



**University of
Nottingham**
UK | CHINA | MALAYSIA

**Department of Mechanical,
Materials and Manufacturing
Engineering**

Towards modern management

What we will talk about today:



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Towards modern management

- *What is management?*
- *Early forms of management*
- *Management innovation following technological innovation*
- *First steps towards modern mass production*
- *Supporting managerial innovation*
- *The growth of Lean into a practical management philosophy*
- *Current trends in management*

Definition of *MANAGEMENT*

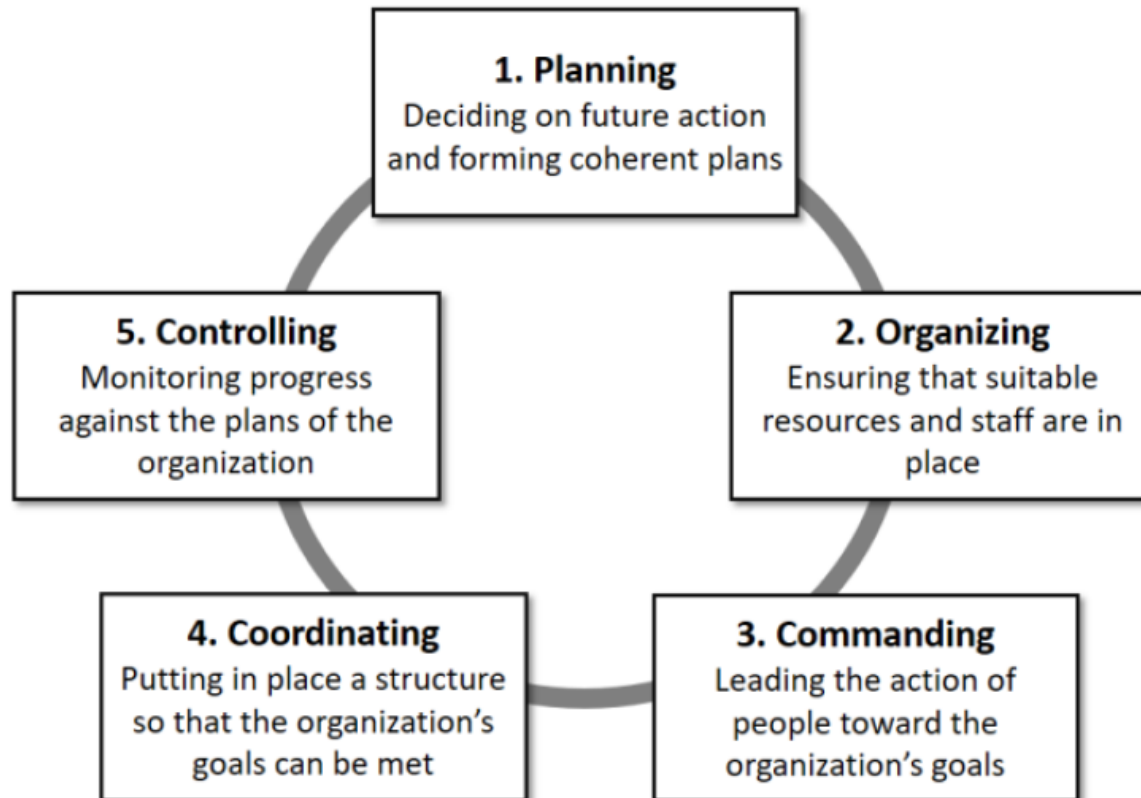
“Management is that group of functions in an organization which concerns itself with the direction of various activities to attain the organization’s objectives. In doing so, management deals with the active direction of human effort.”

The work management really has two senses:

- A general human activity of managing, referring to the process of taking responsibility for the purpose, progress and outcome of events.
- A distinct role that people, especially in organizations, can take on
→ meaning that *managing* is separate from *doing*!

