

The First Industrial Revolution

How manufacturing changed in XVII-XVIII centuries

Introduction

- ❁ The Industrial Revolution was the transition to new manufacturing processes in the period from about 1750 to sometime between 1820 and 1840
- ❁ This transition included:
 - ❁ going from hand production methods to machines,
 - ❁ improved efficiency of water power.
 - ❁ new industrial manufacturing and iron production processes.



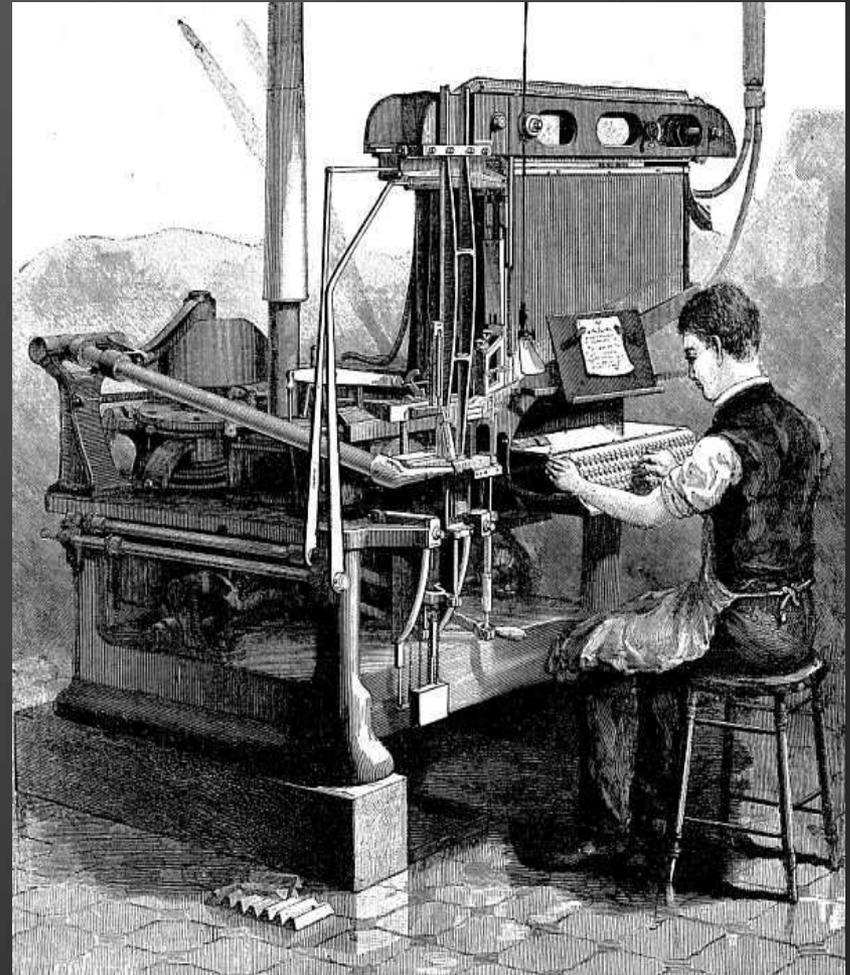
Birth of Industrial Revolution

- Great Britain provided the legal and cultural foundations that enabled entrepreneurs to pioneer the industrial revolution.
- Key factors were:
 - The period of peace and stability.
 - no trade barriers between England and Scotland.
 - Coal available in all over Britain, especially in Wales.
 - the rule of law respecting the sanctity of contracts.
 - free market economy.



