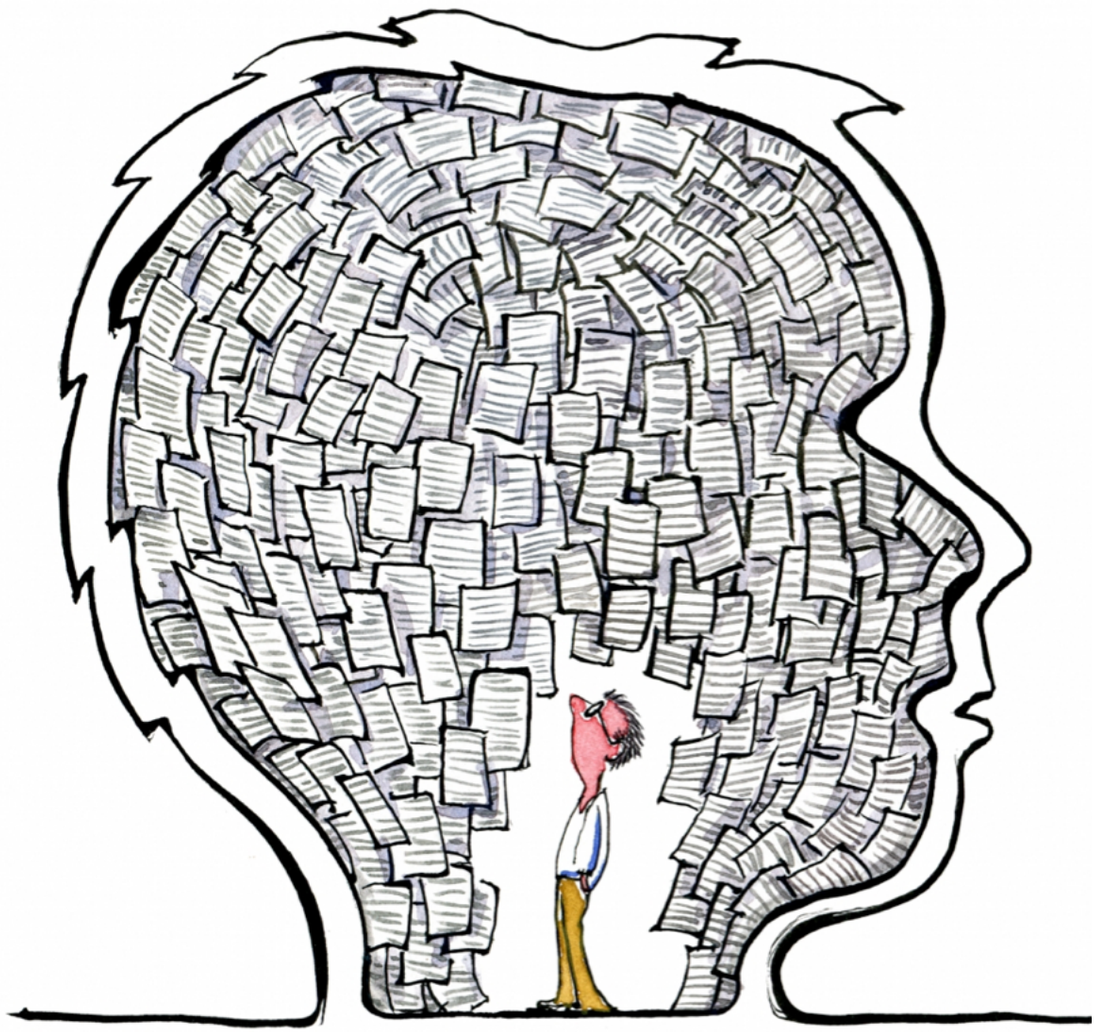
Theories of Work: Origins of the Design and Management of Work



By David Joyce

www.theoriesofwork.com

Image: Man in a head, Frits Ahlefeldt, Added: Apr 3, 2013, color illustration Copyright © 2013 HikingArtist, All Rights Reserved. www.hikingartist.net

Chapter Three

Management Science

Design and Management

__ Concepts __

- Scientific Management and “Taylorism”.
- Productivity Incentives; Payment by Results.
- Work Analysis, Work Breakdown, and Work Measurement.
- Best Practices and Benchmarking.
- Standardized Work, Standard Times, Production Standards, Work Instructions, Job Descriptions, and Work Inspection.
- Division of Responsibility; Planning vs Doing; Blue-Collar vs White-Collar jobs, and Functional Supervision.
- Process Improvement and Waste Removal.
- Time sheets, Employee Discipline and Employee Performance Records.
- Worker Efficiency, Worker Utilization and Worker “laziness”.
- Staff Suggestion Schemes.
- Management Consulting.

THE INDUSTRIALIZED WORLD

In the last two decades of the 19th century, the U.S. was shifting - uneasily - from a loosely connected world of small towns, small businesses, and agriculture to an industrialized network of cities, factories, and large companies linked by rail.[247]

Across the industrialized world owners of early enterprises had the power to run their businesses with virtually no constraints.[243]

They were god-like in the small worlds they had created.[243]

Although employees were known to be human, their personal interests and purposes were irrelevant to their employers.[243]

[247] The Management Century, by Walter Kiechel III hbr.org/2012/11/the-management-century/

[243] Springer, A Systemic View of Transformational Leadership", Ackoff R.L. Systemic Practice and Action Research, Vol. 11, No. 1, February 1998 , pp. 23-36(14) Publication date: 1998-02-01 l094-429X/98/0200-0023$15.00/0 © 1998 Plenum Publishing Corporation with kind permission from Springer Science+Business Media B.V.

Workers were retained only as long they were ready, willing, and able to do what the owners wanted.[243]

When they no longer were, they were discarded and replaced, like replaceable machine parts, by others who were compliant and usable.[243]

In the early days of industrialization the work done by most employees required little or no skill, and unskilled labor was plentiful.[243]

In general, this work force had little education and, therefore, relatively low levels of aspiration.[243]

Many were immigrants with only a very limited knowledge of English. They aspired more for their children than for themselves.[243]

Government began to regulate working conditions, thereby reducing the power of the owners and protecting at least the health and safety of members of the work force.[243]

Unions emerged, improving the conditions of work, work itself, compensation for it, and job security.[243]

Because of continuing advances in mechanization, the skills required of workers continued to increase.[243]

Those who had the required skills were not as plentiful as those who didn't.[243]

It was costly to replace skilled workers; expensive training was frequently involved.[243]

[244] The Man With the Plan - Frederick Winslow Taylor, father of scientific management, Brink Lindsey, from the January 1998 issue, reason.com/archives/1998/01/01/the-man-with-the-plan

As a result, they were treated more like difficult-to-replace organs than easily replaceable machine parts.[243]

All this made the owners less god-like.[243]

Factory work was done according to the craft system; jobs were "trades", and their secrets and rules of thumb were passed down, slowly and grudgingly, from master to apprentice.[244]

The owners and operators of the business really had no idea how their work should be done.[244]

They didn't know how tasks were best arranged, they didn't know how to optimize the output of the machines, and they didn't know what pace of output was sustainable.[244]

[243] Springer, A Systemic View of Transformational Leadership", Ackoff R.L. Systemic Practice and Action Research, Vol. 11, No. 1, February 1998 , pp. 23-36(14) Publication date: 1998-02-01 1094-429X/98/0200-0023$15.00/0 © 1998 Plenum Publishing Corporation with kind permission from Springer Science+Business Media B.V.

THE FOREMAN

In virtually all industries, regardless of the types of manufacturing operations taking place, the foreman was, for all intents and purposes, the manufacturer.[245] [246]

The foreman had near absolute authority over the workers.[245] [246]

He was responsible for hiring and firing personnel, training them, arbitrating grievances, promoting and demoting workers, and enforcing the manufacturer's personnel policies regarding work hours, personal appearance, and rules of conduct.[245] [246]

[245] ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

The foreman set the wages using a "rule of thumb" method,[245] [246] a haphazard practice of organizing the work, which gave individual workers enormous control.[257]

[246] Nelson, Daniel (1980) Frederick W. Taylor and the Rise of Scientific Management Madison Wisconsin, University of Wisconsin Press pp. 8-9

Image: **Foreman's Office, Work Board on the Right**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company p. 211 archive.org/details/costkeepingandsooevangoog

Some more or less experienced foreman or rate-setter came along and looked at a job, and made what appeared to be a guess (often a very close guess) at the time that should be taken to perform the work.[249]

A rate was fixed accordingly. [249]

In many industries the “piece work” system was common.[245 246]

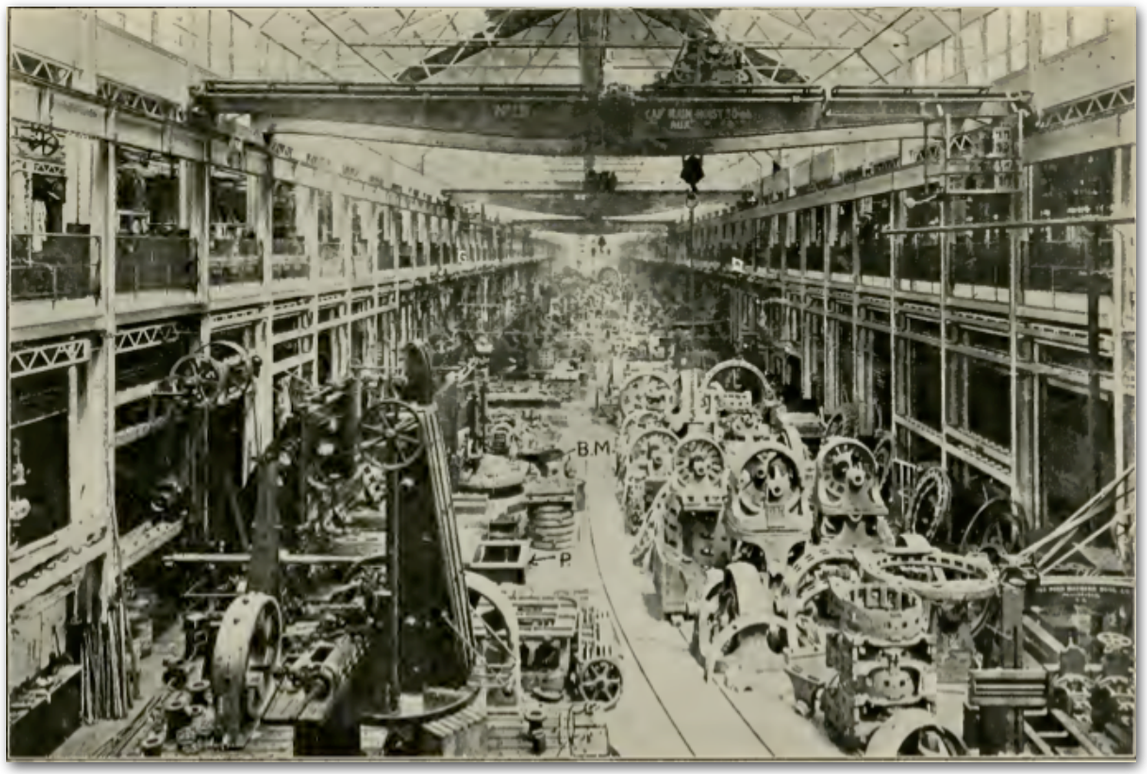
The manufacturer, for whom the foreman worked, usually watched the payroll very closely. When piece workers were so productive that they earned more than the prevailing day wage, the manufacturer would order the piece rate cut, removing any incentive to produce more.[245 246]

[249] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeooochur

[246] Nelson, Daniel (1980) Frederick W. Taylor and the Rise of Scientific Management Madison Wisconsin, University of Wisconsin Press pp. 8-9

Combined with the difficult and unsafe work environments in many factories, there was a more or less permanent state of labor-management strife.[245 246]

Strikes and violence were common.[245 246]



[245] ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

Image: **Interior of a Machine Shop**, The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company p. 154 archive.org/details/principlesofinduoodunc

A SCIENTIFIC APPROACH

Some believed that a more systematic or scientific approach was required.

The initial focus of what became known as 'the scientific management movement' was on efficient use of labor and on costs and cost systems.[332]

As Alexander Church described:

> *"The next step on the path of development of the practical use of analysis was due to the desire of employers of labor to find some satisfactory basis for rewarding it according to results.*
>
> *The old piece-work methods were largely based on the hit-or-miss plan.*
>
> *The early beginnings of this movement were characterized by a desire for more exact knowledge."* [249]

One of the first documented usages of a more scientific management approach was by Boulton and Watt.

Boulton & Watt manufactured stationary steam engines. It was initially a partnership between Matthew Boulton and James Watt.[173]

The firm of Boulton and Watt owed many of its management innovations not to James Watt, Sr., the inventor, or his partner Matthew Boulton, but to their sons, who took over the enterprise.[261]

[173] en.wikipedia.org/wiki/Boulton_and_Watt

[249] The science and practice of management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeooochur

[332] Public Management: Old and New, By Laurence E. Lynn, Jr. Publisher: Routledge; New edition (August 3, 2006) p.92

[261] Management and ideology: the legacy of the international scientific management movement, By Merkle, Judith A, Publisher: Univ of California Pr (December 1980) p.211

This was perhaps the first model of what was later to become a standard pattern in the development of industry, the "father" generation of inventors and entrepreneurs being succeeded by the "sons" who turned to pure management.[261]

In 1794, Watt Jr. became a partner in the Soho Foundry firm of Boulton & Watt.[250] [251]

He became responsible with Matthew Robinson Boulton for its management.[250] [251]

Matthew Robinson Boulton was mainly involved in the initial planning of the Foundry, with James Watt Jr. being more concerned with daily management and organisation.[253] [252]

[261] Management and ideology: the legacy of the international scientific management movement, By Merkle, Judith A, Publisher: Univ of California Pr (December 1980) p.211

[250] en.wikipedia.org/wiki/James_Watt_junior

[251] Williams, Robert (1995), Accounting for steam: The accounts of the Soho factory, Accounting & Finance Working Papers, 95/14, Wollongong, NSW: University of Wollongong, retrieved 2012-09-16 p. 5

They instituted one of the first complete applications of scientific management.[254]

In this plant there is evidence of market research, including machine layout study involving workflow, production standards, cost accounting, employee training, employee incentives, and employee welfare programs.[254]

Although there is evidence of a scientific management approach at Boulton & Watt's plant, there is little evidence that this approach was used elsewhere at the time.

In his book "The Making of Scientific Management", Lyndall Urwick reported:

[252] Williams, Robert (1995), Accounting for steam: The accounts of the Soho factory, Accounting & Finance Working Papers, 95/14, Wollongong, NSW: University of Wollongong, retrieved 2012-09-16 p. 7

[253] en.wikipedia.org/wiki/Matthew_Robinson_Boulton

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

> *"In its setting as part of the history of the pioneers of scientific management ... Was the management at Soho an isolated instance in a time of intense industrial change?*
>
> *Did it maintain its high standards over two or three decades without exerting any influence on the affairs or minds of customers and other contacts?*
>
> *For the present there is no certain answer to these queries."* [248]

Curious as this may be, it wasn't until the late 1800s that a scientific management approach become more widespread.