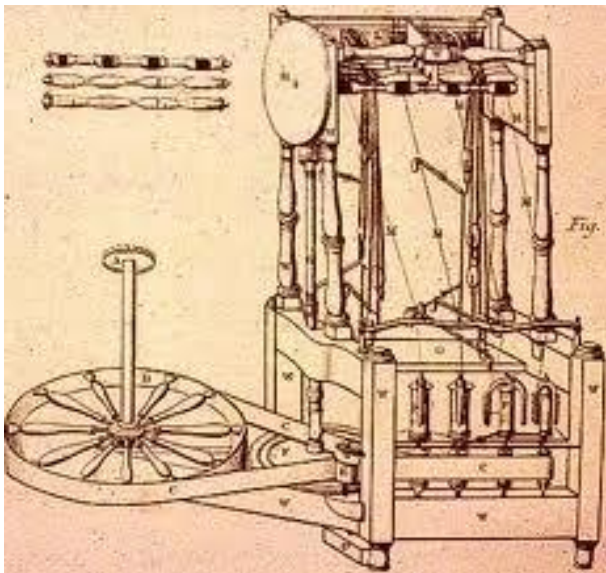
Henri Fayol's five functions of management

A very traditional model defining the various activities of management:



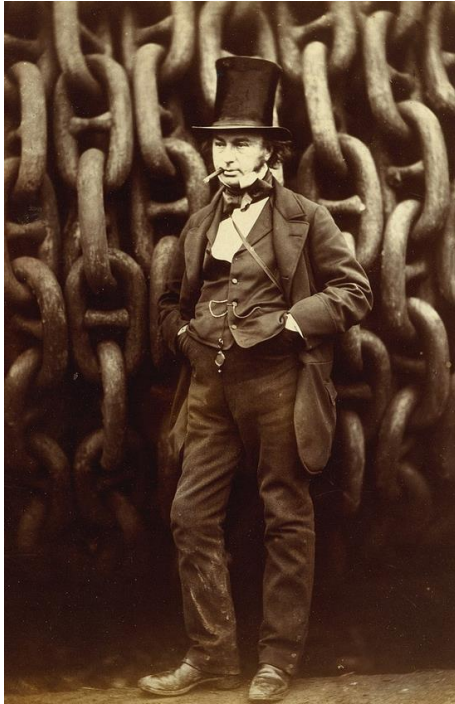
Henri Fayol
(July 29, 1841 – November 19, 1925)

Early forms of management



- The industrial revolution that started in the UK during the 1700s changed the way that goods were produced
- The textile industry is a good example
- Workers who had been self employed and operated simple machinery at home in rural areas were brought to large industrial centres to work in the new factories
- Large scale mechanisation and centralisation
- The bulk of the work required very little skill
- Workers were paid very little and lived and worked in poor conditions

Management innovation following technological innovation



- The 19th century was a period marked by significant technological changes:
 - Power generation
 - Materials
 - Telegraph
 - Transport infrastructure
- Rapidly spreading scientific view of the world.
- But initially, this did not have a large effect on management practice!



The organizational lag model

The span of time between the technological innovations at the start of the industrial innovation and the widespread adoption of a scientific approach to management based on Taylor's ideas is remarkably long

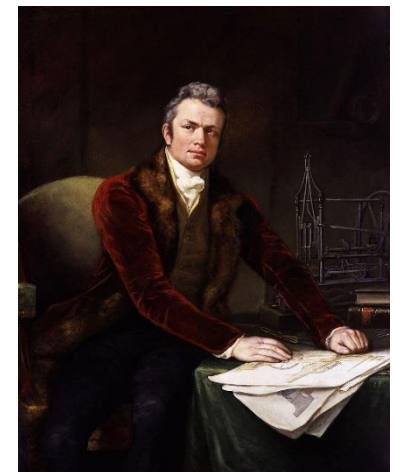
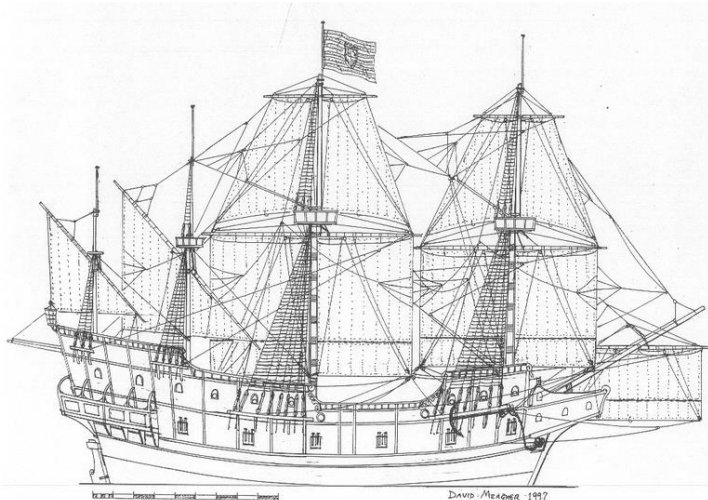
- Organizational and managerial methods tend to lag behind the arrival of new technologies
- Change in management methods is frequently, but not always, driven by constantly evolving technologies
- Highly effective organizations will be faster to adopt new management methods than low-performing organizations