Important Techno-developments

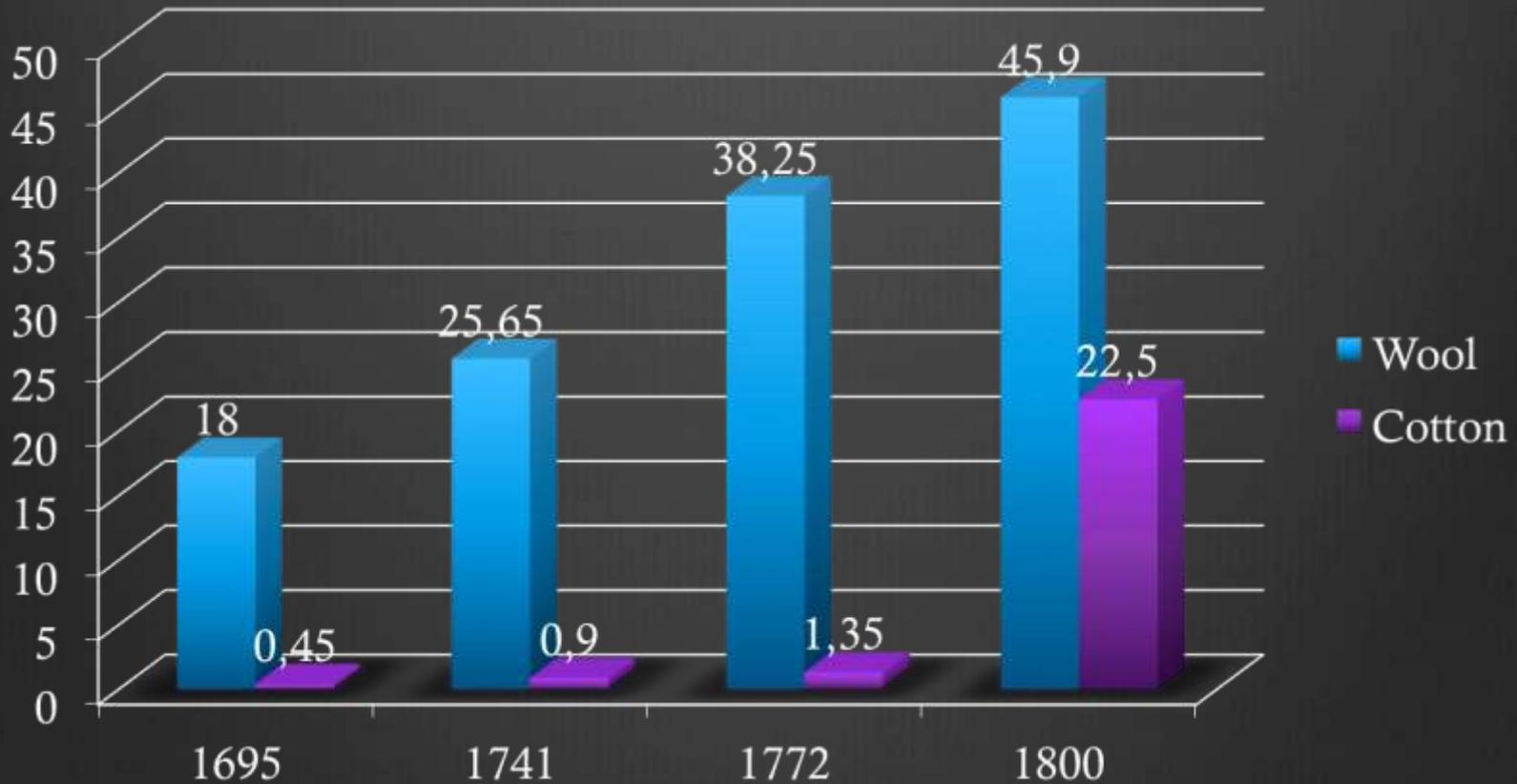
- ❁ Textiles – Mechanized cotton spinning powered by steam or water increased the output of a worker.
- ❁ Steam power – The efficiency of steam engines increased greatly. The adaption of stationary steam engines made them suitable for industrial uses.
- ❁ Iron making – The substitution of coke for charcoal, lowered the fuel cost of iron and wrought iron production.