THE MANAGEMENT ENGINEER

As with Boulton and Watt, the catalyst for this spread were engineers.

[248] The Making Of Scientific Management Volume II (1949), Author: Urwick. L, Publisher: Management Publications p.38 archive.org/details/makingofscientifo32926mbp

[258] en.wikipedia.org/wiki/ASME

Since management relied heavily on engineers for advice in the new factories, it is not surprising that associations of engineers were some of the first to examine and write about management problems. [254]

One such association, ASME, founded [in 1880] as the American Society of Mechanical Engineers, is a professional association that, in its own words, "promotes the art, science, and practice of multidisciplinary engineering and allied sciences around the globe".[258]

ASME had been founded to gather technical information, but in 1886, Henry Robinson Towne, read a paper called The Engineer as Economist, which has been called "the founding document of the new science of management".[257]

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

In this paper he recognised the need for a science of management which could flourish only through its own literature, journals and association[259] and laid out his ideas about the management role for the engineer.[255]

Henry R. Towne was an American mechanical engineer and businessman.[255]

He was introduced to Linus Yale, Jr.[255] the inventor of the pin tumbler lock[440] [256] and in October 1868, the two men formed the Yale Lock Manufacturing Company.[255]

Towne was one of the first engineers to see management as a new social role for engineers and that the development of management techniques was important for the development of the engineering profession.[255]

[255] en.wikipedia.org/wiki/Henry_R._Towne

[256] Yale: History of Yale

[259] Dynamics of Modern Management, By Waino W Suojanen, Publisher: Holt, Rinehart and Winston; 1St Edition edition (1966) p. 101

[440] en.wikipedia.org/wiki/Yale_(company)

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

Image: **Henry Robinson Towne** (1844-1924), Class of 1865, portrait photograph, Date: circa 1900, Source: University of Pennsylvania, Author: Unknown, Permission (Reusing this file) PD-US
en.wikipedia.org/wiki/File:Henry_Robinson_Towne.jpg

Towne was responsible for establishing modern management methods in his company's shop.[259]

He began applying systematic management practices as early as 1870.[254]

He was elected President of the ASME in 1888, and his presidential address continued to address how to improve shop and worker efficiency.[255]

Towne encouraged the writing and publication of papers dealing with management of production.[260]

Towne also published several papers and a book, Evolution of Industrial Management, on the use of "gain sharing" to increase worker productivity.[254]

260 Improving Competitiveness of Industry, By Harold Bierman, Jr. World Scientific Publishing Company; 1 edition (June 10, 2011) p. 119

255 en.wikipedia.org/wiki/Henry_R._Towne

259 Dynamics of Modern Management, By Waino W Suojanen, Publisher: Holt, Rinehart and Winston; 1St Edition edition (1966) p. 101

It is important to recognize the contributions of Henry R. Towne to the early development of scientific management.[260]

WAGES AND INCENTIVES

Frederick A. Halsey was another engineer who wrote papers presented to ASME outlining his ideas about wages.[254]

Halsey fundamentally disagreed with Towne's profit-sharing ideas.[357]

In 1891 Fredrick Halsey read an important paper before the American Society of Mechanical Engineers.[357]

He attacked the evils of profit sharing and proposed a special "premium plan" for paying workers based on time saved.[254]

254 Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

357 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

Halsey proposed incentives based on past production records, including a guaranteed minimum wage and a premium for not doing work.[254]

Workers under the Halsey plan were allowed the same length of time they have been taking in the past as a standard. If they increased output, two-thirds of the gain went to the employer and one-third was given to the men.[357]

The Towne and Halsey schemes were both tried out in factories and both yielded results, in terms of higher wages and increased productivity.[441]

However, the fear by either management or the workers that the other side was 'getting too much', was already rearing its head.[441]

357 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

254 Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

FREDERICK TAYLOR

As industrialism expanded in the United States following the Civil War, the essence of the labor movement was the struggle for control of the workplace between the workers, holding fast to their craft skills, and the management.[257]

One of the most famous figures to participate in this struggle was Frederick Winslow Taylor.[257]

Frederick Taylor was one of the first people to view management as a science to be studied.[327]

Much of this chapter will be dedicated to discussing Taylor, such is his influence on the design and management of work today.

441 Management and Organizational Behaviour, Jayantee Saha, Publisher: Excel Books (July 25, 2012) p.74

257 FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

327 An Analytical Study On Scientific Management HRM 601, Akeem Adebiyi Adeyemi Ersal Aslam Alan Cohen Sangram Singh Jolanta Soltis

The America of the late 'seventies and early 'eighties, the period when Taylor first came on the industrial scene, was gripped in a vicious circle of low wages, low production, low purchasing power and a consequent lack of prosperity.[361]

Strikes and other evidences of widespread industrial unrest marked the period.[361]

Born into a wealthy family in Philadelphia,[257] in 1873, [Taylor] decided to leave school (Phillips Exeter Academy [334]) to become an engineer.[263]

Image: **Frederick Winslow Taylor 1873**, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap commons.wikimedia.org/wiki/File:F._Taylor_at_1873.jpg

[361] Scientific management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, p.xviii archive.org/details/scientificmanageootayl

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[334] Frederick W. Taylor, father of scientific management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 3-7 archive.org/details/frederickwtaylor01copl

So in the spring of 1874, he quit Exeter to work in a foundry, the Enterprise Hydraulic Works, also known as Ferrell and Jones, after the owners who made steam pumps and hydraulic machinery, using the steam-pump design developed by Henry Worthington.[263]

He started as an apprentice patternmaker and later a machinist.

The industrial revolution had been underway for nearly 100 years before Taylor took his first job as an engineer at Philadelphia's Midvale Steel Company.[245 442]

In late 1877, Taylor met Wilfred Lewis and Coleman Sellers, whose father, William Sellers, was the head of a large machine tool company and who owned a controlling interest in Midvale Steel, Sellers was a mechanical genius, with 90 patents.[263]

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

A FAIR DAYS WORK

In late 1878, Taylor went to work at Midvale in the machine shop and Midvale became "a large laboratory"[263] for Taylor.

He excelled, and it wasn't long before Taylor was promoted.

In 1879, Taylor was appointed a gang boss at Midvale Steel, admitting to the workers that:[257]

> *" he was now on the side of management, and that he proposed to do whatever he could to get a fair day's work out of the lathers."* [257]

His methods were to have a profound impact.

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[245] ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

[442] Nelson, Daniel (1980) Frederick W. Taylor and the Rise of Scientific Management Madison Wisconsin, University of Wisconsin Press p 29

Immediately he was plunged into difficulties of management. The output was low and, having been a worker among workers of that day, he knew it was due to systematic as well as unconscious soldiering[362] (today known as slacking, laziness or shirking).

As Taylor explained:

> "Hardly a competent workman can be found ... who does not devote a considerable part of his time to studying just how slowly he can work and still convince his employer that he is going at a good pace. [417]"
>
> Frederick Taylor

To solve this problem, Taylor was inspired by Towne's ideas and directed his efforts to understand all facets of a firm and to develop scientific management.[331]

Taylor wrote:

> "*In the writer's judgment, the Towne-Halsey plan is a great invention, and, like many other great inventions, its value lies in its simplicity.*" [326]

However, it didn't go far enough for Taylor.

[362] Scientific management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, p.1 archive.org/details/scientificmanageootayl

[417] Shop Management, By Frederick Winslow Taylor, Publisher Harper and Brothers New York and London 1911 p. 14 archive.org/details/shopmanagementoitayl

[331] Administrative Thinkers edited by D. Ravindra Prasad, V. Sivalinga Prasad, P. Satyanarāyaṇa Publisher: Sterling; 2nd edition edition (March 30, 2011) p. 65.

[326] Shop Management By Frederick Winslow Taylor, Introduction by Henry Towne, Publisher Harper and Brothers New York and London 1911

Image: **Frederick Winslow Taylor 1873**, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap commons.wikimedia.org/wiki/File:F._Taylor_at_1873.jpg

THE PRODUCTIVITY PROBLEM

He began in 1880 to keep "Book Containing Notes of Importance," and he recorded all data about all processes, taking nothing for granted and accepting none of the past practices.[263]

He also began researching what others were doing to solve the "productivity problem":

> *"Almost as soon as I started with this idea at the Midvale Steel works ... I started to collect what information could be had that was written and published on what constituted a day's work."* [263]

Taylor employed research, industrial "tourism" (visiting other establishments) and early forms of benchmarking.

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

For fifteen years at Midvale, Taylor experimented and recorded every aspect of the work process.[257]

For example, his determination to increase productivity led him in the autumn of 1880, to a series of systematic experiments in metal-cutting.[257]

He found almost immediately that cooling the cutting tools with a water spray, permitted an increase of the cutting speed by 40%.[257]

In 1882, Taylor wanted to eliminate the rule-of-thumb and replace it with scientific knowledge, backed by meticulous data.[263]

The idea of 'guessing' about the time required to perform a job was against Taylor's basic outlook.[269]

[269] Frederick W. Taylor: The Father of Scientific Management : Myth and Reality By Charles D. Wrege and Ronald G. Greenwood, Publisher: Business One Irwin (June 1991) p.54

> **Our trades are learned just as they were in the Middle Ages.** [263]
>
> Frederick Taylor (Testimony, 1912)

STANDARD "SHOULD TAKE" TIMES

Taylor hypothesized that workers could be retooled like machines, their physical and mental gears recalibrated for better productivity.[270]

Taylor began to measure how work was performed, how long it took and, most importantly, began to project how long each job should take.[257]

Taylor described the method:

> *it consists in recording the quickest time in which a job has been done, and fixing this as a standard.*
>
> *If the workman succeeds in doing the job in a shorter time, he is still paid his same wages per hour for the time he works on the job, and in addition is given a premium for having worked faster, consisting of from one-quarter to one-half the difference between the wages earned and the wages originally paid when the job was done in standard time.*" [326]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[270] Crossen, Cynthia (November 6, 2006). "Early Industry Expert Soon Realized a Staff Has Its Own Efficiency". Wall Street Journal. online.wsj.com/article/SB116277621193713997.html

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[326] Shop Management By Frederick Winslow Taylor, Introduction by Henry Towne, Publisher Harper and Brothers New York and London 1911

Image: **Frederick Winslow Taylor 1873**, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap commons.wikimedia.org/wiki/File:F._Taylor_at_1873.jpg

He went on to explain:

> "*since the rate-fixing is done from accurate knowledge, instead of more or less by guesswork, the motive for holding back on work, or 'soldiering,' and endeavoring to deceive the employer as to the time required to do work, is entirely removed.*" [336]

Taylor maintained that higher productivity led to higher employment, but the workers of the late 19th century saw the reverse: they were careful not to finish work too quickly to avoid both running out of work and working too hard.[257]

For the first time, one of Taylor's assistants used a stopwatch to break down the work process into minute components, each of which could be altered to speed up production.[263]

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

Everything became a management method to increase productivity: the design of the machine, the design of the piece, the motions of the operator, etc.[263]

In doing so, Taylor broke down the job to create an expectation, almost mathematical, for future work.[263]

[336] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p. 402 archive.org/details/frederickwtaylor01copl

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Image: **Lathe Operator at Midvale Steel**, Kheel Center for Labor-Management Documentation and Archives, M.P. Catherwood Library, Cornell University. www.ilr.cornell.edu/library/kheel/resources/images/citing.jpg

SCIENTIFIC TIME-STUDY

The use of time-study in organisations had begun. It had been used before, going back to the very beginnings of the factory system[249] but not in a formalized, or what Taylor would call scientific, way.

Opposite we can see an observation sheet used in 1910 for timing work.

Taylor's battle for increased productivity would leave no stone unturned, he also restricted workers from leaving the shop at lunchtime.[263]

In February, 1884, Taylor was promoted, at age 28, to almost complete control of the machine shop; calling himself "Chief Engineer," though he did not officially receive this title until 1887.[263]

[249] The science and practice of management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeooochur

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

OBSERVATION SHEET

Order No. 123 512 Date Sept. 1910
Piece Hand Hole Plates for B&W Boilers.
Operation Rough Forging. Die: 5-36
Machine Drop Hammer No 2 Workman. Wilsey
Sheet No. 3. Time 9.30 A.M. To 10 A.M.

Time	Light Furnace	Waiting for Heat	Forging (Production Time)	Rotusting Dies	Miscs. Waiting	Number of Forgings Made	Bars or Stock Placed in Furnace	Remarks
9.30 To 31				10			XX	
32		30	20					
33						–		
34						–	X	
35						–		
36		35 10	35			–		
37			50 10					—
38		15	35			–	X	
39						–		
40			30	15		–		
41						–		
42						–		
43		25 10	35			–		
44			50				XX	
45						–		
46						–		
47						–		
48		16	45			–		
49								
50		60	10					
51						–		
52						–		
53								
54						–		
55						–		
56								
57			25	35 5		–	X	
58					* 65 20			* Drink of Water.
59			40					
10.00						–	X	
Total	0–0	4–10	22–30	2–05	1–15	20	8	

Image: **Observation Sheet**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company P. 132 archive.org/details/costkeepingandsooevangoog

His methods proved successful, from 1881-1885: Midvale grew tremendously.[263]

Here we can see what was called "A Shop Observation Card For Recording Stop-Watch Time Studies" used in 1909. It includes the job order, the type of work, the name of the workman who did the work, the date and time when work began and was subsequently completed, along with remarks, and total time to complete the job, in this case 10 hours. Each operation is also broken down.

The aim of these time studies was to increase productivity by reducing or removing waste.

JOB ORDER 4672/GA. SHOP OBSERVATION CARD DATE 4-7-09
CHARACTER OF WORK SCUTTLES COAL 24"- WOOD DECK - DECK RING - FOR.

WORKMAN BETTENCOURT. RATE 47¢	OPERATION	DESCRIPTION OF OPERATIONS	1	2	3	4	5
STARTED TO SET MAC. 9 A.M. 4-17	A	PLACE RING ON MACHINE TABLE	2.10	9.32			
MACHINE ALL SET AT 9.27 A.M. "	B	TURN OUTER EDGE OF FLANGE	2.48	12.15			
BEGAN WORK 9.27 A.M. 4-17	C	" INSIDE FOR COVER	4.17	13.46			
	D	" & FORM BEAD	6.20	15.51			
	E	LAND ON FLOOR.	7.15	16.40			
COMPLETED WORK 11 A.M. 4-18	F						
REMARKS	G						
SPECIAL TOOL A-4-4	H						
FOR FORMING BEAD.	I						
LOT - OF 24.	J						
TIME = 10 HRS.	K						
	L						
	M						

FIG. 24. SHOP OBSERVATION CARD FOR RECORDING STOP-WATCH TIME STUDIES.