First steps towards modern mass production



It's interesting to look at the history of manufacturing and the management techniques that were involved in this

- One of the first recorded instances of high volume production was at the Royal Navy docks in Portsmouth.
- The ships of the 16th and 17th centuries use thousands of pulley blocks
- Mass production and standardisation were introduced to ensure delivery and quality
- Invented by Mark Isambard Brunel



Another claimant to the “first mass production”

- The Springfield Rifle of the American Civil War



Significant features:

- Made in large quantities
- Parts interchangeable between rifles (i.e. standardisation!)

The arrival of the automobile

The car was one of the first products that required precision engineering but had the consumer appeal to demand very high volumes

- During the 1890s and the early years of the 1900s cars were produced in factories
- Early craft production methods required skilled craftsmen making hand crafted units
- No two were exactly the same
- apparently identical parts were not usually expected to be interchangeable



- The handwork meant that there was no economy of scale or volume - to make ten cost ten times the cost of a single unit
- This generally suited the bespoke requirements of the wealthy clients

The early car industry

Craft production was characterised by:

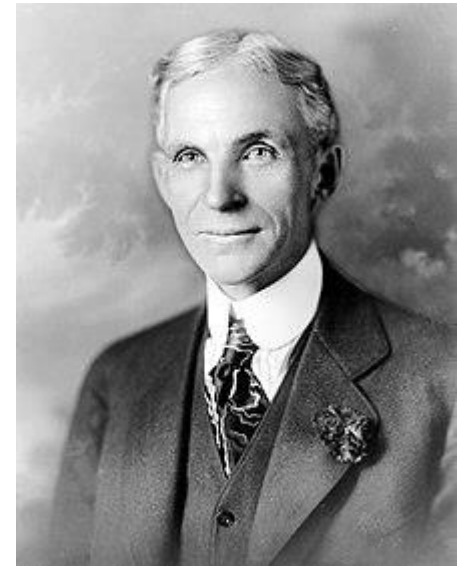
- Highly skilled workforce - often self employed specialists
- De-centralised (but local) organisations
- Standards and measurements varied throughout the supply chain
- General purpose manufacturing facilities
- Little or no specialised machinery
- Low volume production
- Little or no interchangeability of similar parts between units (what we call “modularity” today)



The revolution started by Henry Ford

In 1908 Ford introduced the Model T, which was aimed at the mass market. Its design objectives were:

- low cost
- designed for manufacture
- owner maintenance



Henry Ford
(1863 - 1947)

Initially Ford achieved this by:

- working to a standard measurement gauge within his plant.
- the use of new materials which allowed post machining heat treatments without significant distortion.
- elimination of need for a skilled shop floor work force.



Changes to the nature of factory work

- In 1903 a Ford car was typical in being largely built by one fitter, the car stayed where it was and the fitter went to collect all that he needed
- As a next step, Ford broke the work down into very small elements such as fitting a wheel, but nevertheless, the car still stayed in one place while the workforce came to it. This required the use of more specialist tooling and machinery
 - By these means Ford halved the average operation time and almost completely “de-skilled” the assembly, resulting in the production of 2,000,000 cars per year by 1922.
- However, the need to maintain a flow of parts to the assemblers gave rise to new skilled occupations such as industrial and production engineers
 - In, 1915 workforce was mainly ex-farm workers and immigrants, with the breakdown into very limited tasks minimised the need for training

Emergence of the vertically integrated firm

By 1915 virtually everything that Ford needed was produced within his own plants, which was partly the perception of a business need but largely the result of Ford's distrust of anyone else

- The enormous commercial success of this model gave Ford huge cash reserves
- Agents paid for the cars on delivery while he had 60 day terms with his raw material suppliers