Manufacturing in XVIII century

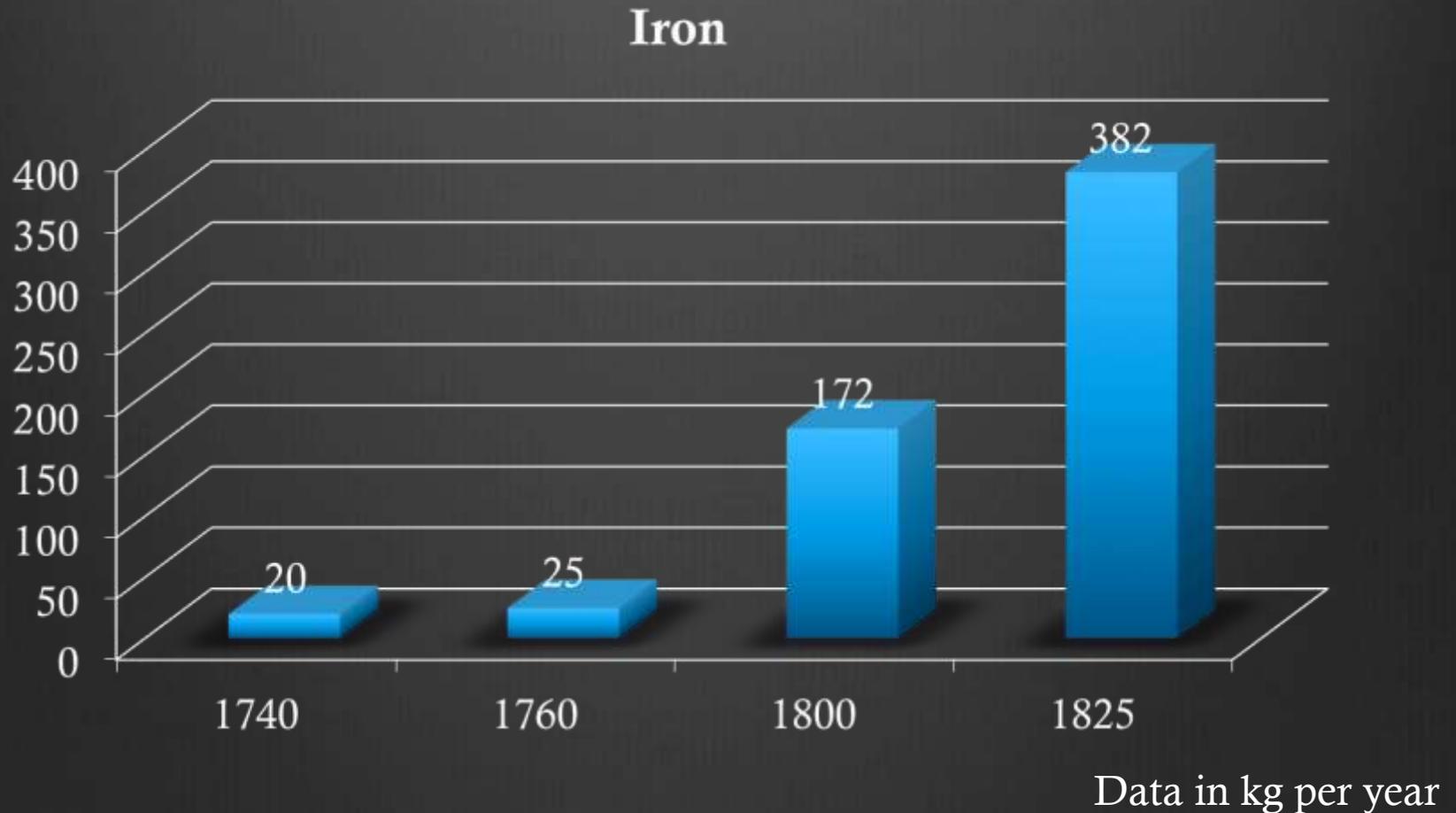
- ⊗ In its earliest form, manufacturing was usually carried out by a single skilled artisan with assistants.
- ⊗ Before the Industrial Revolution, most manufacturing occurred in rural areas, where household-based manufacturing served as a supplemental subsistence strategy to agriculture.
- ⊗ In XVII century, entrepreneurs organized a number of manufacturing households into a single enterprise through the putting-out system.

Textile Manufacturing in XVIII century



Data in kg per year

Iron Production in XVIII century



The Second Industrial Revolution

The beginning: from 1850 - 1914

Changes and new technologies

- ❁ The first industrial revolution broke out in England, and only in this country.
- ❁ This is characterized by the dominance of the textile industry and the use of coal. The symbols are the steam engine and the train.
- ❁ If the energy in the first industrial revolution was coal in the second industrial revolution it was petrol and then electricity.
- ❁ The years of the second industrial revolution are characterized by a mix of science and industry.
- ❁ The symbol of the second industrial revolution is steel.



