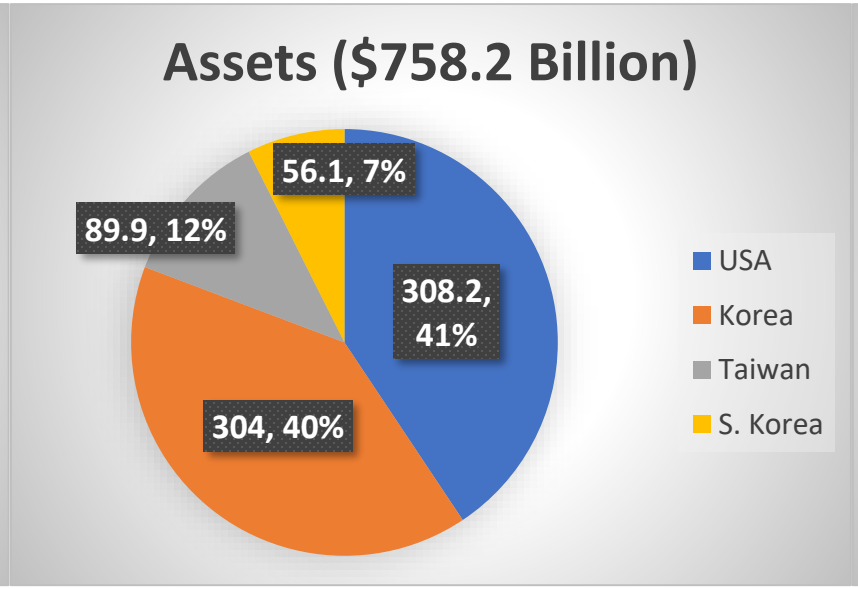
MICROPROCESSOR MARKETS

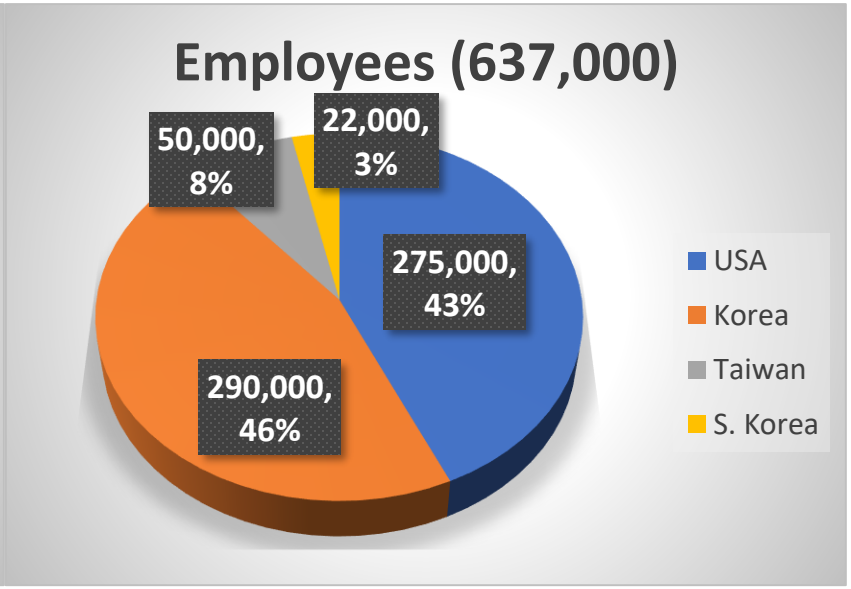
Top Ten Largest Global Microprocessor Companies