By the early 1930s, Ford had become a truly global company with factories in the US, UK, Germany and France. These were still one product facilities - each made a different product and supplied internationally

- By the mid 30s Ford owned rubber plantations, iron mines, ships and railways
- He made unsuccessful entries into the aircraft and food industries

Downsides of this new way of production

Ford had given himself the problem of poor motivation within his workforce

- The shop floor employees were well paid by the standards of contemporary farm workers but were still cheap labour
- Typically his workers would be farmers or immigrants who came to work for him to make some money, then return to their homes. He had a very high turnover of labour
- In 1913 Ford was able to cut the cost of his car while famously doubling shop floor wages to \$5 per day
- He hoped to reduce turnover - and succeeded
- The problem was that his workforce could now not afford to return to their homes
- Suddenly, working conditions that were acceptable short term did not seem so attractive for a life's work

Unionisation as a consequence

The large scale dissatisfaction contributed to the unionisation of the motor industry

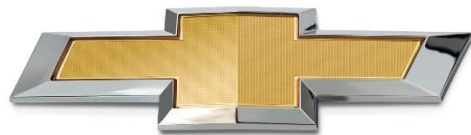
- This led Ford to an increasingly restrictive set of rules which inhibited its further growth
- The opposition were catching up, and in 1927 the Model T, still remarkably unchanged, went out of production



Supporting managerial innovation

A company that was pivotal in building on Ford's engineering innovations with other management innovations was General Motors (GM)

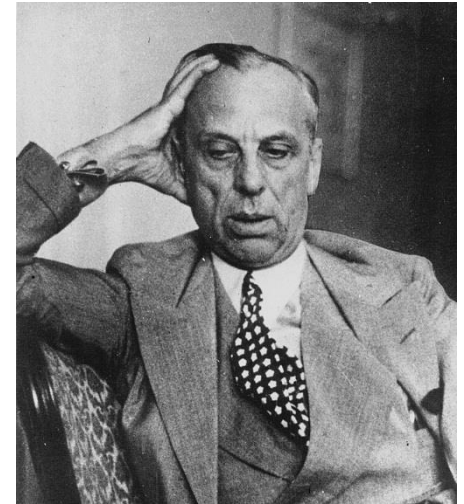
- GM was been founded in 1908 by William Durant, who was a tycoon who had purchased a number of companies such as Chevrolet and Cadillac
- Durant owned a dozen or so uncoordinated companies
- Alfred Sloan joined as President in the 1920
- Sloan and his team rationalised the products with brands ranging from cheap (Chevrolet) to luxury (Cadillac)



Alfred Sloan's organisational innovations

Sloan established each company as a “profit centre” and monitored them closely - replacing managers as and when necessary

- Sloan also accepted the need for external funding, gaining support from major banks and institutions
- Sloan recognised the need for a new breed of financial manager and marketing specialist
- Wherever possible GM used common parts, such as pumps and generators
- GM also introduced new marketing concepts:
 - the annual styling revision
 - additional accessories, such as air conditioning and automatic transmissions



Alfred P Sloan
(1875 –1966)

A new structure for an industry

By the 1940s, the elements for mature mass production were in place:

- Ford's factory practice
- Sloan's management techniques
- The workers union movement



The established auto industry reaches its limit

By 1955 the US motor industry reached a peak of 7 million cars sold. Then a decline started as foreign manufacturers established a foothold

- Overseas makers such as Morris and Citroen had not been slow to see the advantage of mass production
- But, with economic depression and the impact of the war, they had been unable to exploit it
- The rise in mass production continued into the 1970s and 80s
- The growth in the unions and their consequent strength caused major disputes and disruption
- This was fuelled by the lack of prospects of the shop floor assembly worker



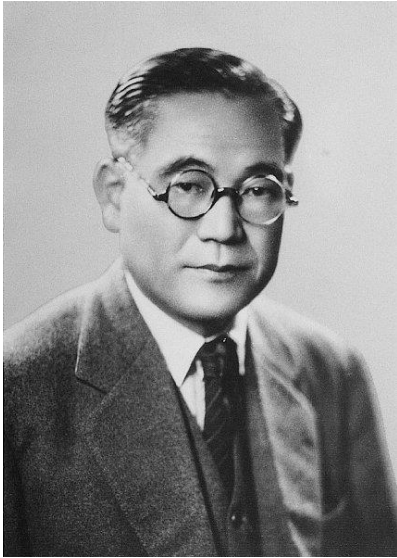
Meanwhile in Japan...