263 Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Image: **Shop Observation Card for Recording Stopwatch Time Studies**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company P. 205 archive.org/details/costkeepingands00evangoog

In his chapter "Wasted Time Detected by Time Studies" (1911) Evans stated that:

> *"Wasted time is the principal reason for inefficient labor.*
>
> *Very few owners or managers realize that an enormous amount of time is wasted by men in their employ.*
>
> *Wasted time, while due to many causes, may be classed under four general heads: Loafing, Employment on Unsuitable Work, Lost Time due to Unnecessary Waits, and Poor Equipment.*
>
> *The proper procedure is to first find the cause.*
>
> *This can only be accomplished by detail observation.*
>
> *The best means for doing this is by stop-watch unit time studies."* [317]

[317] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 127-128 archive.org/details/costkeepingandsooevangoog

[276] Techniques of Scientific Management www.managementstudyguide.com/techniques_scientificmanagement.htm

Taylor stipulated that a fair day's work should be "determined through observations ... and analysis".[276]

As he observed each movement, moreover, Taylor tried to simplify each one.[257]

His view was that:

> Standard Time × Working Hours = Fair Day's Work [276]

While his immediate goal was increasing productivity, he contributed to the deskilling of the work place.[257]

By calculating "scientifically" how each job should be performed, and how long it should take, Taylor increased productivity but, most importantly, transferred control of the work process over to management.[257]

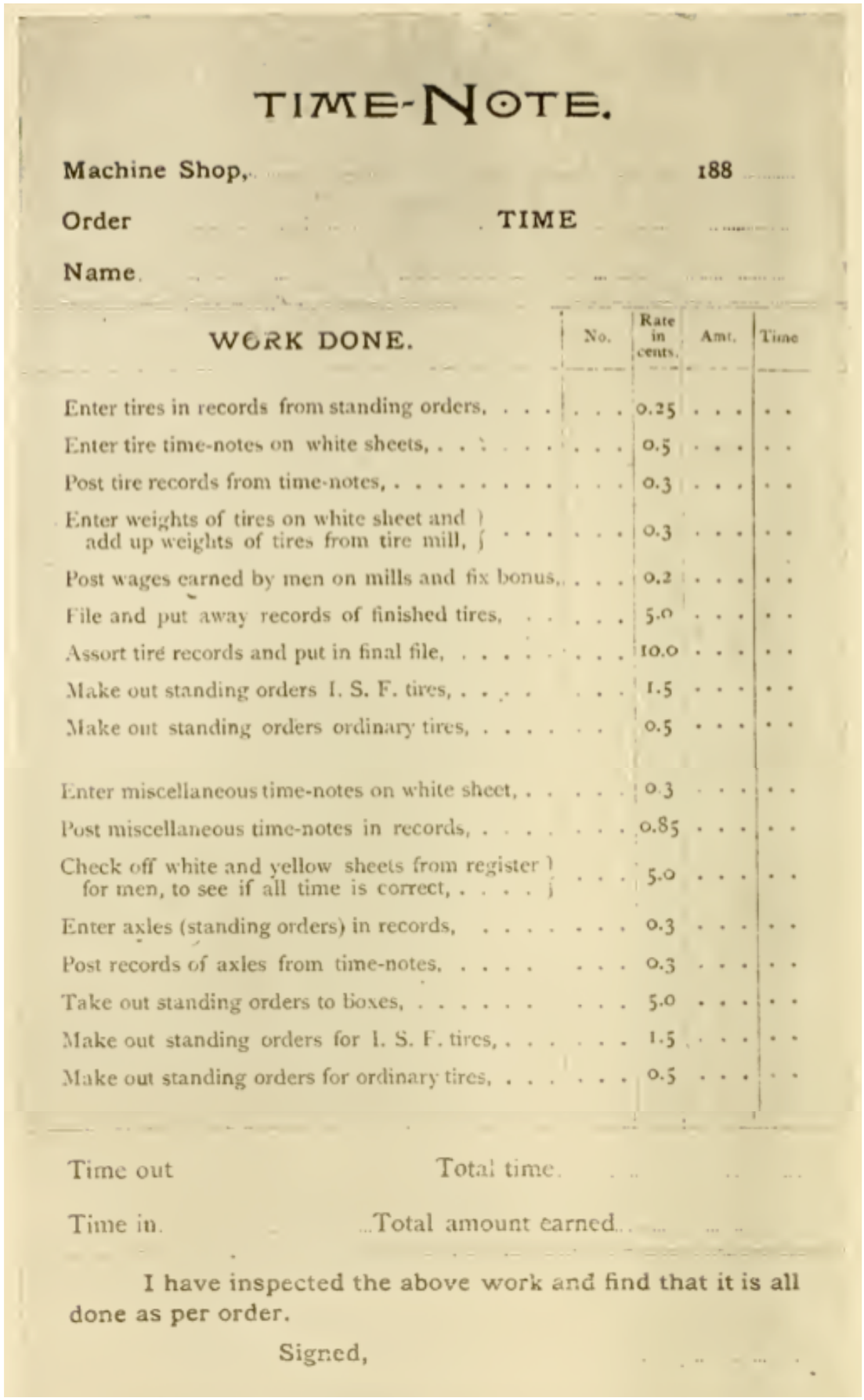
[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

Taylor's idea was that every part of a factory, or a whole organization, should be scientifically analyzed and redesigned to achieve the most efficient output.[278]

With this in mind Taylor also sought to apply the same principles to standardize clerical operations.

Here you can see an early Taylor Clerical Time Form from Midvale in 1885.

It included timings and rates for each piece of work, when the work started, when the work ended, the total time the work took, and if it passed inspection.



TIME-NOTE.

Machine Shop,. . . . . 188 . . . .

Order . . . . . TIME . . . . . .

Name. . . . . .

WORK DONE.	No.	Rate in cents.	Amt.	Time
Enter tires in records from standing orders, . . .		0.25	. . .	. .
Enter tire time-notes on white sheets, ...		0.5	. . .	. .
Post tire records from time-notes, ...		0.3	. . .	. .
Enter weights of tires on white sheet and add up weights of tires from tire mill, ...		0.3	. . .	. .
Post wages earned by men on mills and fix bonus, . . .		0.2	. . .	. .
File and put away records of finished tires, ...		5.0	. . .	. .
Assort tire records and put in final file, ...		10.0	. . .	. .
Make out standing orders I. S. F. tires, ...		1.5	. . .	. .
Make out standing orders ordinary tires, ...		0.5	. . .	. .
Enter miscellaneous time-notes on white sheet, ...		0.3	. . .	. .
Post miscellaneous time-notes in records, ...		0.85	. . .	. .
Check off white and yellow sheets from register for men, to see if all time is correct, ...		5.0	. . .	. .
Enter axles (standing orders) in records, ...		0.3	. . .	. .
Post records of axles from time-notes, ...		0.3	. . .	. .
Take out standing orders to boxes, ...		5.0	. . .	. .
Make out standing orders for I. S. F. tires, ...		1.5	. . .	. .
Make out standing orders for ordinary tires, ...		0.5	. . .	. .

Time out . . . . . Total time. . . . . .

Time in. . . . . Total amount earned. . . . . .

I have inspected the above work and find that it is all done as per order.

Signed, ...

[278] Frederick W. Taylor: The Father of Scientific Management : Myth and Reality By Charles D. Wrege and Ronald G. Greenwood, Publisher: Business One Irwin (June 1991) p.255

Image: **Time Note for Standardized Clerical Operations**, Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.257 archive.org/details/frederickwtaylor01copl

STANDARDIZED WORK

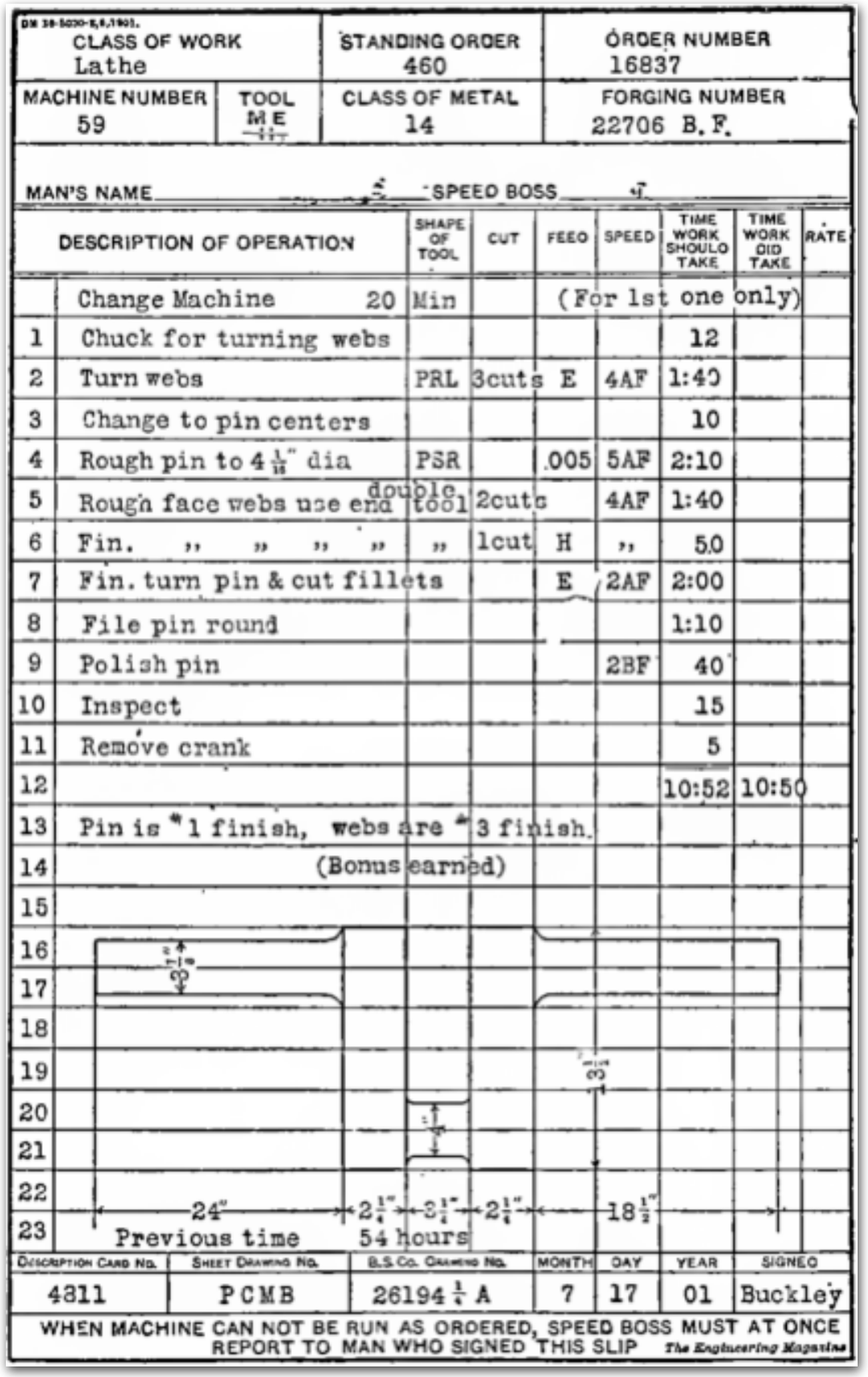
In a further attempt to improve productivity Taylor also created “instruction cards,” which noted each motion and each decision that workers had passed along informally to each other.[257]

These decisions were recorded for the foreman and were used both to instruct and to control new workers.[257]

Taylor had effectively standardised work.

Here you can see an example of one of Taylor’s instruction work cards.

Each detail of the operation is described along with how long each operation should take, and how long it did take. The worker who performed the work is recorded, as is his boss, and any bonus earned.



CLASS OF WORK: Lathe	STANDING ORDER: 460	ORDER NUMBER: 16837
MACHINE NUMBER: 59	TOOL: M E	CLASS OF METAL: 14
		FORGING NUMBER: 22706 B. F.

MAN'S NAME _____ SPEED BOSS _____

	DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
	Change Machine 20 Min			(For 1st one only)				
1	Chuck for turning webs					12		
2	Turn webs	PRL	3cuts	E	4AF	1:40		
3	Change to pin centers					10		
4	Rough pin to 4 1/16" dia	PSR		.005	5AF	2:10		
5	Rough face webs use end	double tool	2cuts		4AF	1:40		
6	Fin. " " " "	"	1cut	H	"	5.0		
7	Fin. turn pin & cut fillets			E	2AF	2:00		
8	File pin round					1:10		
9	Polish pin				2BF	40		
10	Inspect					15		
11	Remove crank					5		
12						10:52	10:50	
13	Pin is #1 finish, webs are #3 finish.							
14	(Bonus earned)							
15								
16								
17								
18								
19								
20								
21								
22								
23	24" Previous time 2 1/4" 54 hours 3 1/4" 2 1/4" 18 1/2"							

DESCRIPTION CARD NO.	SHEET DRAWING NO.	B.S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
4311	PCMB	26194 1/4 A	7	17	01	Buckley

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP *The Engineering Magazine*

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

Image: **Example of an Instruction Card**, Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. p. 264 archive.org/details/cu31924013870724

FUNCTIONAL MANAGEMENT

In 1883 Taylor also began to break down the job of the foreman, he advocated functional foremanship.[276]

The scheme of functional foremanship is an extension of [the] principle of specialization at the supervisory level.[276]

This technique was developed to improve the quality of work as a single supervisor may not be an expert in all the aspects of the work. Therefore workers were to be supervised by specialist foreman.[276]

Taylor had now separated planning from doing. Four of the specialist foreman would be located in the office for planning and four on the shop floor with the workmen.