Company	Country	Revenue	Total Assets	Employees	Products & Applications	Major Customer
Intel Corp	USA	$77.9 billion	$153.1 billion	110,000	Computers, network interface controllers, integrated circuits, flash memory, graphics chips, embedded processors	Lenovo, HP, Dell
Samsung Electronics	Korea	$52.2 billion	$304 billion	290,000	Smartphones, tablets, lithium-ion batteries, image sensors, and camera modules, display	Apple, Sony, HTC, Nokia
Taiwan Semiconductor	Taiwan	$45.5 billion	$89.9 billion	50,000	Semiconductor wafers	Apple
SK Hynix	S. Korea	$25.3 billion	$56.1 billion	22,000	Memory chips	Apple, Asus, Dell, HP
Broadcom Corporation	USA	$23.9 billion	$75.9 billion	20,000	Computer, smartphones, ecommerce, secure communication	Apple, Motorola, IBM, Dell, Asus, Lenovo, Logitech, Nokia, Nintendo
Qualcomm	USA	$23.5 billion	$35.6 billion	41,000	Computers, Vehicles, watches, laptops, smartphones, WiFi	Apple, Samsung Huawei, LG, Oppo, Sony, Vivo, Xiaomi
Micron Tech.	USA	$21.4 billion	$53.7 billion	40,000	MicroSD card for automobiles, consumer electronics, communications, servers, computers	Apple
Applied Materials	USA	$17.2 billion	$22.4 billion	20,000	Microprocessor manufacturing machines, microprocessors	Samsung, Taiwan Semiconductor, Intel
Nvidia Corp.	USA	$14.8 billion	$26.9 billion	13,775	GPU, gaming, smartphones, vehicles	Amazon, Facebook, Google, Tesla
Texas Inst.	USA	$14.5 billion	$19.4 billion	30,000	Electric & electronic devices, automotive, communication, enterprise systems	Miscellaneous

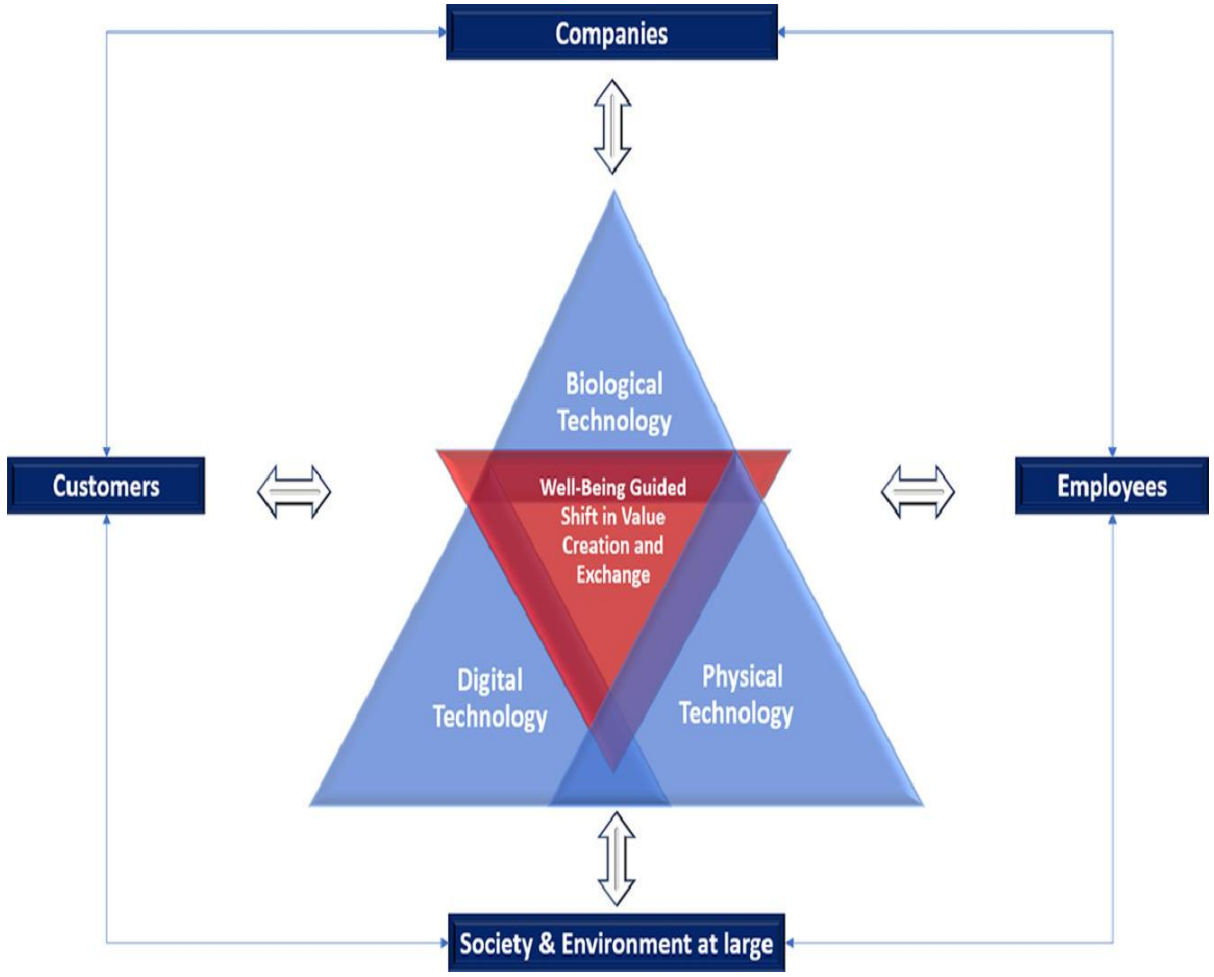
Global Microprocessor Manufacturing Countries