In Japan, Kiichiro Toyoda had been trying to manufacture Toyota private cars since the 1920s, but has been constrained by the government

As the Japanese tried to build a car industry following the second world war, they found that they were unable to copy the US mass production model because:

- Their financial resources were limited
- Japanese culture would not accept Ford's practices
- Restrictive labour laws (introduced by the US occupying powers)





Kiichiro Toyoda
(1894 – 1952)



Taiichi Ohno
(1912 – 1990)



TOYOTA

Toyoda and his senior engineer, Taiichi Ohno made several trips to the US:

- They came to believe that there were inherent flaws in the mass production system
- They could solve both these and their own problems simultaneously
- The system that they evolved and eventually perfected has come to be known as:

Lean

A definition of Lean

“Lean is an on-the-job learning method based on two pillars: continuous improvement, which means continuously challenging oneself and learning by continuous small steps, and respect, which means making the best effort to understand the obstacles each person encounters, supporting their development and making the best possible use of their abilities.”

A brief outline of Lean

Toyota and Ohno's system differed from classic mass production:

- High value tooling systems such as major presses were minimised by increased flexibility and inter-changeability
- Workers were given the responsibility of changing and maintaining their tooling
- This enabled small but economic batches to be used which cut down shop floor inventory
- Assembly workers operated in small teams under a leader
- These teams had the responsibility for production assembly and quality, house keeping and minor tool repair
- Ohno saw that improvement would come from many small changes rather than giant leaps
- This method of continuous incremental improvement became known as "Kaizen"

Important features of Lean

- Time was allocated to allow the teams to discuss their responsibilities and work on ways of improving the operation
- Production line workers were empowered to stop the production line
- The Lean system was filtered down the supply chain
- Parts would arrive from sub contractors “just in time”, further reducing inventory
- Lean principles extended into all aspects of the Toyota operation, such as product development and consumer expectations
- By the end of the 20th century, the Japanese motor industry had come to dominate in terms of quality and customer acceptance
- Now almost many modern manufacturing (and increasingly office) processes follow lean practice

More on this in Year 3!

Current trends in management

Many organizations are facing a complex and competitive environment and management competencies needed to thrive in the modern-day business world are changing. Change is, at least in part, due to ongoing and rapid technological change requiring new management methods:

- This change stems from range of global trends, often called “megatrends” due to their great significance
- Whether or not this environment has become more challenging than in the past is unclear
- This is at least in part due to ongoing and rapid technological change requiring new management methods



Megatrends changing the way business is done

Technological change

New technologies, in particular new information technologies, are rapidly changing the behaviour and expectations of customers as well as the tools and methods available to organizations.

Progressing urbanization

An increasing share of the world's population is living in cities. Significant challenges are posed by the growth of mid-sized cities in developing countries into megacities.

Global warming and scarcity of resources

Growth in the demand for energy, food and water is currently at an unsustainable level. The same applies to carbon emissions. The resulting increase in average temperatures across the globe may lead to catastrophic consequences if left unaddressed.

Rebalancing of the economic performance of countries and regions

Some emerging economies that were growing strongly in the recent past are now stagnating. Organizations investing in these emerging economies will need improved methods to manage this uncertainty.

Demographic and social changes

It is expected that unsustainable population growth will occur in some developing countries in the foreseeable future. In developed countries, an ageing population will pose different challenges.

(Some) management responses

- *Adopting new organizational structures.*
 - Flatter hierarchies
 - New managerial styles
 - Workplace democracy
 - New organizational forms (e.g. “gig economy”)

- *Promoting the development of workers as individuals.*
 - Continuously changing skills requirements
 - Lifelong learning

- *Striving for gender balance and inclusivity.*
 - Increased representation of women and minorities in management
 - Management must capitalize on diversity
 - Businesses must learn to address lack of representation/role models, unconscious bias and unequal pay practices

Lecture summary in three points

- Now able to define what management is and what its scope is
- Organizational lag model, managerial change follows technological change, discussed extensively using the example of the 20th century automotive industry
- Understanding of global megatrends and broad current themes in the field of management...



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Thank you!