The Eiffel Tower was built in 1889

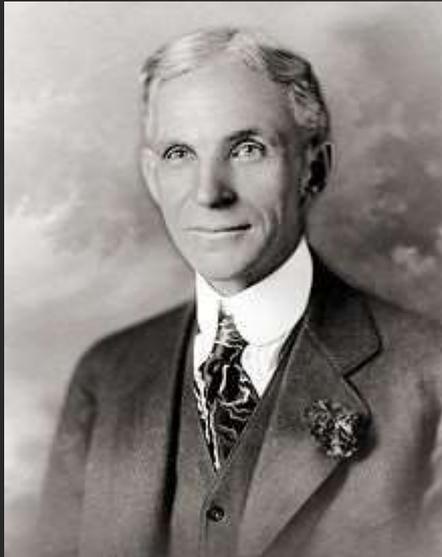
Mass production

- ❁ Mass production played a lead role in the Industrial Revolution.
- ❁ Though it didn't just start on its own, the era was inspired through many inventions throughout the century.
- ❁ In about 1890's many more inventions were created making this era unique.
- ❁ The newer inventions advanced the speed and quality of thread spinning as a milestone for most other machinery and products.

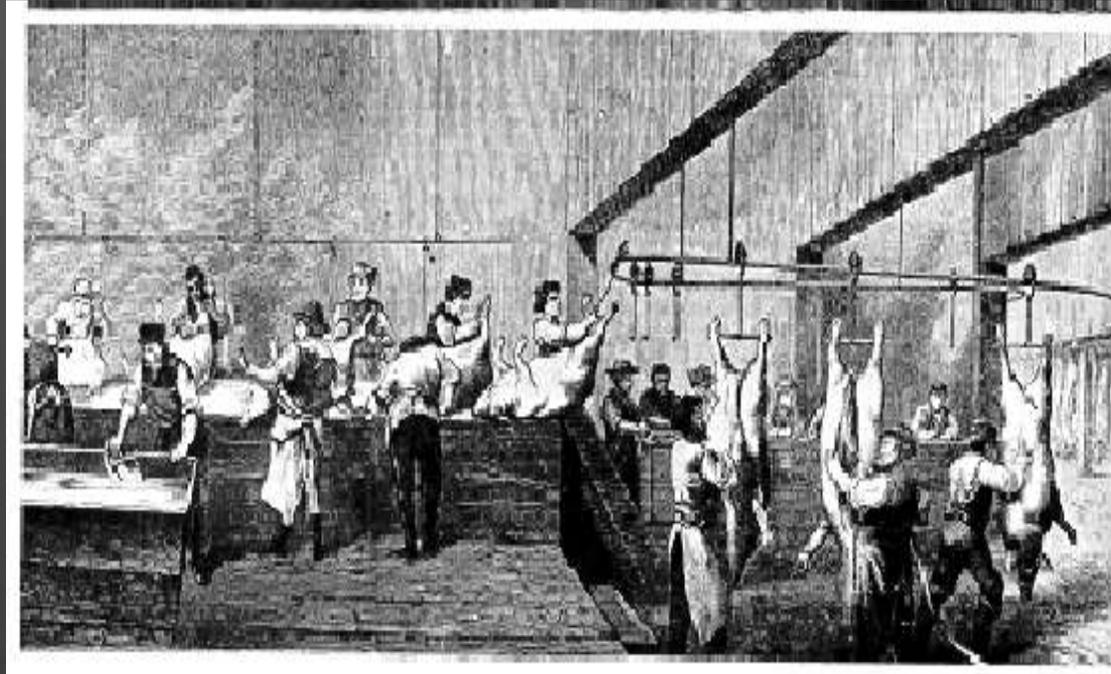


Slaughterhouses & Henry Ford's idea

- It started at slaughterhouses in the USA where workers would stand at fixed stations and a pulley system would bring the meat to each worker and they would complete one task.
- Henry Ford was influenced by the slaughterhouse practice in the later developments at Ford Motor Company.