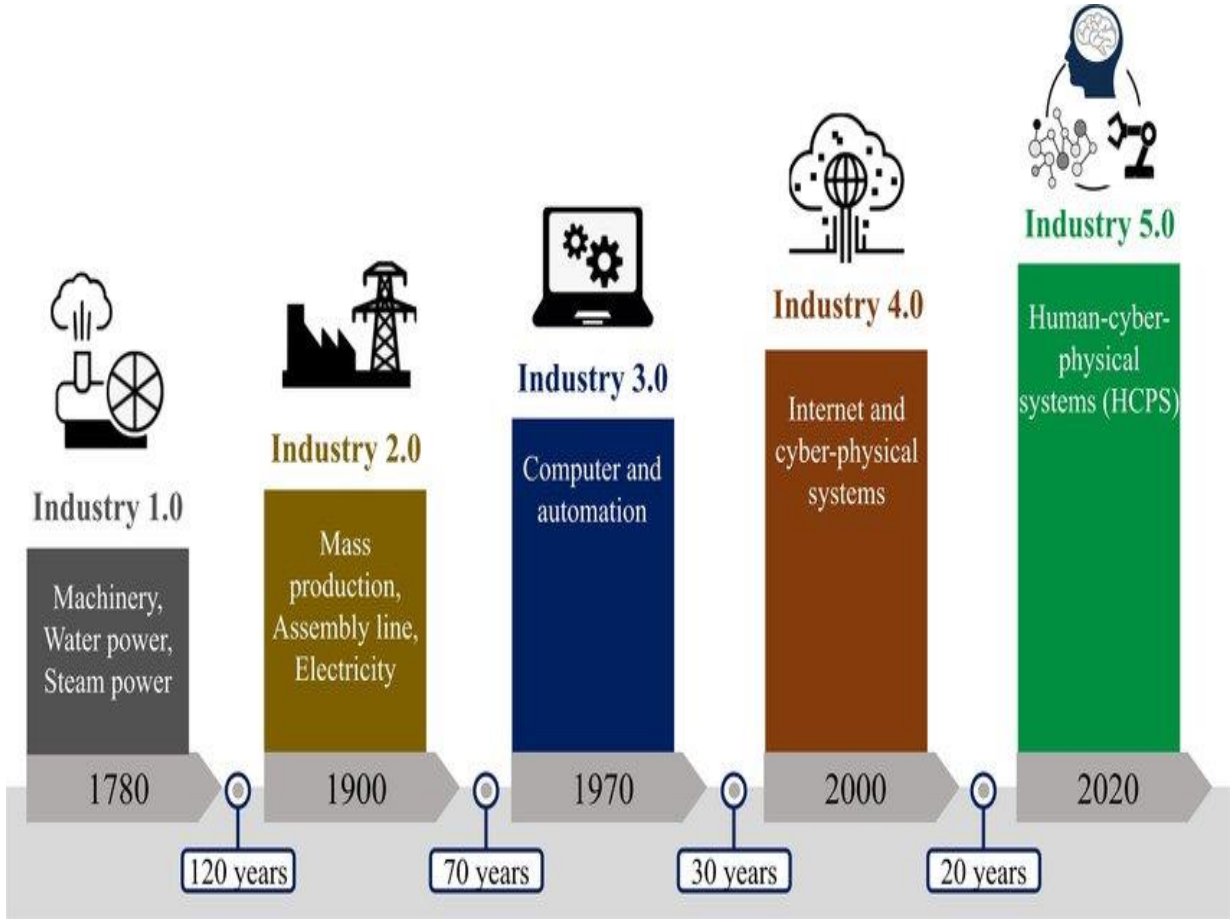






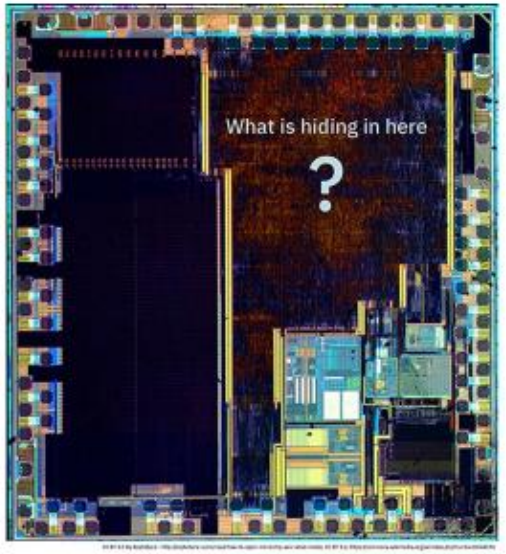
Industry 5.0 Revolution & Microprocessor Industry





Global Microprocessor Business Issues

- Espionage
- Supply chain disruption
- Segmental shortage
- Loss of competitive advantage
- Technology dilution
- Technology dependence
- TRIPS & TRIMS violations



