

# THE NEXT REVOLUTION IN ENGINEERING

## WHEN DID ENGINEERING BEGIN? WHERE IS ENGINEERING HEADING?

We could say that engineering has been in existence as long as the world's earliest inventions, including the wheel around 3500 B.C. To better understand where the future of engineering is headed, let's take a look back at where it's been, starting with the Industrial Revolution.

### ENGINEERING 1.0 — 1760 TO 1965 (THE INDUSTRIAL AGE)



1765

James Watt developed a steam engine that rotated a shaft, producing a practical power plant

#### DID YOU KNOW?

The first engineer known by name and achievement was Imhotep, builder of the Step Pyramid at Saqqārah, Egypt, around 2550 BC.



1795

Eli Whitney patented the cotton gin

1842

The first recorded patent for the sewing machine



1844

Samuel Morse sent his first telegraph message from Washington, D.C. to Baltimore, Maryland

1903

Orville and Wilbur Wright made the first powered, sustained, and controlled flight in a heavier-than-air flying machine

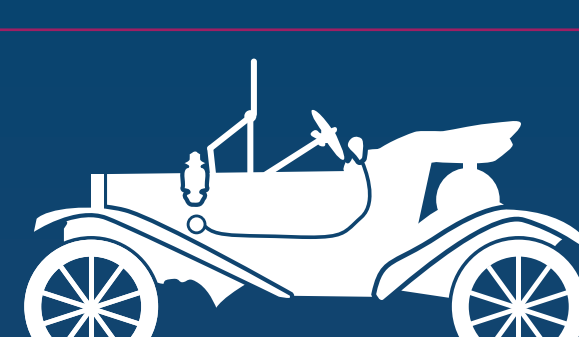


#### DID YOU KNOW?

There were more than 60,000 cars powered by steam from 1897 to 1927 in the U.S. These cars used the first effective and practical steam engine based on James Watt's improvements and developed in 1712 by Thomas Newcomen.

1908

The Model T, an automobile built by the Ford Motor Company, was conceived by Henry Ford as practical, affordable transportation for the common man



#### DESIGN METHODOLOGIES:

Inventions were designed and communicated to manufacturing using paper, vellum or mylar drawings or blueprints. Extensive use of physical prototypes and trial and error engineering.

### ENGINEERING 2.0 — 1966-1995 (THE DIGITAL AGE)

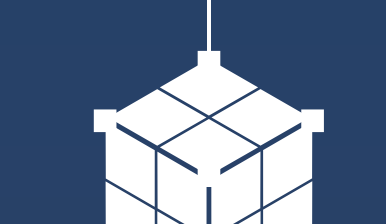


1970

A Boeing 747 jet arrived at Heathrow Airport in London after completing its maiden flight from New York

1966

French engineer Pierre Bezier invented 3D CAD to ease the design of parts and tools for the automotive industry



1980

The Hungarian architect Erno Rubik's cube went on sale, becoming the best-selling toy of all time

1973

Dr. Martin Cooper invented the mobile phone



Apple Computer launched the first commercially successful computer to use a mouse and graphical user interface

1984



1981

The first space shuttle flight, Space Shuttle Columbia, was launched



1990

Tim Berners-Lee invented the world wide web



#### DESIGN METHODOLOGIES:

- Circles, lines and arcs were placed virtually on computer screens
- Speed increased
- No more electric erasers
- Problems solved using geometry, thereby reducing mathematical calculations

Conceived by Roger Easton, Global Positioning System (GPS) measures time and location in all weathers using a network of satellites

1995



### ENGINEERING 3.0 — 1996-2015 (THE INFORMATION AGE)



1997

NASA landed its first probe on Mars

1997

The Toyota Prius was the first mass-produced hybrid automobile



Skydiver Felix Baumgartner broke the sound barrier without the use of a vehicle, diving 24.23 miles and reaching a speed of 843.598 mph



2012

1997

Ericsson was the first brand to coin the phrase "smartphone," with the release of its GS88



#### DESIGN METHODOLOGIES:

- Simulate, test or validate designs before manufacturing
- Parts tested for strength under different loading conditions
- Electrical circuits tested
- Fluid flow analyzed
- Plastic injection molding processes designed and tested before melting pellets

#### DID YOU KNOW?

The word engineer has its roots in the Latin word ingeniare, which means: "To devise in the sense of construct or craftsmanship."

### ENGINEERING 4.0 - (THE AUTOMATION AGE)



2017

NASA's largest rocket yet, the Space Launch System (SLS), will launch its first test flight, boosting 143 tons to orbit

The Internet of Things will include 26 billion internet-connected devices

2020



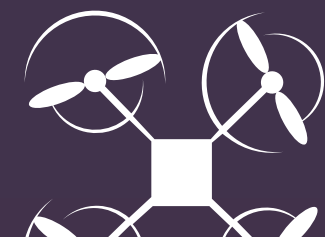
Computers will be cleverer than humans, according to Ray Kurzweil, Google's director of engineering



2029

2025

30,000 drones will patrol U.S. airspace



2035

11.8 million self-driving cars will be on the road



#### DESIGN METHODOLOGIES:

- Sharing data via an automated delivery and update mechanism
- Each stakeholder having access to the information needed, in the specific format needed
- 24/7 accessibility through any device
- Social and Collaborative Design
- Secure centralized vaulting system
- Less time spent recreating and re-interpreting data

#### FORMATS:

- Automated price quoting for purchasing and sales
- Costing and environmental optimization
- Renderings and animations for sales and marketing
- Animations and exploded views for documentation, field service & repair
- Automated inspection drawings and reports for the QA department
- Electronic viewing of 3D models with PMI Product Manufacturing Information using MBD (Model Based Definition) engineering methods

#### DID YOU KNOW?

SOLIDWORKS' mission to enable SOLIDWORKS 3D CAD on every Engineer's desktop was started in 1995 and has since reached out to include more than 2 million users in education and commercial endeavors.

#### SOURCES

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