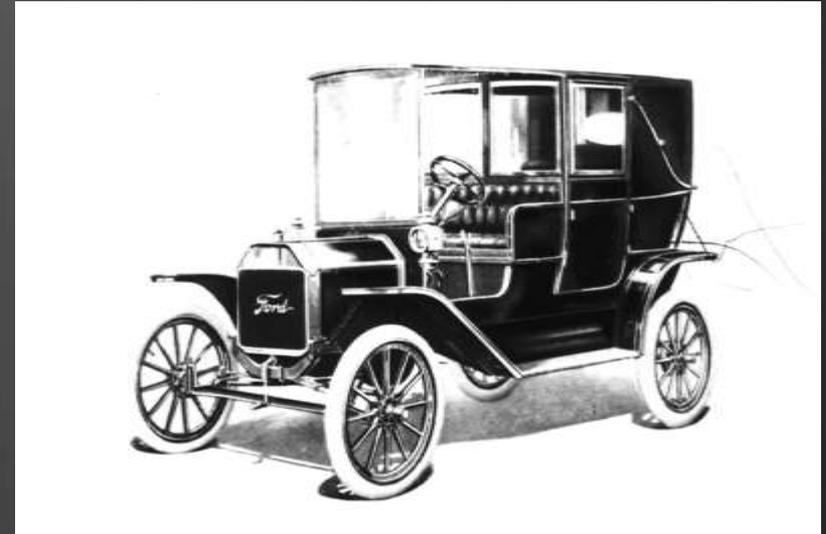
Henry Ford



Slaughterhouses in USA in 1800

The assembly line

- ❁ They would hire many people to each do one part of a job in a line, this way made making cars much easier than usual. In the assembly line, one person would do a specific task, while others did a different one.
- ❁ Using this method Henry Ford produced the first car with the assembly line, The Model T



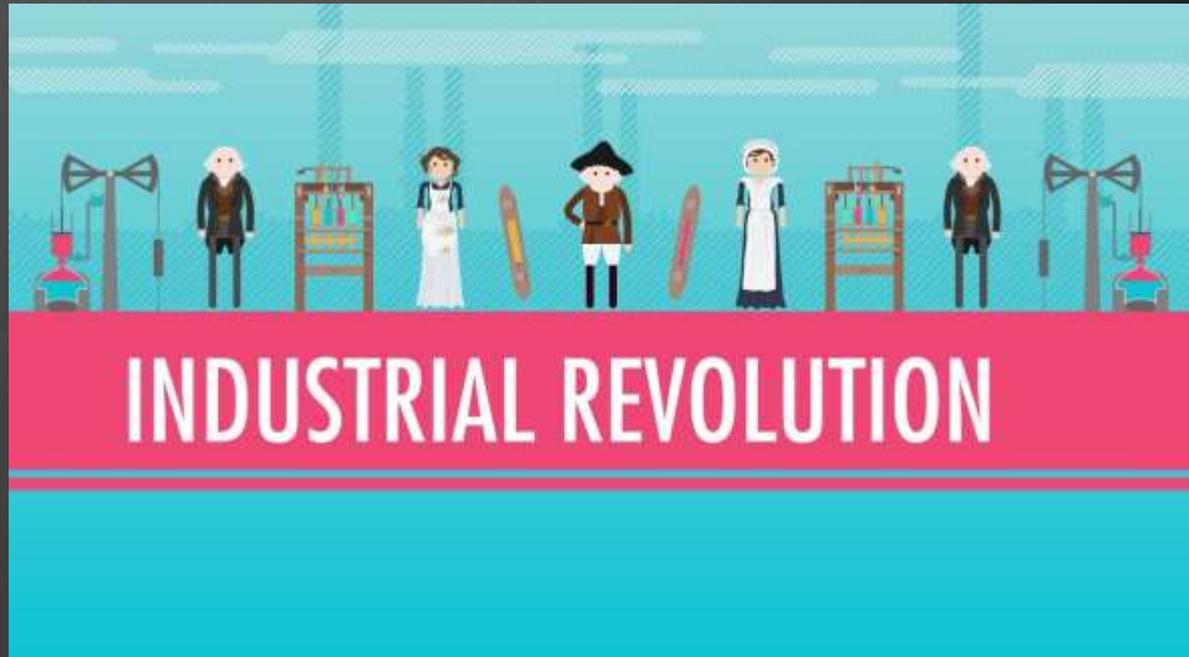
The Ford Model T



Model T assembly line

Social Impact

- ❁ The industrial revolution in the long run, however, allowed to raise the welfare conditions of an increasingly large percentage of the population, leading by the end of the nineteenth century to a general improvement in health conditions.