At the planning level there were four supervisors.[274]

Taylor described their roles in relation to the worker who does the work:

> *"The Instruction Card Clerk; describing in detail the task which he is to accomplish, as well as the means to be used in doing the work.*[434] *These instructions represent the combined work of several men in the planning room, each of whom has his own specialty or function.*
>
> *The Time Clerk; as to everything relating to his pay and to proper written reports and returns.*
>
> *The Route Clerk; as to the order in which he does his work and as to the movement of the work from one part of the shop to another.*
>
> *The Disciplinarian; in case a workman gets into any trouble with any of his various bosses the "disciplinarian" interviews him."* [277]

276 Techniques of Scientific Management www.managementstudyguide.com/techniques_scientificmanagement.htm

277 The principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers pp. 122-125 archive.org/details/principlesofscieootaylrich

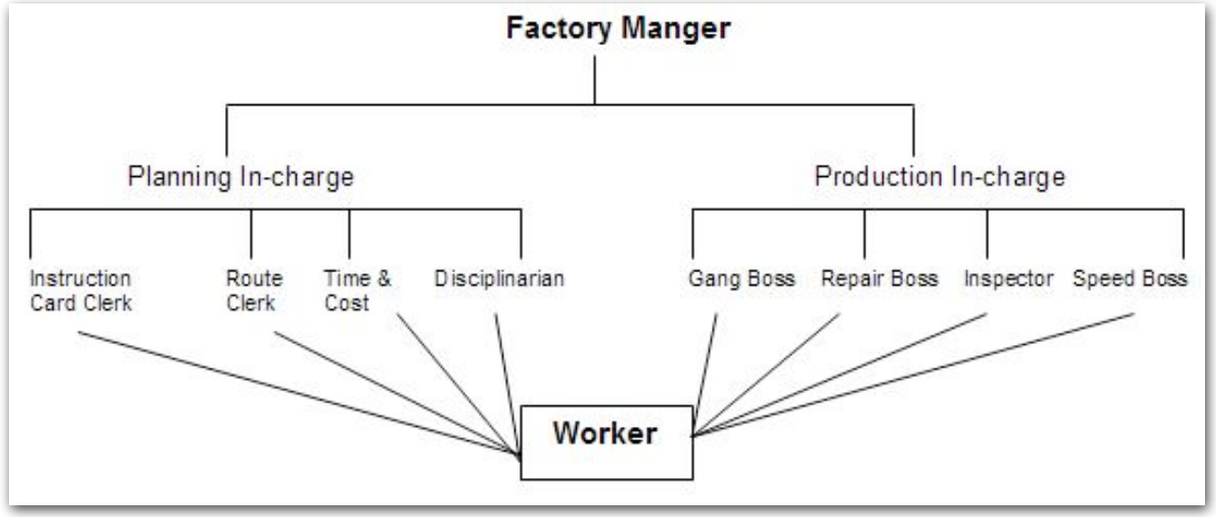
434 ibid., p. 39

274 F. W. Taylor's Scientific Management Theory - kalyan-city.blogspot.com/2011/06/frederick-taylor-principles-of.html

At the doing level there were also four supervisors.[274] Again Taylor described their roles in relation to the worker:

> *"The Inspector; sees to it that he understands the drawings and instructions for doing the work. He teaches him how to do work of the right quality.*
>
> *The Gang Boss; shows him how to set up the job in his machine, and teaches him to make all of his personal motions in the quickest and best way.*
>
> *The Speed Boss; sees that the machine is run at the best speed and that the proper tool is used in the particular way which will enable the machine to finish its product in the shortest possible time.*
>
> *The Repair Boss; as to the adjustment, cleanliness, and general care of his machine."* [277]

[277] The principles of scientific management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers pp. 122-125 archive.org/details/principlesofscieootaylrich



Taylor had created the functional organization, replacing the line organization.

Taylor had applied the division of labor, to both white and blue-collar jobs, creating the modern white-collar workforce, dividing the work place into workers and directors of work.[263]

This division is still commonplace today.

[274] F. W. Taylor's Scientific Management Theory - kalyan-city.blogspot.com/2011/06/frederick-taylor-principles-of.html

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Image: **Taylor's Functional Foremanship**, Techniques of Scientific Management www.managementstudyguide.com/images/functional_foreman.jpg

RESOURCE PLANNING DEPARTMENT

Inherent in Taylor's style of management was the setting up of planning departments of clerks who ensured that '... every labourer's work was planned out well in advance, and the workmen were moved from place to place by the clerks with elaborate diagrams'.[265]

As Taylor stated:

> *" These men of necessity spend most of their time in the planning department, because they must be close to the records and data which they continually use in their work, and because this work requires the use of a desk and freedom from interruption."* [277]

Thus, today's resource planning and process improvement departments were born.

[265] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

[277] The principles of scientific management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers pp. 122-125 archive.org/details/principlesofscieootaylrich

[443] The Principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers p.128 archive.org/details/principlesofscieootaylrich

STAFF SUGGESTION SCHEMES

Taylor proposed a form of incentive for employees to make suggestions if they felt an improvement could be made to either the method or the implement used to undertake a task.[265]

After analysis of the suggestion, and if it was introduced into the workplace [265] Taylor stated that:

> *" The workman should be given the full credit for the improvement, and should be paid a cash premium as a reward for his ingenuity."* [443]

Staff suggestion schemes and innovation bonuses were born.

Taylor sought to measure the human inputs and outputs in manufacturing. Workers were evaluated and rewarded in terms of the 'work units' they produced.[266]

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

DIFFERENTIAL RATES

Taylor claimed the primary motivation of an employee was to earn money. Therefore, the way to get an employee to work harder was to pay by the piece.[267]

Taylor theorized that workers were inefficient because they tended to ration their workload or work less than they could to prevent the job tasks from running out, resulting in a loss of wages.[268]

By 1884, Taylor proposed a set of differential rates at Midvale that would be set "scientifically," with higher rates per piece paid above certain production standards established by management.[263]

It was intended to provide individual employee productivity incentives.[267]

[274] F. W. Taylor's Scientific Management Theory - kalyan-city.blogspot.com/2011/06/frederick-taylor-principles-of.html

[268] Frederick Winslow Taylor: Father of Modern Management Frederick Winslow Taylor: Father of Modern Management, www.mgmtguru.com/mgt301/301_Lecture1Page8.htm

Under differential piece rate system, a standard output was first fixed. Then two wage rates were fixed as follows: [274]

> "*It consists briefly in offering two different rates for the same job; a high price per piece in case the work is finished in the shortest possible time and in perfect condition, and a low price, if it takes a longer time to do the job, or if there are any imperfections in the work.*" [273]

This enabled the management to fix the amount of work to be done by each worker in one hour or in one day. That is, management can fix a standard output of work for a certain period of time.[274]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[267] Questions on Organizational Behavior Stephen W. Hartman, Ph.D. iris.nyit.edu/~shartman/mba0299/120_0299.htm

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

[273] Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 pp. 109-110 archive.org/details/costkeepingscien00evanrich

Taylor in his paper describing the differential rate, read before the Society of Mechanical Engineers[273] said:

> *"The following table will show the economy of paying high wages under the differential rate:"* [273]

COST OF PRODUCTION PER LATHE PER DAY

ORDINARY SYSTEM OF PIECE WORK		DIFFERENTIAL RATE SYSTEM	
Man's Wages	$2.50	Man's Wages	$3.50
Machine Cost	3.37	Machine Cost	3.37
Total Cost per Day	$5.87	Total Cost per Day	$6.87
5 pieces produced.		10 pieces produced.	
Cost per piece	$1.17	Cost per piece	$0.69

Since different rates would be paid for all work on a kind of sliding scale, depending on daily productivity, these differential rates were a dramatic change from simple piece rates, which had been introduced at Midvale and were common in machine shops.[263]

[273] Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 pp. 109-110 archive.org/details/costkeepingscienooevanrich

Image: **Table showing the economy of paying high wages under the differential rate**, Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 p.110 archive.org/details/costkeepingscienooevanrich

Halsey's plan, along with Taylor's ideas on piece rates, had a major influence in the United States and Great Britain on the design of pay schemes.[254]

Here was the genius, perverse or inspired, of Taylorism, which far exceeded the principle of differential rates: the seizing of control of the world process on behalf of management.[257]

This created a new class, and successive generations, of order-takers: do it the management way or else, destroying the last vestiges of worker control in the pre-industrial work place.[257]

"Modern" industrial practices, as we know them today, began to take definite form.[257]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

Image: **Frederick Winslow Taylor 1886**, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap commons.wikimedia.org/wiki/File:F._Taylor_at_1886.jpg

In 1890 Taylor resigned from Midvale.[263]

In the twelve years he spent at Midvale, or in the years of his young manhood between the ages of twenty-two and thirty-four, he developed single-handed a system of shop management the like of which never had been known before, and despite the opposition his radically new ways were bound to arouse, put the thing into effect with such success that he brought the entire works around to it.[264]

And it is to be observed that in these years Midvale steadily increased in size and general importance.[264]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[264] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.117 archive.org/details/frederickwtaylor01copl

THE WORLD'S FIRST MANAGEMENT CONSULTANT

From 1893 - 1898 Taylor set himself up as Frederick Taylor, Consulting Engineer in Management, for various companies.[257]

He was the world's first management consultant.[266]

As Taylor himself would state:

> *" I believe I was the first man in this country to undertake this work as a profession. "* [446]

Here we can see what he listed on his business card and letter-heads.

FRED W. TAYLOR, M.E.,
ROSS STREET, GERMANTOWN, PHILADELPHIA.[1]
CONSULTING ENGINEER
SYSTEMATIZING SHOP MANAGEMENT AND
MANUFACTURING COSTS A SPECIALTY

266 The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79.
By permission of Ken Hopper and Will Hopper

257 FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

446 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.390 archive.org/details/frederickwtaylor01copl

Image: **Taylor Rubber Stamp**, Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.391 archive.org/details/frederickwtaylor01copl

THE SCIENCE OF ADMINISTRATION

Captain Henry Metcalfe, a graduate of West Point and the Ordnance Department, went beyond technology management and focused on the science of administration.[338]

While Taylor was engaged in his early Midvale battles, Metcalfe had progressed enough to write The Cost of Manufactures, publicly broaching the need for an administrative science whose researchers would collect and classify past records to produce generic principles to apply in future cases.[337]

His book is considered a pioneer work in the area of management science.[254]

Metcalfe, of the United States Army Ordnance Department, was in charge of the gun-making workshops at Frankford Arsenal, a position

that involved the need to increase productivity(which was considered low in arsenals) and manage people.[337]

Metcalfe realised immediately on taking over as manager of Frankford Arsenal that traditional methods of organisation and control are both wasteful and ineffective.[339]

To remove these problems he developed a system of control in 1881 which was universally recognised as a new milestone in management literature.[339]

[338] In Search of the Lost Grail of Middle Management: The Renaissance of Middle Managers, By Quentin R. Skrabec University Press of America (15 Dec 2003) p.4

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[337] Frederick Taylor and the Public Administration Community: A Reevaluation By Hindy L. Schachter Publisher: State University of New York Press; SUNY Series in Public Administration edition (November 1989) p. 28

[339] Management Principles, Practices and Techniques Second Edition By N.S. Gupta and Alka Gupta, Published by Atlantic Publishers & Distributors 1986 p. 71

TIME-SHEETS

In the book Metcalfe described the "Present System" in use at that time at an Arsenal:

> *"The timekeeper, generally the foreman, goes about the shop towards the close of the day and asks each workman how he has spent it; according to the workman's recollection he enters the time reported in a book.*
>
> *There are two general forms of time book; one, form A in which the time made by each man during each day is entered in gross;*
>
> *and form B occupies a page for each day, and a line for each man."* [342]

You can see examples of forms A and B opposite.

[342] The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) pp. 59-60 archive.org/details/costofmanufacturoometc

FORM A.

Time book for month of April, 1874.

NAMES.	DAYS OF THE MONTH. 1	2	3	4	5	6	to 31	Total days.	Wages per day.	Am'nt.
J. Smith.....	1	½	¾	0	0	1¼	.....	3½	$2 00	$7 00
A. Jones.....	1	0	1	1	1	1	.....	5	5 00	25 00
T. Brown.....	1	1	1	1	1	1	.....	6	75	4 50

FORM B.

Work Report for April 2d, 1874.

NAMES.	Occupation.	Total days.
John Smith.....	¼ hour cleaning engine, ½ hour sawing wood, 1¼ hours filing brass for lathe bearings.....	¼
A. Jones	Absent	0
T. Brown.....	½ day on shop fixtures, ¼ general jobbing, ¼ helping smith.....	1

Image(s): **Work Report**, The Cost of Manufacturers and the Administration of Workshops, by Henry Metcalfe, Publisher: John Wiley & Sons New York (1890) p.60 archive.org/details/costofmanufacturoometc

Metcalfe went onto explain his newer system. He proposed a separate shop order card for each job. The system required that the workman note the time he spent on each job on a separate labor card, filed by job number.[341]

> *Each workman is supplied with a book of fifty pages, each page containing a coupon card 2¾ x 5½ inches and a stub about 1½ inches wide, in which, to save him writing, is stamped his shop number, his name, and his wages per time unit, unless he is working by the piece.*
>
> *When the workman goes to work in the morning, he gets his book from the foreman, and when he leaves work he returns it to him, made out so as to indicate the distribution of his time during the day.*
>
> *He fills that portion of the card showing the employment by writing under 'Charge to'.*

[343] The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe
Publisher: John Wiley & Sons New York (1890) pp. 152-155
archive.org/details/costofmanufacturoometc

[341] Handbook of Cost Management, By Roman L. Weil, Michael W. Mahe
Publisher: Wiley; 2 edition (May 30, 2005) p. 736

In the 'time unit' space he puts down the number of quarter days, hours, half hours, etc., he has worked on the job.

SERVICE CARD, Frankford Arsenal. APR 2 1885

No.	Name.	Price per unit.
235,	Lannigan,	0,25.

Charge to—	Nature of service in detail.	No. of units. Pieces.	Time.	AMOUNT. Doll's.	Cents.
S-O. 784	General work on job.		8		
C. W.					
O.					
N. 991.					

N. B. Make but one entry on each card.

Absentees for a whole day are so marked on a leaf taken out of their own books.

A man working on piece work, who has completed a suitable batch of pieces, makes out a ticket to correspond, and gives it with the pieces made to the foreman or inspector. ... [343]

Image: **Service Card**, The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe, Publisher: John Wiley & Sons New York (1890) p. 157
archive.org/details/costofmanufacturoometc

If the work receives the inspector's approval, he punches the service card and forwards it with the other cards.