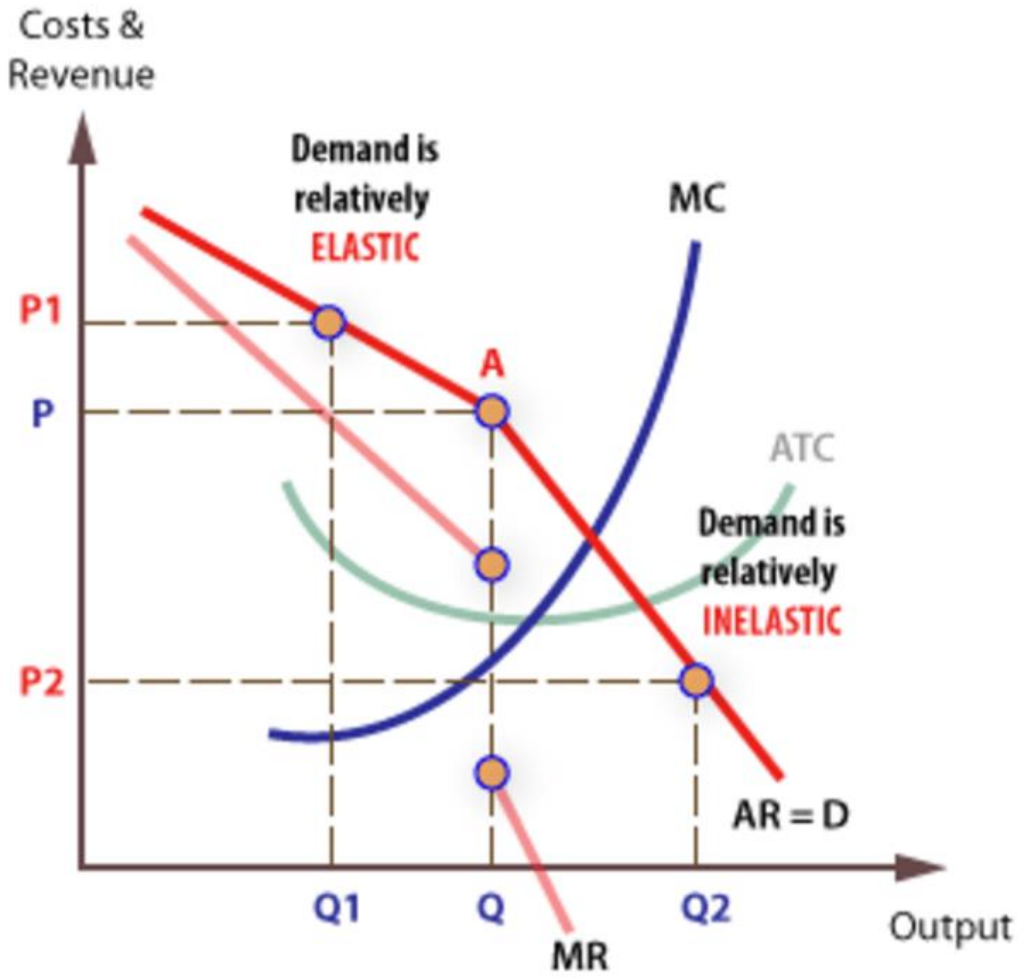
Objectives of CHIPS & Science Act 2022, & United States Innovation and Competition Act-USICA

CHIPS: Creating Helpful Incentives to Produce Semiconductors

- To enhance the US share of indigenous microprocessor manufacturing which fell from 40% (1990) to 12% (2020)
- Maintains a robust manufacturing base in strategic industries
- Protecting high-priority supply chains to avoid disruptions
- Investment of $250 billion in semiconductor and R&D in five years
- Creation of 642,000 jobs in manufacturing sector
- NASA to send astronauts back to the moon and beyond
- A ten-year ban prohibiting from producing chips more advanced than 28-nanometers in China and Russia

How the Microprocessor Industry will Change

- China & Russia have already embarked upon the journey of self-sufficiency in microprocessor manufacturing
- The industry will move from duopoly to oligopoly
- US will do insourcing in manufacturing but outsource jobs globally
- Security protocols will continue to enhance