The Third Industrial Revolution

- ❁ New technologies, such as the Internet, and the renewable energies changed the history.
- ❁ In the 20th century began the Third Industrial Revolution. Products are produced in a new way, using computers and new machines.



Outsourcing

- Trade began to be easier with new innovations, companies started to produce in foreign countries
- A new process started in this century, which is now called "globalisation"



Globalisation & Multinational Companies

By this process the world is becoming interconnected as a result of increased trade and cultural exchange. It has increased the production of goods and services and the biggest companies now are called multinational corporations.



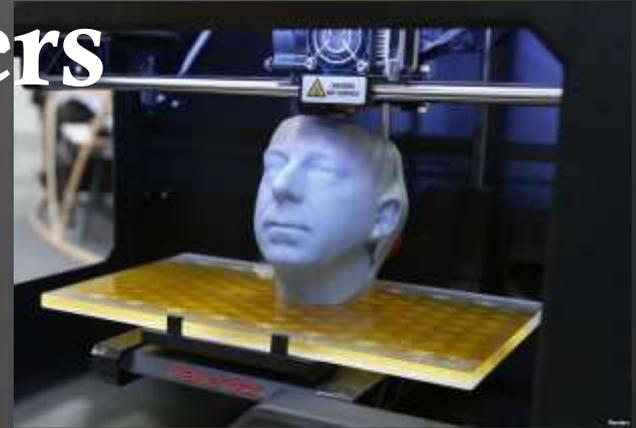
Production in the future

Production is involved in a continuous process of evolution and the digitalisation of manufacturing will transform the way goods are made.

Tomorrow's manufacturing robots will be smaller, smarter, and more efficient. Many manufacturing machines can be left alone to produce all day and night.