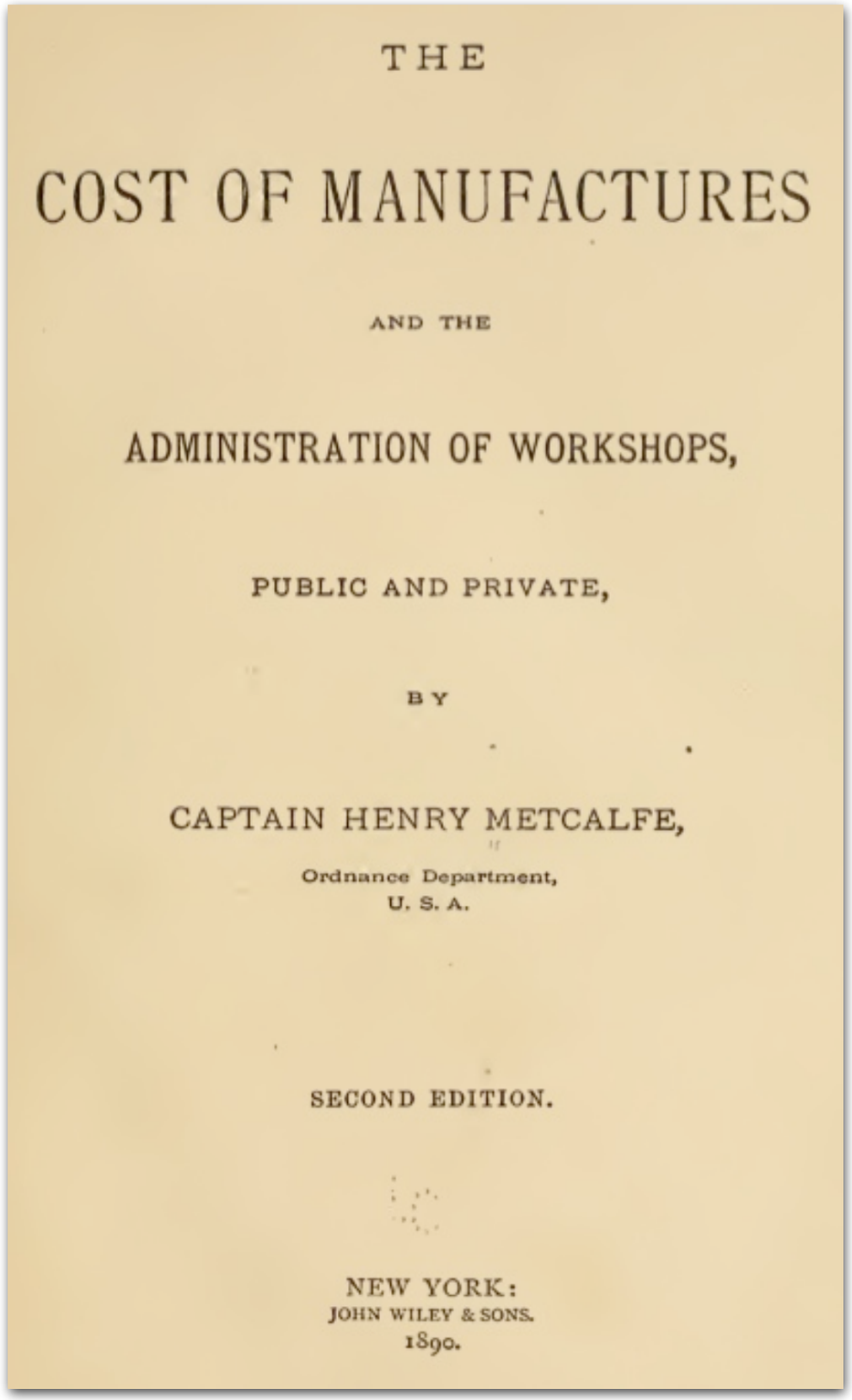
The cards go to the Cost Clerk and the time is then entered in the time book.

The cards corresponding to each order number are then placed in a pigeon hole bearing the number of the order.

Each pigeon hole shows at a glance what labor has been done on the job it represents, when, and by whom. Every empty pigeon hole testifies to a job so far untouched, and so on.

When the order ticket comes back 'completed', the cards corresponding to it are taken out." [343]

Thus what today we would recognise as time-sheets were created, and put to use as a method to measure utilisation.


THE

COST OF MANUFACTURES

AND THE

ADMINISTRATION OF WORKSHOPS,

PUBLIC AND PRIVATE,

BY

CAPTAIN HENRY METCALFE,

Ordnance Department,
U. S. A.

SECOND EDITION.

NEW YORK:
JOHN WILEY & SONS.
1890.

343 The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) pp. 152-155 archive.org/details/costofmanufacturoometc

Image: **The Cost of Manufacturers and the Administration of Workshops,** by Henry, Metcalfe Publisher: John Wiley & Sons New York (1890) Title Page archive.org/details/costofmanufacturoometc

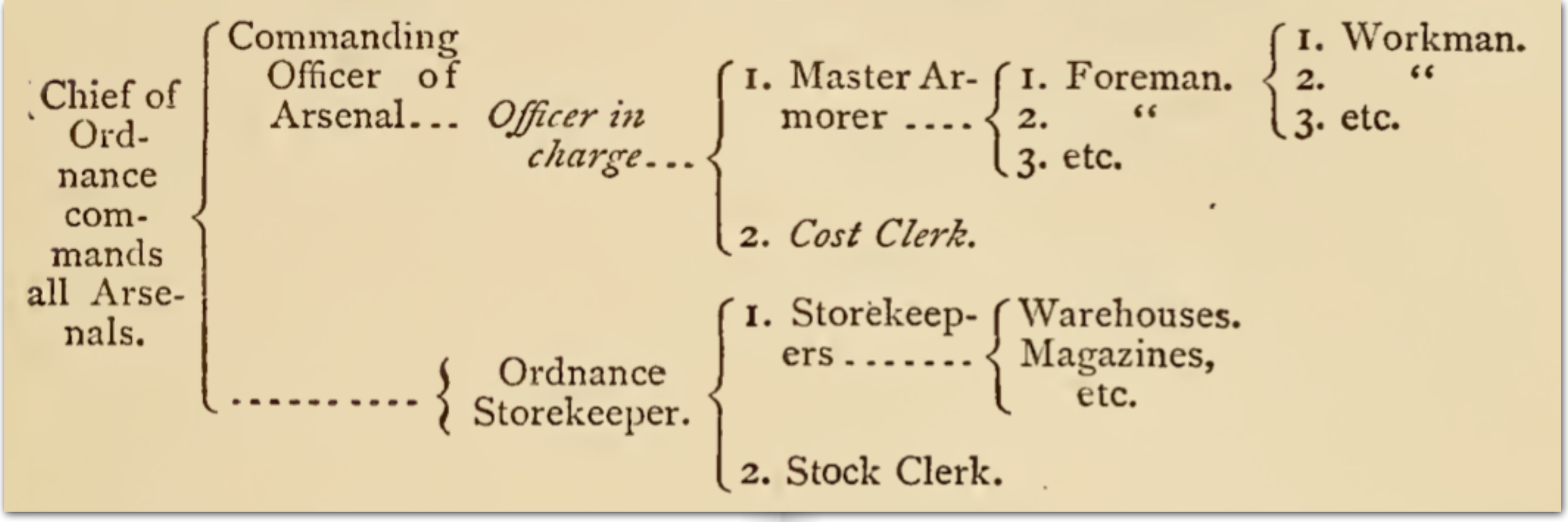
ADMINISTRATIVE MANAGEMENT

While Metcalfe is famous for the development of the "time card" and work orders, he was a pioneer in defining the administrative role of middle management.[338]

In chapter two we discussed the roots of the organisation chart.

In 1894 Metcalfe created his version of the org chart when describing the organisation of the Arsenal.

We can see something more recognisable to how an organisation is depicted today.



[338] In Search of the Lost Grail of Middle Management: The Renaissance of Middle Managers, By Quentin R. Skrabec University Press of America (15 Dec 2003) p.4

Image: **Organization of an Arsenal**, The Cost of Manufacturers and the Administration of Workshops, by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) p.27
archive.org/details/costofmanufacturoometc

Taylor recognised the work of Metcalfe whilst he was himself at Midvale.

He wrote:

> *"The card system of shop returns invented and introduced as a complete system by Captain Henry Metcalfe, U. S. A., in the government shops of the Frankford Arsenal represents another such distinct advance in the art of management.*
>
> *The writer appreciates the difficulty of this undertaking as he was at the same time engaged in the slow evolution of a similar system in the Midvale Steel Works, which, however, was the result of a gradual development instead of a complete, well thought out invention as was that of Captain Metcalfe."* [340]

340 Shop Management, By Frederick Winslow Taylor, Publisher Harper and Brothers New York and London 1911 p. 202
archive.org/details/shopmanagement01tayl

445 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.4
archive.org/details/frederickwtaylor02copl

BETHLEHEM STEEL

Returning our story back to Taylor, after leaving Midvale, Taylor worked at various companies as a management consultant. Whilst successful as a consultant, his next full time role came at Bethlehem Steel.

In 1887 the company obtained from Secretary Whitney contracts both for forgings for heavy cannon and for armor plate.[445]

It was realized, however, that something needed to be done to brace up the works management.[445]

When the works management problem at Bethlehem became more pressing, eyes there were turned to Midvale. Not that they wished to copy their rival's methods. But Midvale appeared to have an exceptionally good works management.[445]

Taylor was approached as his work at Midvale had become well known.

The negotiations with Taylor lasted off and on from November, 1897, throughout the following winter. To him the prospect of going to Bethlehem was more than pleasing. Here again he saw opening for him the door of a great opportunity.[445]

The Bethlehem Company at this time had a nominal capital of $5,000,000, while its value was placed at $15,000,000 or more. Between five and six thousand men were then employed.[445]

The American steel industry was reeling from a price-fixing scandal for armour plating, and desperately needed to find some way of cutting costs.[275]

444 Steel worker housing in South Bethlehem, PA, circa 1935. explorepahistory.com/displayimage.php?imgId=1-2-C00

445 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.4 archive.org/details/frederickwtaylor02copl

Bethlehem's hopes rested on Taylor.[275]

Philadelphia was then one of the biggest industrial centres on the planet, the second biggest city in the USA, with a population of nearly 850,000 and export figures more than five per cent of the exports of the whole nation. In the six years before Taylor started work, 3,000 miles of rail had been laid across America.[275]

In the early 1900s South Bethlehem became a crowded and noisy boomtown. Biographer Catherine Drinker Bowen, who lived in Bethlehem as a child, wrote that the borough was

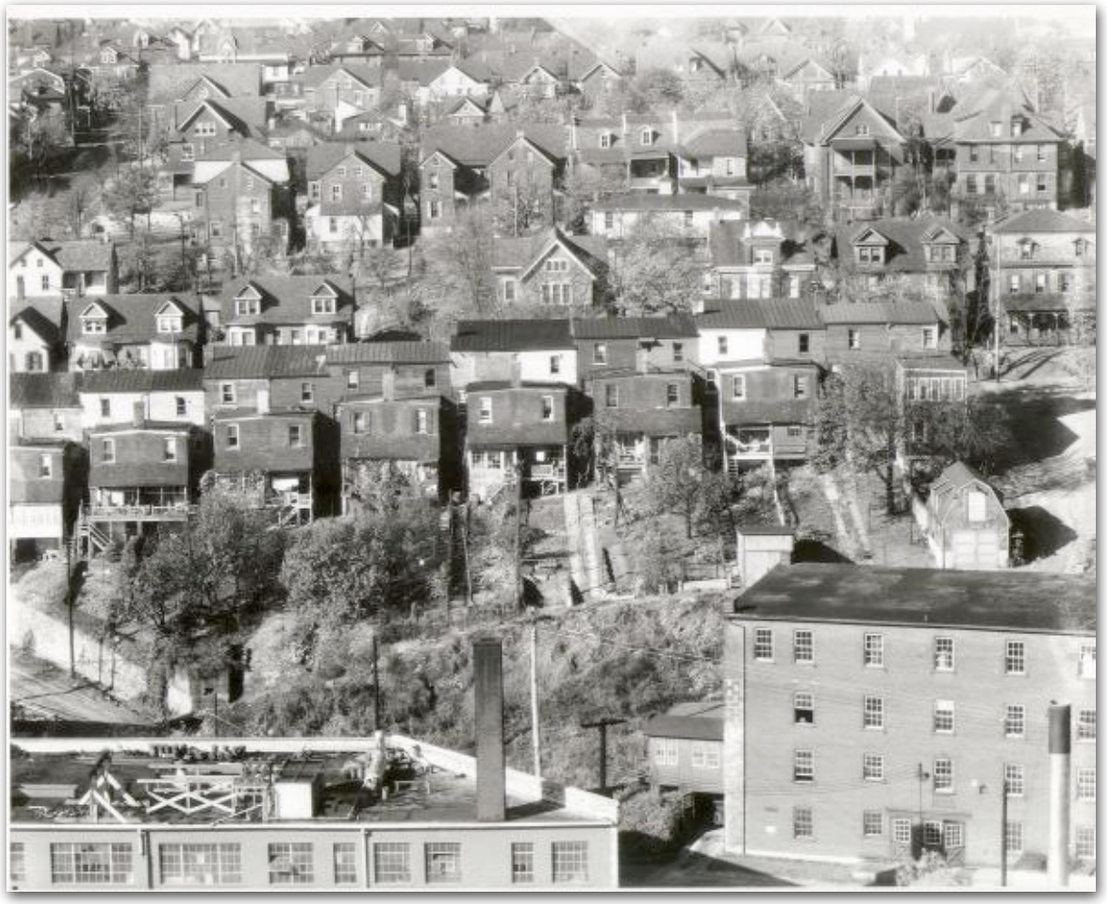
> "*like another place and another planet, a Wild West of its own.*" [444]

275 BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

445 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.4 archive.org/details/frederickwtaylor02copl

In Bethlehem there was also a mixture of races from all over the earth.[445]

The steel works, which, as the World War came to stimulate their business, offered employment to more than 25,000 persons.[445]



445 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.4 archive.org/details/frederickwtaylor02copl

Image: **Steel Worker Housing in South Bethlehem**, PA, circa 1935. explorepahistory.com/displayimage.php?imgId=1-2-C00

Taylor was hired by Bethlehem Steel in the spring, 1898, and given control over Machine Shop No. 2, producing enormous cannon for the Spanish-American War.[257]

Bethlehem at the time boasted the largest machine shop in the world and a 90ft steam hammer - also the world's largest.[275]

He would work under, Robert P. Linderman, the company's chief executive.[445]

Taylor, was indomitably resolved on getting the Bethlehem Company to accept his methods complete, and ... when it finally was settled that he should begin his work in May, 1898, he prepared himself for the struggle of his career.[447]

257 FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

275 BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

447 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 14-16 archive.org/details/frederickwtaylor02copl

On May 27, 1898, the day he formally began his work, he addressed to Linderman his "Recommendation No. 1. Subject: Desirability of establishing standards throughout the works." 447

In his recommendation he stated:

> *" Any attempt toward the adoption of standards of this kind will meet with great opposition, the chief ground of which is based on the supposition that uniform conditions of this sort discourage originality and individual improvement among the men.*
>
> *If this system of standards, however, is properly applied it produces quite the opposite effect, since each workman then understands that if he succeeds in making any improvement that such improvement may be adopted as the work's standard. "* 447

447 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 14-16 archive.org/details/frederickwtaylor02copl

The method of setting and documenting a standard, understanding and working to that standard, and then seeking improvement to create a new standard had been born.

Today this is in use as recommended "best practice", and has been adopted by many efficiency consultants and practitioners.

Taylor went on to ask Linderman:

> *" 1st. To determine whether you wish to adopt a series of standards for the small details throughout your works.*
>
> *2nd. If you decide in the affirmative, to convince your leading assistants in the works of the desirability of standards.*
>
> *3rd. To determine upon the best method of establishing these standards and enforcing their adoption and maintenance throughout the works. "* 447

Linderman agreed to Taylor's requests.