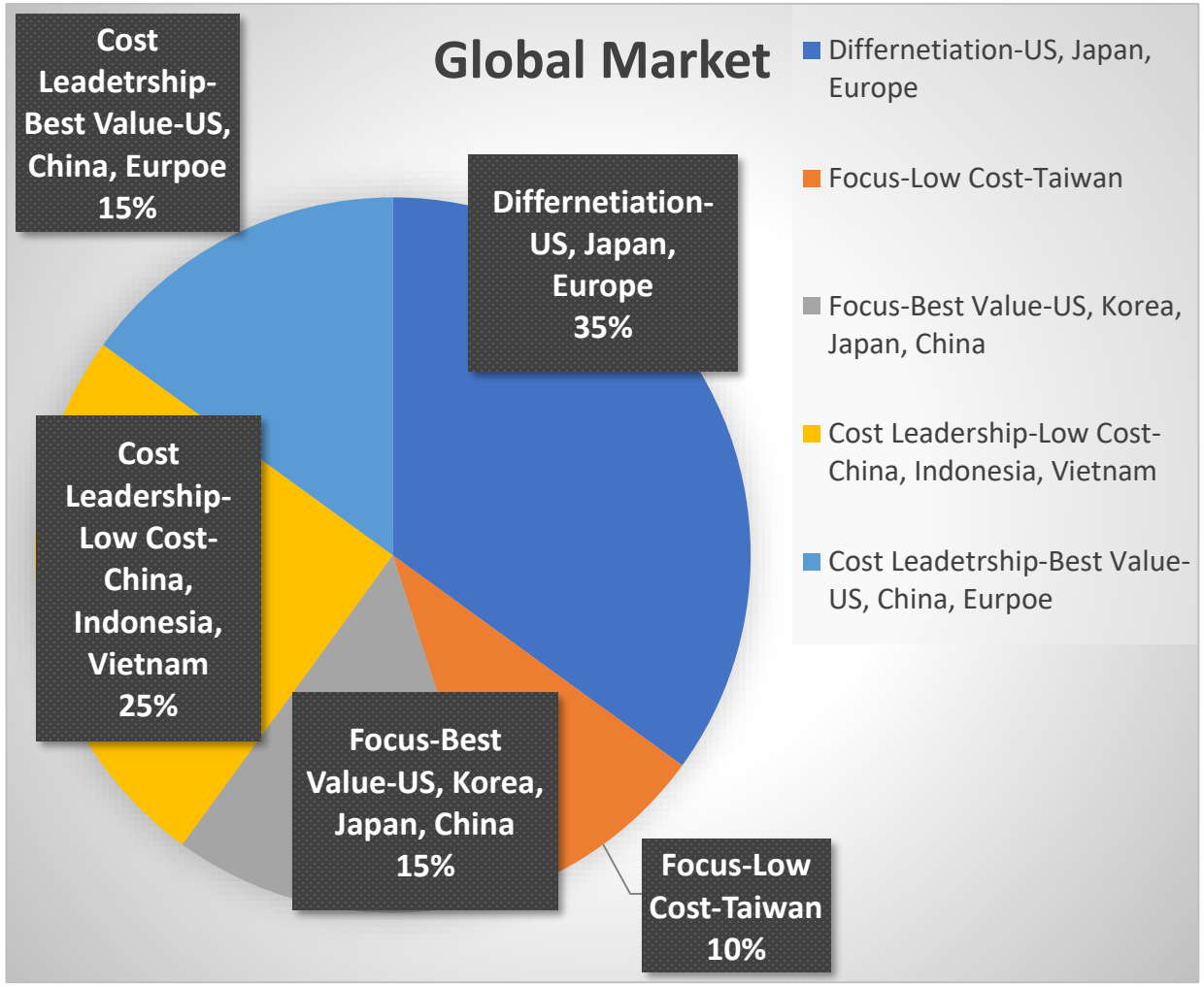
Future Trends in Microprocessors

- Peer-to-peer streaming and GPU post-processing in data acquisition systems
- Un-trackable infra structure to safeguard from hackers
- Development of media processors for graphics, videos, animations, films, and data analytics

Post CHIPS & Science Global Business Era

- Market disruption
- Technological disruption
- Supply chain disruption
- Differential pricing
- Cartel and monopoly formation at high end microprocessor market
- World will be back to protective era
- Change in global business regulatory framework
- Retaliatory measures
- Regionalization
- Business process dynamism
- High spending on R&D
- Expensive products for consumers
- Third world will move further behind in technology
- Creation of jobs both in and outside US particularly for knowledge workers
- Intense and frequent training requirements for knowledge workers

Post CHIPS & Science Global & US Market



US Market

Pre-CHIPS

- **Fabrication**
  - Outsourcing
- **Low-End Jobs**
  - Outsourcing
- **High-End Jobs**
  - Insourcing

Post-CHIPS

- **Fabrication**
  - Insourcing
- **Low & Medium End Jobs**
  - Outsourcing
- **High-End Jobs**
  - Insourcing