3D Printers

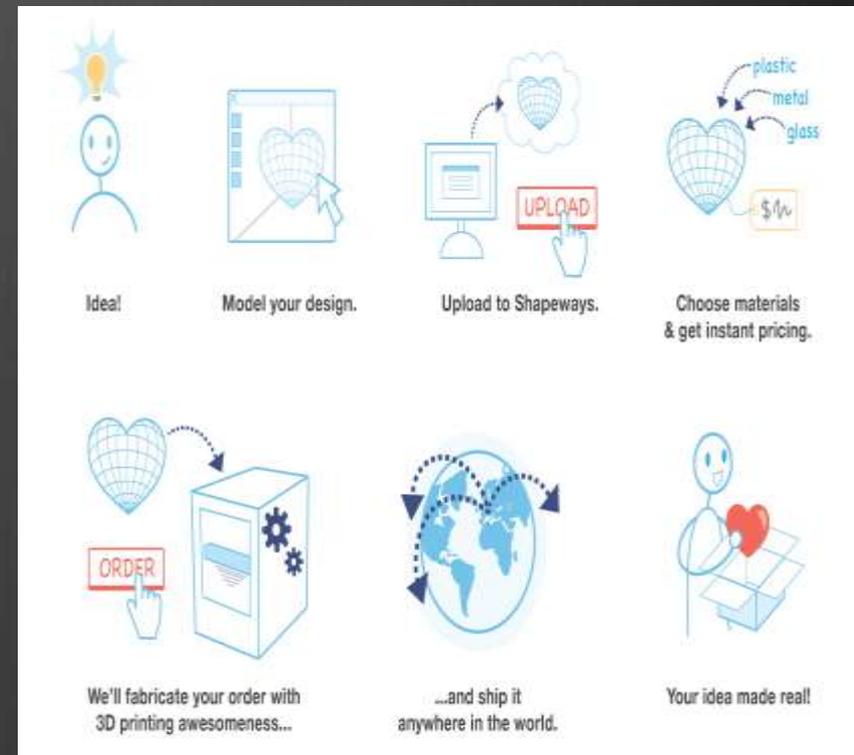
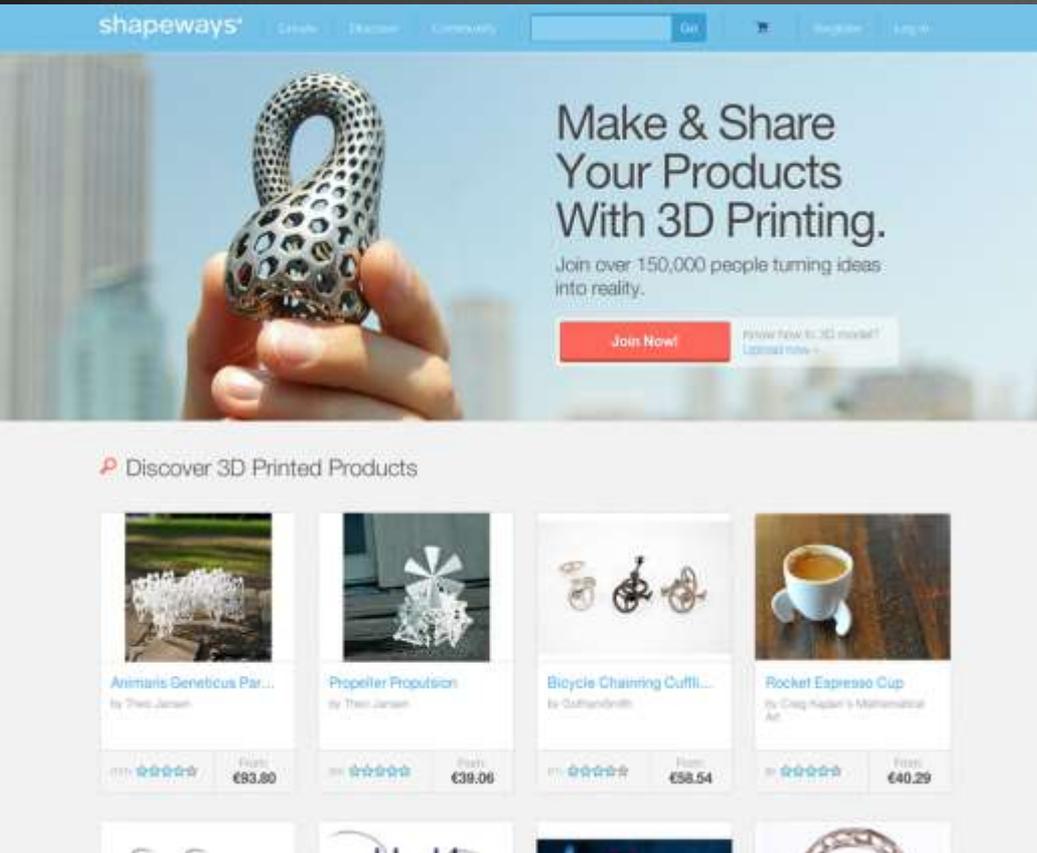


3D printing is an additive manufacturing technology which makes it possible to turn 3D modelled designs into custom solid objects. It is achieved using an additive process, where successive layers of material are laid down in different shapes. The individual customer can now get exactly what he wants at a low price.



Shapeways

Shapeways is an online 3D printing community where anyone in the world can upload a 3D model and they will print it for you.



First Industrial Revolution 1750-1850

The Industrial Revolution was the transition to new manufacturing processes in the period from about 1760 to sometime between 1820 and 1840. This transition included going from hand production methods to machines.

Birth of the first industrial revolution in Britain

Great Britain provided the legal and cultural foundations that enabled entrepreneurs to pioneer the industrial revolution. Key factors were: The period of peace and stability, the rule of law respecting the sanctity of contracts, a legal system which allowed the formation of companies, and a free market

Important technological developments

- Textiles – Mechanized cotton spinning powered by steam or water increased the output of a worker.
- Steam power – The efficiency of steam engines increased so much. The adaption of stationary steam engines to rotary motion made them suitable for industrial uses.
- Iron making – The substitution of coke for charcoal greatly lowered the fuel cost of iron and wrought iron production. Using coke also allowed larger blast furnaces, resulting in economies of scale.