TAYLORISM

Calling Bethlehem Steel "a case study in inefficiency," Taylor began to transform the work place in every area, installing "scientific management," or "Taylorism," as it was now known, over the objections of both workers and managers.[257]

A GROUP OF BETHLEHEM STEEL COMPANY EXECUTIVES
Taylor stands behind the third man seated, from the reader's left. About 1900

Image: **Bethlehem Steel Company Executives with Taylor**, Frederick W. Taylor, father of scientific management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.84
archive.org/details/frederickwtaylor02copl

Another protégé arrived at Bethlehem when Carl Barth was hired to develop mathematical formulas for calculating the job rates. By devising a special slide rule, management was able to accurately predict the amount of time needed for each process, eliminating the rule-of-thumb which had dominated the shop.[257]

Up to the spring of 1899 all of the materials in the yard of the Bethlehem Steel Company had been handled by gangs of men working by the day, and under the foremanship of men who had themselves formerly worked at similar work as laborers.[368]

The Bethlehem Steel management wanted to increase workers' output.[365]

365 en.wikipedia.org/wiki/Henry_Noll

257 FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

368 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.37
archive.org/details/frederickwtaylor02copl

Focusing on worker's output, Taylor conducted a study at Bethlehem Steel regarding the loading of pig iron onto railroad cars.[365]

At the start of the study, workers were loading an average of 12.5 tons of pig per laborer per day, and received a wage of $1.15 per day, regardless of individual output. [365]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Image: **Men Sitting on Stack of Pig Iron**, Jones & Laughlin South Side Works, Pittsburgh, PA, 1885. Creator: Frederick T. Gretton
Frederick T. Gretton Photographs, 1857-1953, MSP 328, Library and Archives Division, Senator John Heinz History Center, By kind permission
images.library.pitt.edu/cgi-bin/i/image/image-idx?q1=Men%20sitting%20on%20stack%20of%20pig%20iron;view=entry;cc=hpichswp;entryid=x-msp328.b001.f14.101

In addition to Taylor, two of Taylor's employees worked at the Bethlehem Steel plant, experimenting with loading strategies and searching out exemplary workers to serve as models for the assertion that "a good day's wages could be made at the existing rates by a good man".[365] [366]

SCHMIDT PIG-IRON EXPERIMENTS

Enter "Schmidt," the pig-iron handler at Bethlehem.[367]

Taylor began the famous shoveling experiments with an obscure 28-year old laborer named Henry Noll,[263] later disguised by Taylor as "a man named Schmidt." [257]

[366] Charles D. Wrege and Amadeo G. Perroni, "Taylor's Pig Tale: A Historical Analysis of Frederick W. Taylor's Pig-Iron experiments" in: Academy of Management Journal, 17 (March 1974), 6-27

[367] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company p. 81 archive.org/details/theorypracticeof01thom

[365] en.wikipedia.org/wiki/Henry_Noll

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004),

Taylor described "Schmidt":

> *" He was a little Pennsylvania Dutchman who had been observed to trot back home for a mile or so after his work in the evening, about as fresh as when he came trotting down to work in the morning.*
>
> *This man we will call Schmidt.*
>
> *The task before us, then, narrowed itself down to getting Schmidt to handle 47 tons of pig iron per day and making him glad to do it.*
>
> *If Schmidt had been permitted to attack the pile of forty-seven tons of pig iron without any guidance, he probably would have tired himself out before noon.*
>
> *This was the science of his work. How could he possibly have discovered this science for himself?"* [369]

[369] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 43-49 archive.org/details/frederickwtaylor02copl

Watch video vimeo.com/75161632

In this film you can see the results of Taylor's famous Pig Iron Carrying Experiment, with pay per day before and after scientific study.

Men would pick up a piece of pig iron, walk up a plank, and then drop that pig iron into a train car, closely studied by Taylor's men.

Video: Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_2

Taylor also analysed the affect physical exertion had a on a worker, and found that a worker required a fixed amount of time to rest per amount of work completed. With this knowledge the most efficient use of properly spaced rest periods could be devised thus resulting in increased output.

Beginning as an evaluation of a labor gang loading pig iron on freight cars, the later experiments on shovel sizes and design showed that "Taylorism" could apply to even the most unskilled job.[257]

Gradually the suspicions of the other men were overcome. The spectacle of Schmidt, plainly not over-worked, and yet getting $1.85 day after day while they were getting only $1.15, was too much for them.[369]

[369] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 43-49 archive.org/details/frederickwtaylor02copl

It proved, however, that only about one man in eight in that gang of seventy-five was physically capable of handling forty-seven tons a day.[369]

To make up his special force of pig-iron handlers, he had to get some men from outside the works.[369]

Taylor's results were impressive.

By 1901, the workforce at Bethlehem was handling three times as much material as before and their wages were 60 per cent higher.[275]

He reduced the number of shovellers in their two-mile goods yard from 500 to [140].[275]

Under his methods, the cost of handling pig iron was just about cut in half. And he was under the impression that what he had done was a good thing for everybody.[369]

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

Later on in 1911 a report was circulated by opponents of Scientific Management that Schmidt had naturally succumbed to the task laid upon him by Fred Taylor - that Schmidt, in fact, was quite dead.[370]

Through the inspector of the Ordnance Department stationed at the Bethlehem works, Schmidt was found in that town, and in January, 1914, A. B. Wadleigh was commissioned by Taylor to employ a physician and report on Schmidt.[370]

The physician, Dr. C.L. Johnstonbaugh,of Bethlehem, certified[370] Noll to be "in good physical condition".[370]

Taylor continued with his experimentation at Bethlehem until he left the company in 1901.

[370] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.55 archive.org/details/frederickwtaylor02copl

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

Soon after leaving, Charles Schwab, as president of US Steel, bought Bethlehem.[263]

DOCUMENTING SCIENTIFIC MANAGEMENT

In November 1901 Taylor "retired" to become a consultant.[263] He also turned his attention to documenting his methods and providing case studies of their use.

In June 23, 1903, Taylor presented Shop Management at the annual meeting of the American Society of Mechanical Engineers (ASME) in Saratoga, NY.[263]

It was the first comprehensive summary of "Taylorism".[263]

The presentation was filled with technical exhibits and diagrams.[257]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Taylor would report:

> *"To ensure the best results, the organization of productive labor must be directed and controlled by persons having not only good executive ability, and possessing the practical familiarity of a mechanic or engineer, with the goods produced and the processes employed, but having also, and equally, a practical knowledge of how to observe, record, analyze, and compare essential facts in relation to wages, supplies, expense accounts, and all else that enters into or affects the economy of production and the cost of the product."* [326]

"Shop Management" is seen as an extremely influential.

Which is why a cultural historian like Martha Banta could describe Taylor's 1903 lecture as "one of the key documents shaping … modern industrialisation". [275]

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

In 1906 Taylor was elected president of ASME, and begin to import "efficiency" into the organizational practices.[263]

The ASME had membership of 542 very influential men[263] of the time.

THE PIVOTAL MOMENT

Although his ideas were beginning to spread, Taylor came to national prominence thanks to the future Supreme Court justice Louis Brandeis, who realised 'scientific management' could win his case against the railroad companies for raising fares.[275]

It is worthwhile exploring this pivotal moment, and how, as a result, "scientific management" became popularised.

[326] Shop Management By Frederick Winslow Taylor, Introduction by Henry Towne, Publisher Harper and Brothers New York and London 1911 archive.org/details/shopmanagement01tayl

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Early in the summer of 1910, the railroads of the north-eastern section of the United States filed with the Interstate Commerce Commission new freight tariffs calling for a general advance in rates, and in September, October, and November the Commission held hearings to determine their reasonableness.[334]

It was the first case of its kind.[334]

From the beginning the contest provided good "copy" for the newspapers, and it waxed in intensity.[334]

It was argued that through more efficient management the railroads could save more money than they demanded in increased rates.[334]

334 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 3-8 archive.org/details/frederickwtaylor01copl

Brandeis argued against rate increases by citing the probable effects of the application of 'scientific management'.[333]

One of the witnesses, Harrington Emerson, an engineer, testified that in this way the railroads could save a million dollars a day.[334]

Other witnesses, managers of plants, swore that through Scientific Management they had reduced their costs, while increasing their men's wages 25 to 100 per cent.[334]

Scientific Management! In common with the public in general, reporters and editors of the non-technical press never had heard of it before, and it seemed a phrase to conjure with.[334]

And a saving of a million dollars a day! That was truly sensational.[334]

333 Management Principles for Health Professionals, By Joan Gratto Liebler, Charles R. McConnell Publisher: Jones & Bartlett Learning; 6 edition (May 18, 2011) p. 58

All through the testimony about Scientific Management, one man was referred to as its originator and principal exponent.[334]

Though Brandeis had visited him several times to get information, this man had done nothing, directly or indirectly, to prompt the introduction of the Scientific Management idea at those rate hearings, and he himself did not appear, but again and again his name came up.[334]

And it was in that way that Frederick W. Taylor, to some extent, at least, became known to the generality.[334]

The effect of the insertion of the scientific management argument into the rate hearings contest was felt almost instantaneously by the whole country.[334]

334 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 3-8 archive.org/details/frederickwtaylor01copl

Only a few days after the introduction of the evidence, the early December reviews of current events gave great space to the dramatic testimony of some of the witnesses.[334]

Through January, February, March and every month of 1911, the periodical press, popular as well as technical, was filled with explanation after explanation as to what scientific management is, why it is good, or why it is worthless.[334]

By the fall of 1911, Dartmouth College had arranged for a conference to spread information as to the merits of scientific management.[334]

"SCIENTIFIC MANAGEMENT"

But how did "Scientific Management" get its name?

In October, 1910, Brandeis had a conference with [Henry] Gantt and several other engineers including Frank B. Gilbreth and Robert T. Kent, and at this conference, held in Gantt's New York apartments, the question came up as to what the system they all had in mind should be called.[329]

"Efficiency," "Functional Management," and "Taylor System" were some of the names formally considered and rejected.[329]

Then was suggested the phrase Taylor for several years had been using casually, and all present agreed that Brandeis could not do better, in speaking of the system at the rate hearings, than to call it Scientific Management.[329]

Following the popularity given to this phrase at the rate hearings, Taylor himself made bold to use it formally.[329]

A name had been found, and people were keen to talk about their experiences of its application, and on the subject of management in general.

THE TAYLOR SOCIETY

In 1911 there was a meeting of ASME members who found it increasingly difficult to get any papers on the subject of management through the Meetings Committee.[330]

Under the leadership of Frank Gilbreth and Robert T. Kent, these insurgent engineers held their first meetings … and out of their deliberations came the organization at first called the Society to Promote the Science of Management, and after Taylor's death, the Taylor Society.[330]

[329] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers archive.org/details/frederickwtaylor02copl p. 372

[330] ibid. pp. 382-383

OPPOSITION AND RESISTANCE

As unionism grew after the turn of the century, so did organized opposition to "Taylorism."[257]

Labor leaders and others denounced "Taylorism" as oppressive and antidemocratic.[244]

Taylor maintained that the benefits of higher productivity achieved by means of greater efficiency would be shared with the workforce.[266]

However, workers were not deceived and soon recognized that although they had been promised more, they were being paid less.[266]

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

[244] The Man With the Plan - Frederick Winslow Taylor, father of scientific management, Brink Lindsey, from the January 1998 issue, reason.com/archives/1998/01/01/the-man-with-the-plan

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[450] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 340-344 archive.org/details/frederickwtaylor02copl

On April 26, 1911, James O'Connell, president of the "International Association of Machinists, affiliated with the American Federation of Labor," sent to the various lodges of that association a circular: [450]

> *"The present effort on the part of Mr. Taylor is to have his system installed in the Government arsenals and navy yards.*
>
> *He has been so successful that the War Department has decided to give the system a trial.*
>
> *This would give his methods a tremendous advertisement, and only be a short time until all private manufacturers throughout the country would adopt his system... this proposed staggering blow at labor must be met by determined resistance."* [450]

This resistance was soon to manifest itself.

The proposed introduction of "scientific management" at the Watertown, MA, Arsenal,[257] in August, 1911[263] starting with a time-study, caused individual opposition, shop-wide work stoppages, petitions, discharges, extensive meetings and national publicity all over the topic of "Taylorism."[257]

It was the first strike that had occurred under Scientific Management.[450]

As a result, the House of Representatives authorized a "Special Committee to Investigate the Taylor and Other Systems of Shop Management".[257]

The committee began its work on October 4, 1911, and did not finish it until February 12, 1912. It visited the Water-town Arsenal, and held hearings in Boston, New York, and Washington.[448]

At the one of the hearings, James O'Connell stated:

> *"Mr. Taylor's plan is this: He will come to your establishment and say to you: "I want to look over your factory." After looking over it, he will say that he finds that you have a great amount of waste in every line of industry in your factory.*
>
> *Then he will say: "Now, I will put into effect a system that will be the means of saving you a great deal of money, ...* [423]

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[423] Investigation of Taylor System of Shop Management: Hearings Before the Committee on Labor of the House of Representatives, Author: United States Congress. House . Committee on Labor , Samuel Gompers, Publisher: U. S. Gov. Prnt. Off. Year: 1911 p.35
archive.org/details/investigationta00gompgoog

[448] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 346-349
archive.org/details/frederickwtaylor02copl

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[450] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 340-344
archive.org/details/frederickwtaylor01copl

I will put a man here, an expert in this line of business, who will successfully put this scheme into operation for you."

The men at the Rock Island Arsenal, of the United States Government, 1,500 of them, when it became generally known that the Taylor system would be put into effect, these men, regardless of their trade or calling, whether mechanics or laborers, this army of men arose as one man and said: "No; no Taylor system for us. We will not accept the Taylor system."

