

MENG 3444

Work Analysis and Design

Key Contributors



Lotfi K. Gaafar

Key Events

- James Watt's steam engine started the Industrial Revolution in England in 1770 with the invention of several new machines used in the production of textiles
- Interchangeable parts manufacture was being introduced in the United States. Much credit for this concept is given to Eli Whitney (1765-1825)
- Mass production and the moving assembly line around the end of the nineteenth century and the start of the twentieth with key contributions from Henry Ford (1863-1947).
- Scientific Management (1880-1915): Introduced to manage the large scale, labor-intensive factories brought on by the developments above.

Frederick Taylor (1856-1915)

- Father of scientific management
- Main Principles:
 - Develop a science for each element of work
 - Select the best worker for each task
 - Train the worker in the prescribed method
 - Develop a spirit of cooperation between management and labor
 - Divide the work between management and labor into equal shares, each doing what they do best
- Key publications:
 - Shop Management (1903)
 - Principles of Scientific Management (1911)



Frederick Taylor (1856-1915)

- Example productivity improvement



Tons handled on piecework during the year ended 30 April 1901			924,040	
Cost of handling these materials			\$30,798	
Former cost per year			\$67,215	
Net saving			\$36,417	
Average cost per ton	Now	\$0.033	Formerly	\$0.072
Average earnings per man per day		\$1.88		\$1.15
Average tons handled per man per day		57		16
Number of men		140		400-600

Calculate the increase in productivity

Frank Gilbreth (1868-1924)



- Father of motion study
- Basic motion elements (Therbligs) as a prelude to Predetermined time standards
- A leading public speaker for Taylor's scientific management movement
- Key publications:
 - Motion Study(1903)
 - Principles of Scientific Management (1911)

Frank Gilbreth (1868-1924)



- Developed “time and motion” study as an approach to scientific management.
- Motion study: finding the best method to perform a task.
- Time study: establish work standards for a job.
- Used Cine camera in analysis.
- Constructed 3 dimensional models of motion
- Identified Two factors affecting job execution: 1) Worker
2) Environment.

Frank Gilbreth (1868-1924)



- Example productivity improvement

Designed a special scaffold and a new brick laying procedure that reduced the movements needed from 18 to 5 and in one case to 2. The worker's productivity increased from laying 120 bricks per hour to laying 350 bricks per hour.



Calculate the increase in productivity

Lillian Moller Gilbreth (1878-1970)



- Partnership with her husband Frank
- Difference in their natures and its effect on business:
 - Frank: technical aspects of time management
 - Lillian: human aspects of working efficiency
- A sum up of their idea found in 2 books
 - “Applied Motion Study ”
 - “Fatigue Study”
- Mother of 12 Children
- Author of 12 Books
- Holder of several degrees

Lillian Moller Gilbreth (1878-1970)



- Applying efficiency techniques for handicapped to facilitate their lives
- Directing doctors in treating patients
- Wrote on homemaking and parenting
 - “Living with Children”
 - “Homemaker and her Job”
 - “Foreman and Power Management in the Home”

Lillian's Late Achievements



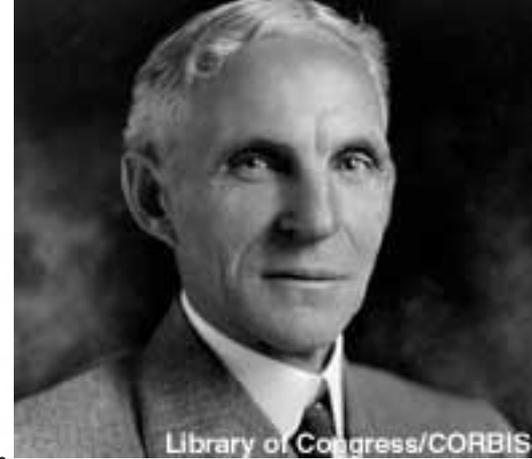
Lillian Gilbreth

- Education at the age of 50
 - MS in Engineering
 - Doctorate in Engineering
- Served in the New Jersey State Board of Regents
- Delegate to the World Power Congress
- Professor at Purdue
- Advisor for American Presidents
- Retired at the age of 90
- Passing away at the age of 92

Henry Ford (1863-1947)

Building a career:

- First job as an apprentice machinist (1879).
- Returned to Greenfield Township and marries Clara Bryant (1888).
- Worked in different factories in Detroit.
- Worked as an engineer for Edison Illuminating Company(1891).



<https://www.youtube.com/watch?v=Oqd1Q0FFeoc>

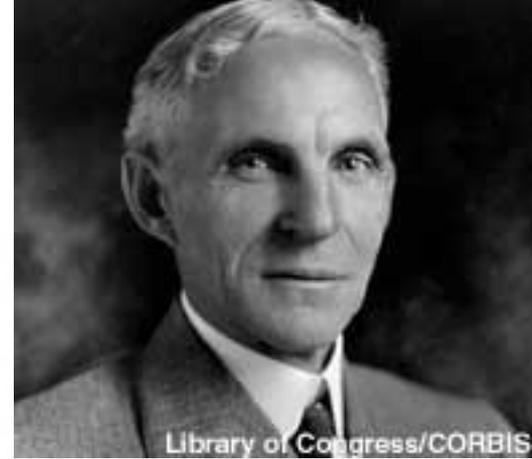


1896 Ford

Henry Ford (1863-1947)

Building a career:

- He completed his first automobile, the Quadricycle.
- Worked as chief engineer and partner in Detroit Automobile(1899).
- Establishment of Ford Motor Company (1903).



Henry Ford (1863-1947)

Building a career:

- Introducing the Model T (1908).
- Mass production
- The moving assembly line (1913).
- First to introduce the 8-hour work day in 1914 (down from 9, 16 hrs in some places). Became law in 1938.
- First to introduce the \$5 work day in 1914.