Manufacturing

- In its earliest form, manufacturing was usually carried out by a single skilled artisan with assistants.
- Before the Industrial Revolution, most manufacturing occurred in rural areas, where household-based manufacturing served as a supplemental subsistence strategy to agriculture.
Then entrepreneurs organized a number of manufacturing households into a single enterprise through the putting-out system.

Second industrial Revolution 1850-1914

1) Changes and technology innovations:

The 1st industrial revolution broke out in England, and only a certain country. This is characterized by the dominance of the textile industry and the use of coal. The symbols are the steam engine and train. The 2nd industrial revolution is marked by a wide range of sectors entirely new as the chemical industry, mechanical engineering, food. If the energy in the 1st industrial revolution was coal in the 2nd industrial revolution were the oil and electricity. In the years of the 2nd industrial revolution also comes a binomial fundamental science and industry. The results of science flow together in the industries especially in the chemical industry that made her mistress in the pharmaceutical and food industries. The symbol of the 2nd industrial revolution is steel and the years of the construction of the Tour Eiffel

2) Mass production:

Mass production played a lead role in the Industrial Revolution. Though it didn't just run itself, the era was inspired through many inventions throughout the century. Right about 1890's many more inventions were created making this era unique. The newer inventions advanced the speed and quality of thread spinning as a mile

stone for most other machinery and products. Although all human work was not replaced, one of the best production ways was the assembly line.

3) Assembly line:

Workers would stand at fixed stations and a pulley system would bring the meat to each worker and they would complete one task. Henry Ford and others have written about the influence of this slaughterhouse practice on the later developments at Ford Motor Company.

They would hire many people to each do one part of a job in a line, this way made making cars much easier than usual. In the assembly line, one person would do a specific task, while others did a different one.

4) Social Impact:

The industrial revolution in the long run, however, allowed to raise the welfare conditions of an increasingly large percentage of the population, leading by the end of the nineteenth century to a general improvement of health conditions.

Third Industrial revolution - now

Manufacturing changed a lot in the 20th century. New technologies, such as the Internet, and the renewable energies changed the history. In this period began the Third Industrial Revolution. Products are produced in a new way, using computers and new machines. Trade began to be easier with new innovations, companies started to produce in foreign countries. This system now is call "offshoring" and it is used to reduce costs of labour and raw materials. A new process started in this century, which is now called "globalisation". By this process the world is becoming interconnected as a result of increased trade and cultural exchange. It has increased the production of goods and services and the biggest companies now are called multinational corporations.

Future

Production is involved in a continuous process of evolution and the digitalisation of manufacturing will transform the way goods are made. In fact it is already happening. Many of the new production methods in this next revolution will require fewer people working on the factory floor. There is fear that a robotic takeover of manufacturing jobs will keep humans out of work. Tomorrow's manufacturing robots will be smaller, smarter, and more efficient. Many manufacturing machines can be left alone to produce all day and night. An example of these new technologies are 3D printers. 3D printing is an additive manufacturing technology which makes it possible to turn 3D modeled designs into custom solid objects. It is achieved using an additive process, where successive layers of material are laid down in different shapes. The individual customer can now get exactly what he wants at a low price. Initially used only in industries, this new technique is now available to a large number of people and it will soon change the global economy. We will not need to transport goods all over the world because they will be printed anywhere at any time. This new technology could make improvements to medicine too. Some researches have already used it to make artificial ears and bones and others are trying to build artificial organs. People will not need to wait for months to have a transplantation and they will be sure that the new organs are compatible with their body.

Other changes to the production system are taking place. New materials are lighter, stronger and more durable than the old ones. Carbon fibre is replacing steel and aluminium in products ranging from aeroplanes to mountain bikes. New techniques let engineers shape objects at a tiny scale. Nanotechnology is giving products enhanced features. Genetically engineered viruses are being developed to make items such as batteries. And with the internet allowing ever more designers to collaborate on new products, the barriers to entry are falling.