We state to you that this system is wrong, because we want our heads left on us." [423]

MORAL IMPLICATIONS

Living as a consultant of sorts, Taylor had not been directly confronted with the moral implications of scientific management and

[423] Investigation of Taylor System of Shop Management: Hearings Before the Committee on Labor of the House of Representatives, Author: United States Congress. House . Committee on Labor , Samuel Gompers, Publisher: U. S. Gov. Prnt. Off. Year: 1911 p.35
archive.org/details/investigationtaoogompgoog

over the years had forced his system through unorganized work places.[257]

At most of the hearings, especially the early ones, Taylor was present as a sort of lay counsel for his cause.[448]

Taylor's own testimony was given at the Capitol in Washington towards the close of the hearings, in January, 1912. He was on the stand more than twelve hours scattered over a period of four days.[448]

From the Congressional hearing, the edited transcript provides the fullest expression of Taylor's views.[257]

[448] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 346-349
archive.org/details/frederickwtaylor02copl

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

It was Taylor's most heroic attempt to elucidate the philosophy of Scientific Management in a popular way.[449]

From his testimony:

> *"There are many elements of scientific management ... that are utterly impossible to go into at a hearing of this kind; but I want ... to make clear what may be called the essence of it, so that when I use the words "scientific management," you men who are listening may have a clear, definite idea of what is in my mind. ...*
>
> *I want to clear the deck, sweep away a good deal of rubbish first by pointing out what scientific management is not. ...*
>
> *Scientific management is not any efficiency device ... nor is it any bunch or group of efficiency devices.*

> *It is not a new system of figuring costs; it is not a new scheme of paying men; it is not holding a stop watch on a man and writing things down about him; it is not time study; it is not motion study nor an analysis of the movements of men; it is not the printing and ruling and unloading of a ton or two of blanks on a set of men and saying, "Here's your system; go to it."*
>
> *It is not divided foremanship or functional foremanship; it is not any of the devices which the average man calls to mind when scientific management is spoken of. ... I am not sneering at cost-keeping systems, at time study, at functional foremanship, nor at any new and improved scheme of paying men, nor at any efficiency devices, if they are really devices that make for efficiency. ...* [449]

449 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 9-10 archive.org/details/frederickwtaylor01copl

I believe in them; but what I am emphasizing is that these devices in whole or in part are not scientific management; they are useful adjuncts to scientific management, so are they also useful adjuncts of other systems of management.

Now, in its essence, scientific management involves a complete mental revolution on the part of the workingman engaged in any particular establishment or industry - a complete mental revolution on the part of these men as to their duties toward their work, toward their fellow men, and toward their employers.

And it involves the equally complete mental revolution on the part of those on the management's side - the foreman, the superintendent, the owner of the business, the board of directors - a complete mental revolution on their part as to their duties toward their fellow workers in the management, toward their workmen, and toward all of their daily problems.

And without this complete mental revolution on both sides scientific management does not exist.

That is the essence of scientific management, this great mental revolution.

Scientific management cannot be said to exist ... in any establishment until after this change has taken place in the mental attitude of both the management and the men, both as to their duty to cooperate in producing the largest possible surplus and as to the necessity for substituting exact scientific knowledge for opinions or the old rule of thumb or individual knowledge.

These are the two absolutely essential elements of scientific management." [449]

449 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 9-10 archive.org/details/frederickwtaylor01copl

At the close of his testimony he was deliberately baited by his labor-leader opponents.[448]

Two of them went at him at the same time with insults and sneers. In so far as the plan was to make him lose his temper, to destroy his self-control, it was a success,[448] he lost his temper so uncontrollably that the record was scrubbed.[275]

The committee made a report to the house. Dated March 9, 1912, it was unanimous.[448]

> *"The committee ... failed to find any ground in the representations made by the opponents of the system upon which to base condemnation or serious criticism of the methods."* [448]

265 Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

448 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 346-349 archive.org/details/frederickwtaylor02copl

275 BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

THE PRINCIPLES OF SCIENTIFIC MANAGEMENT

In 1911, Taylor introduced his The Principles of Scientific Management paper to the American mechanical engineering society, eight years after his Shop Management paper.[281]

These ideas were an accumulation of his life's work.[265]

The Principles of Scientific Management, was published in three issues of The American Magazine, beginning in March, 1911; and then, along with Shop Management (but separately), was brought out in book form by Harper & Brothers.[330]

From the outset the book proved extremely popular.

281 en.wikipedia.org/wiki/Frederick_Winslow_Taylor

330 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers archive.org/details/frederickwtaylor02copl pp. 382-383

Writing in April, 1911, to Colonel E. D. Meier, then the president of the A.S.M.E., Taylor said: [330]

> *"I am in daily receipt of letters from members of the A.S.M.E. to whom I mailed copies of the special edition of the book, asking me where they can get additional copies.*
>
> *These requests run all the way from a single copy to as many as fifty copies, for distribution among their friends and employees, etc."* [330]

He listed three goals for the work: [328]

> *"First. To point out, through a series of simple illustrations, the great loss which the whole country is suffering through inefficiency in almost all of our daily acts. ...* [277]

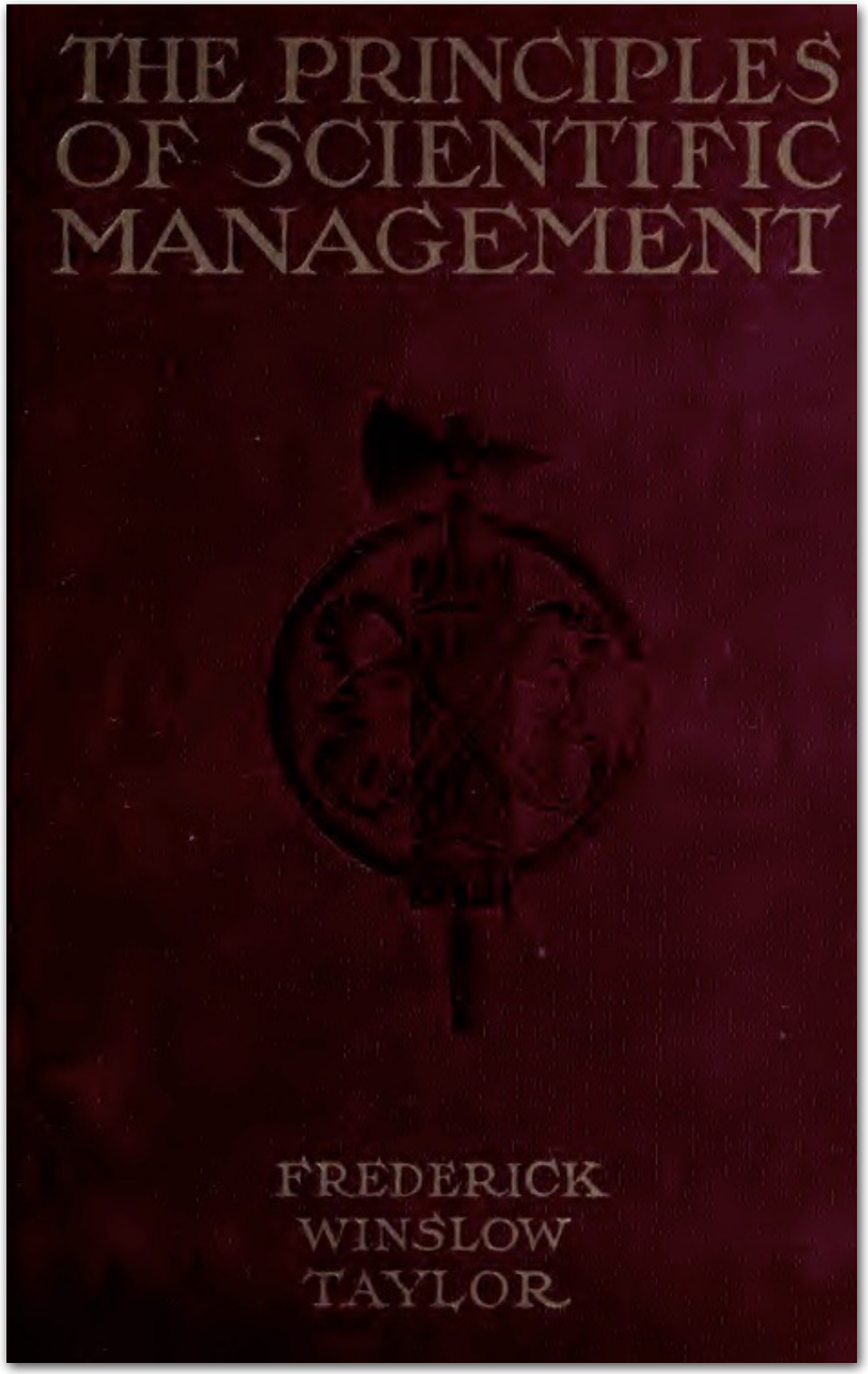


Image: **The Principles of Scientific Management** (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers Front Cover
archive.org/details/principlesofscieootaylrich

330 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers archive.org/details/frederickwtaylor02copl pp. 382-383

328 en.wikipedia.org/wiki/The_Principles_of_Scientific_Management_(monograph)

277 The principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers pp. 122-125 archive.org/details/principlesofscieootaylrich

Second. To try to convince the reader that the remedy for this inefficiency lies in systematic management, rather than in searching for some unusual or extraordinary man.

Third. To prove that the best management is a true science, resting upon clearly defined laws, rules, and principles, as a foundation.

And further to show that the fundamental principles of scientific management are applicable to all kinds of human activities, from our simplest individual acts to the work of our great corporations, which call for the most elaborate cooperation.

And, briefly, through a series of illustrations, to convince the reader that whenever these principles are correctly applied, results must follow which are truly astounding." [277]

[277] The Principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers pp. 122-125 archive.org/details/principlesofscieootaylrich

[278] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

text

Taylor developed five principles of scientific management: [282]

" 1. *Each part of an individual's work is analysed 'scientifically', and the most efficient method for undertaking the job is devised; the 'one best way' of working. Measuring the maximum amount a 'first-class' worker could do in a day; workers are then expected to do this much work every day.* [265]

2. *The most suitable person to undertake the job is chosen, again 'scientifically'. The individual is taught to do the job in the exact way devised. Everyone, according to Taylor, had the ability to be 'first-class' at some job. It was management's role to find out which job suited each employee and train them until they were first-class. ...* [265]

[282] "QUALITY: QUO VADIS?", The Swiss Deming Institute (December 2006): Ernst C. Glauser, p. 10 Used with kind permission. www.deming.ch/downloads/E_quo_vadis.pdf

3. *Provide financial incentives for following the methods.*[282]

4. *Managers must cooperate with workers to ensure the job is done in the scientific way.* [265]

5. *There is a clear 'division' of work and responsibility between management and workers. Managers concern themselves with the planning and supervision of the work, and workers carry it out."* [265]

Taylor warned about attempting to implement parts of scientific management without accepting the whole philosophy, stating that too fast of a change was often met with trouble, strikes, and failure.[328]

[282] "QUALITY: QUO VADIS?", The Swiss Deming Institute (December 2006): Ernst C. Glauser, p. 10 Used with kind permission. www.deming.ch/downloads/E_quo_vadis.pdf

[265] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

[452] The Principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers p.83 archive.org/details/principlesofscieootaylrich

Ensuring this didn't happen was laid squarely on the shoulders of management:

> "It is only through enforced standardization of methods ... and enforced cooperation, that faster work can be assured.
>
> The duty of enforcing the adoption of standards and enforcing this cooperation rests with management alone. [452] "
>
> Frederick Taylor

[328] en.wikipedia.org/wiki/The_Principles_of_Scientific_Management_(monograph)

Image: **Frederick Taylor**, Wikipedia en.wikipedia.org/wiki/File:Frederick_Winslow_Taylor_crop.jpg PD-OLD

SPREADING THE WORD

Beyond the Principles of Scientific Management, he devoted most of the remainder of the work to providing case studies to support his case.[328]

Following publication of the book, Taylor embarked on a series of lectures.

Prior to 1911 he had done little public speaking apart from the lectures he gave at Harvard.[451]

During 1911, the fifty-fifth year of his age, his schedule of lectures was a heavy one.[451]

This excerpt from a letter addressed by him in 1909 to the Boston Merchants' Association, expresses the attitude he continued to take generally:[451]

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

> *"To convince even the most interested man that the new type of management must of necessity be overwhelmingly better than the old, takes me not less than two hours."* [451]

Taylor would state in his standard lecture:[275]

> *"Every day, year in and year out, each man should ask himself over and over again, two questions ... First, 'What is the name of the man I am now working for?' And having answered this definitely then 'What does this man want me to do, right now?'*
>
> *Not, 'What ought I to do in the interests of the company I am working for?' Not, 'What are the duties of the position I am filling?' Not, 'What did I agree to do when I came here?' Not, 'What should I do for my own best interest?' but plainly and simply, 'What does this man want me to do?'"* [275]

[451] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p. 391 archive.org/details/frederickwtaylor02copl

[328] en.wikipedia.org/wiki/The_Principles_of_Scientific_Management_(monograph)

He would sum this up by stating:

> "We do not ask the initiative of our men. We do not want any initiative.
>
> All we want of them is to obey the orders we give them, do what we say, and do it quick." [293]
>
> Frederick Taylor

293 An A-Z of business quotations, Labour, Aug 31st 2012, 13:12 by B.R. www.economist.com/blogs/schumpeter/2012/08/z-business-quotations-3

Image: **Frederick Taylor**, Wikipedia en.wikipedia.org/wiki/File:Frederick_Winslow_Taylor_crop.jpg PD-OLD

Summary

Management Science

Taylor died in 1915 but his legacy lives on.

Taylorism has led to a cascade in management thinking, and has become the archetypal model for Western corporations in the 20th [279] and 21st centuries.

Scientific Management gave life to concepts like efficiency, productivity and standardization.[284]

Taylor prescribed the way to do things better was that each part of an individual's work is analysed 'scientifically', and the most efficient method for undertaking the job is devised; the 'one best way' of working.[265]

This would involve the breakdown of work tasks into constituent elements; the timing of each element based on repeated stopwatch

[265] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

studies; the fixing of piece rate compensation based on those studies; standardization of work tasks on detailed instruction cards; and generally, the systematic consolidation of the shop floor's brain work in a "planning department." [244]

Today, this "best practice" is widely in use. We have workforce planning departments, and process improvement departments, that are separate from where work occurs just as Taylor advocated; with a reliance on data and reports to inform them on how work is progressing.

Taylor described that "elaborate diagrams"; [265] should be used by such functions. Today these are called spreadsheets, slide packs, and flow charts.

[284] Gary Hamel: Management Revolution, Posted by Doug Goldstein pksimplex.blogspot.com/2009/10/gary-hamel-management-revolution.html

[244] The Man With the Plan - Frederick Winslow Taylor, father of scientific management, Brink Lindsey, from the January 1998 issue, reason.com/archives/1998/01/01/the-man-with-the-plan

Convention is that activity equals cost and that standardising work will improve efficiency. However writing standard work instructions are guaranteed to make performance worse, yet we still do it.[279]

I would argue that many of methods used in Scientific Management bear a remarkable similarity to methods employed by consultants today, obsessed with eliminating waste and delays, and improving efficiency.

The method of setting and documenting a standard, understanding and working to that standard, and then seeking improvement to create a new standard was born under Taylor. This method is still in use today as a recommended "best practice" and has been adopted by many efficiency consultants and practitioners.

Gary Hamel goes further:

> *"If you read Frederick Winslow Taylor there are three fundamental things he taught:* [455] [456]
>
> 1. *Find the best practice wherever it exists. Today we call it benchmarking.*
> 2. *Decompose the task into its constituent elements. We call it business process re-design.*
> 3. *Get rid of things that don't add value. Work out what we call it now."* [455] [456]

Taylor's aim was to seek ways to do it cheaper and faster. He was the earliest advocate of "work smarter, not harder", [280] a mantra still very much espoused in today's organisations.

[265] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

[455] Frederick Winslow Taylor (1856-1915) www.eldritchpress.org/fwt/taylor.html

[456] Toronto Globe and Mail, (1995) January 26, pp. B26

[280] Henry L. Gantt and Frederick Taylor: The Pioneers of Scientific Management, Peter B. Darmody, PSP, 2007 AACE International Transactions, p.1

If you remember back to chapter two, we discussed how in Babbage's Economy of Machinery it was described what is now called the Babbage principle. It pointed out commercial advantages available with more careful division of labour.[202]

What Babbage remarked is that skilled workers typically spend parts of their time performing tasks that are below their skill level. If the labour process can be divided among several workers, labour costs may be cut by assigning only high-skill tasks to high-cost workers, restricting other tasks to lower-paid workers.[202 204]

The Babbage principle is an inherent assumption in Frederick Winslow Taylor's scientific management.[202 271]

[204] Giddens, Anthony; Held, David (1982). Classes, Power and Conflict: Classical and Contemporary Debates. University of California Press. p. 155. ISBN 978-0-520-04627-6. Retrieved 18 April 2013.

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

We have discussed how Taylor applied the division of labor, to both white and blue-collar jobs, creating the modern white-collar workforce, dividing the work place into workers and directors of work.[263]

His functional foremanship is an extension of principle of specialization at the supervisory level.[276] As a result, references to "white collar" appear as early as 1911.[454]

Taylor's industrial models separated 'working' from 'doing'; he believed that it was the role of management to determine the 'one best way' to perform the work[28] and managers were tasked with the responsibility of motivating their employees.[279]

[271] Yeheskel Hasenfeld; Andrew Delano Abbott (1 April 1992). Human Services as Complex Organizations. SAGE Publications. p. 211. ISBN 978-0-8039-4065-9. Retrieved 18 April 2013.

[202] en.wikipedia.org/wiki/Charles_Babbage

[454] en.wikipedia.org/wiki/White-collar_worker

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

[276] Techniques of Scientific Management www.managementstudyguide.com/techniques_scientificmanagement.htm

This is what is taught, and practiced, as good management today.

Scientific Management proponents wanted to expose lazy workers and improve the utilization of the workforce. This led to the invention of production standards, time sheets, worker inspection, employee performance records and employee discipline. These methods are commonly in use today.

Taylor sought to drive out craft production; we can see this thinking still in use by those who manage knowledge workers today.

Employees are becoming commoditized assets. For example, you will hear managers talking about "resources" when they mean people, it has become the norm to simplify and standardize work which can then be

outsourced to lower cost organisations or lower cost economies[500] to reduce costs.

Scientific management bases human motivation wholly on extrinsic rewards and discards the idea of intrinsic[272] motivation.

It is common for organisations today to set output targets and reward employees if they reach them, or apply pressure if they are falling short; management by fear.

The idea of productivity incentives; payment by results, is commonplace today as a method for motivation and increased productivity.

Taylor would look upon their use with pride.

[272] en.wikipedia.org/wiki/Motivation

[500] Rethinking Lean Service, John Seddon, The Systems Thinking Review, 7th Aug 2009 www.thesystemsthinkingreview.co.uk/index.php?pg=18&backto=1&utwkstoryid=186

Surely we have moved on? Do we not value input from our employees and ask for them to suggest improvements rather than impose methods upon them?

As we discussed, Taylor created staff suggestion schemes; with financial rewards for each suggestion that was implemented, both of these methods are used today.

Taylor was the world's first management consultant.[266]

Today, there are thousands of management consultancies, and hundreds of thousands of management consultants.

Governments and organizations spend billions on management consultants, yet, many of them will promulgate the same scientific management methods we have discussed in this chapter.

Rather than being vilified, as many people often do (for example there is a piece on YouTube entitled "Frederick Taylor-the biggest bastard ever" [453]), Taylorism unquestionably supplied the methods which were largely responsible for growth of American Industry; also for the ability to mobilise and employ the raw untrained labour which flooded into the US in the late 19th and early 20th century.[279]

Taylor wanted to exploit the work potential of a large uneducated and untrained workforce. This lead at the very beginning of the industrial age to enormous productivity increases, higher salaries and shorter working hours, all in all to a higher standard of living.[282]

279 www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

453 Frederick Taylor- the biggest bastard ever, www.youtube.com/watch?v=Wa4_ihxT9rI

266 The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

282 "QUALITY: QUO VADIS?", The Swiss Deming Institute (December 2006): Ernst C. Glauser, p. 10 Used with kind permission. www.deming.ch/downloads/E_quo_vadis.pdf

A balanced look at his life and times reveals not a villain but a tragic hero.[244]

His innovations ushered in enormous productivity gains, which brought unprecedented affluence to the United States and the nations that followed its lead; at the same time, though, Taylor's system employed methods that misunderstood, and thereby grievously undermined, the full promise of the new mass production economy.[244]

It is fair to say that Frederick Taylor's career exemplified the Industrial Revolution he helped to lead: a mixture of beneficent achievements and malign shortcomings.[244]

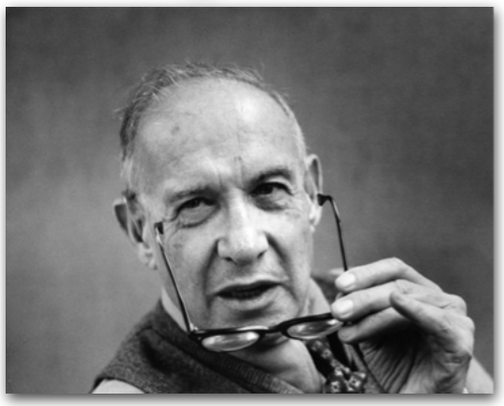
[281] en.wikipedia.org/wiki/Frederick_Winslow_Taylor

[244] The Man With the Plan - Frederick Winslow Taylor, father of scientific management, Brink Lindsey, from the January 1998 issue, reason.com/archives/1998/01/01/the-man-with-the-plan

Image: **Peter Drucker**, Photograph Courtesy of The Drucker Institute at Claremont Graduate University

I will leave the final thoughts on Taylor's influence on today's theory of work; how we design and manage work, to management guru Peter Drucker.

> "Taylor was the first man in recorded history who deemed work deserving of systematic observation and study.
>
> His approach to work is still the basic foundation used today. Not much has been added even though he has been dead for years. [281]"
>
> Peter Drucker



Taylor's work was also described by Drucker as "the most powerful as well as the most lasting contribution America has made to Western thought since the Federalist Papers."[275]

Drucker ranked him with Freud and Darwin as a maker of the modern world[286] - more even than Marx.[275]

As we will learn in the next chapter, he spawned a mental revolution that still has a grip today.

---

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

[286] THE ONE BEST WAY: Frederick Winslow Taylor and the Enigma of Efficiency, Robert Kanigel www.robertkanigel.com/_i__b_the_one_best_way__b___frederick_winslow_taylor_and_the_enigma_of_efficienc_57916.htm

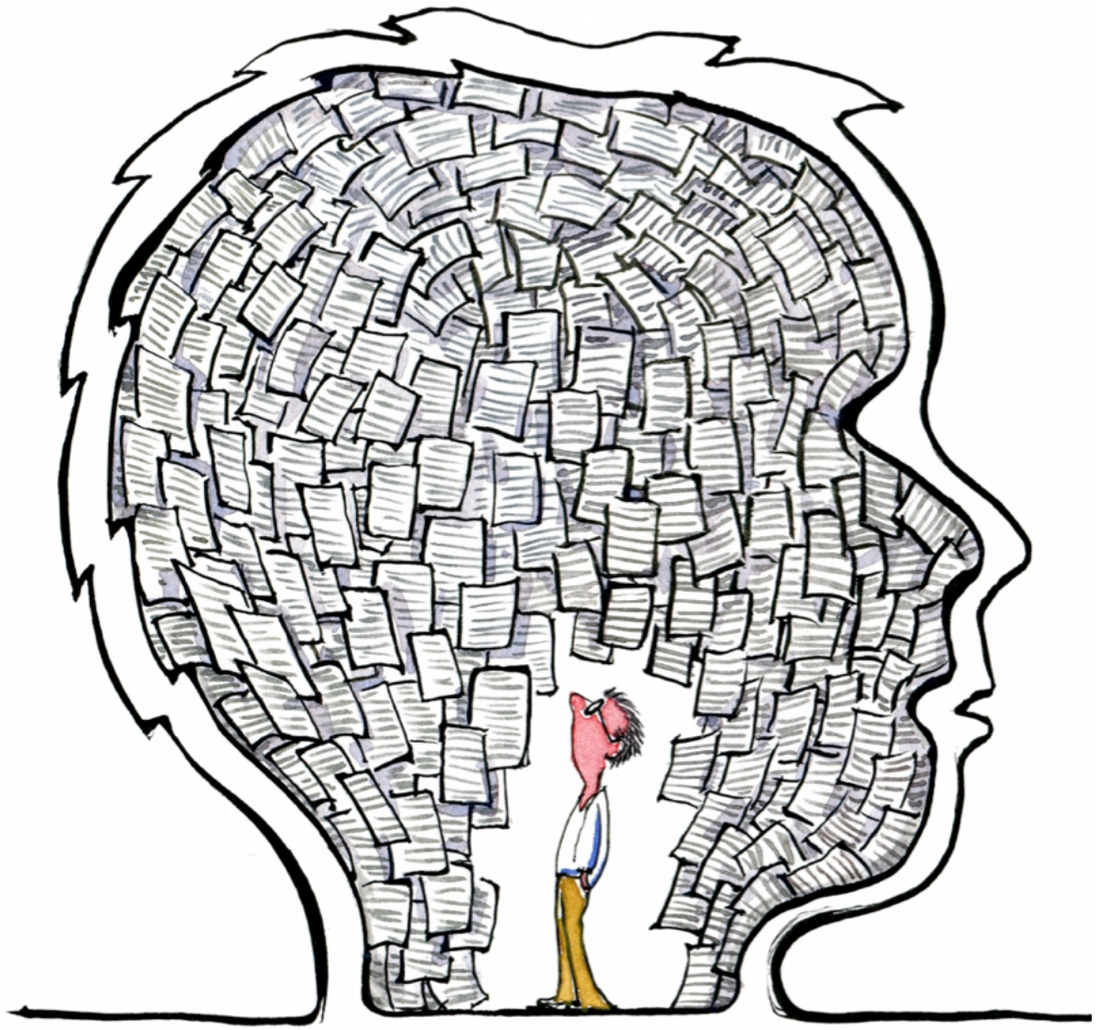
Design and Management

__ Concepts __

- Scientific Management and “Taylorism”.
- Productivity Incentives; Payment by Results.
- Work Analysis, Work Breakdown, and Work Measurement.
- Best Practices and Benchmarking.
- Standardized Work, Standard Times, Production Standards, Work Instructions, Job Descriptions, and Work Inspection.
- Division of Responsibility; Planning vs Doing; Blue-Collar vs White-Collar jobs, and Functional Supervision.
- Process Improvement and Waste Removal.
- Time sheets, Employee Discipline and Employee Performance Records.
- Worker Efficiency, Worker Utilization and Worker “laziness”.
- Staff Suggestion Schemes.
- Management Consulting.

In our next chapter we will discuss how Scientific Management spread around the world, across the whole of society, resulting in Taylor's "Mental Revolution" taking hold.

Chapter Three:
Management Science



By David Joyce

Bibliography

247 The Management Century, by Walter Kiechel III hbr.org/2012/11/the-management-century/

243 Springer, A Systemic View of Transformational Leadership", Ackoff R.L. Systemic Practice and Action Research, Vol. 11, No. 1, February 1998 , pp. 23-36(14) Publication date: 1998-02-01 l094-429X/ 98/0200-0023$15.00/0 © 1998 Plenum Publishing Corporation with kind permission from Springer Science+Business Media B.V.

244 The Man With the Plan - Frederick Winslow Taylor, father of scientific management, Brink Lindsey, from the January 1998 issue, reason.com/archives/ 1998/01/01/the-man-with-the-plan

245 ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/ 2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

246 Nelson, Daniel (1980) Frederick W. Taylor and the Rise of Scientific Management Madison Wisconsin, University of Wisconsin Press pp. 4-9

247 The Management Century, by Walter Kiechel III hbr.org/2012/11/the-management-century/

257 FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

332 Public Management: Old and New, By Laurence E. Lynn, Jr. Publisher: Routledge; New edition (August 3, 2006) p.92

173 en.wikipedia.org/wiki/Boulton_and_Watt

261 Management and Ideology: the legacy of the international scientific management movement, By Merkle, Judith A, Publisher: Univ of California Pr (December 1980) p.211

248 The Making Of Scientific Management Volume III (1949), Author: Urwick. L, Publisher: Management Publications Trust p.38 archive.org/details/ makingofscientif032926mbp

249 The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeooochur

253 en.wikipedia.org/wiki/Matthew_Robinson_Boulton

252 Williams, Robert (1995), Accounting for steam: The accounts of the Soho factory, Accounting & Finance Working Papers, 95/14, Wollongong, NSW: University of Wollongong, retrieved 2012-09-16 p. 7

254 Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

258 en.wikipedia.org/wiki/ASME

250 en.wikipedia.org/wiki/James_Watt_junior

251 Williams, Robert (1995), Accounting for steam: The accounts of the Soho factory, Accounting & Finance Working Papers, 95/14, Wollongong, NSW: University of Wollongong, retrieved 2012-09-16 p. 5

255 en.wikipedia.org/wiki/Henry_R._Towne

259 Dynamics of Modern Management, By Waino W Suojanen, Publisher: Holt, Rinehart and Winston; 1St Edition edition (1966) p. 101

440 en.wikipedia.org/wiki/Yale_(company)

256 Yale: History of Yale

260 Improving Competitiveness of Industry, By Harold Bierman, Jr. World Scientific Publishing Company; 1 edition (June 10, 2011) p. 119

357 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

441 Management and Organizational Behaviour, Jayantee Saha, Publisher: Excel Books (July 25, 2012) p.74

327 An Analytical Study On Scientific Management HRM 601, Akeem Adebiyi Adeyemi Ersal Aslam Alan Cohen Sangram Singh Jolanta Soltis

272 en.wikipedia.org/wiki/Motivation

271 Yeheskel Hasenfeld; Andrew Delano Abbott (1 April 1992). Human Services as Complex Organizations. SAGE Publications. p. 211. ISBN 978-0-8039-4065-9. Retrieved 18 April 2013.

331 Administrative Thinkers edited by D. Ravindra Prasad, V. Sivalinga Prasad, P. Satyanarāyaṇa Publisher: Sterling; 2nd edition edition (March 30, 2011) p. 65.

361 Scientific management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, p.xviii
archive.org/details/scientificmanageootayl

263 Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

442 Nelson, Daniel (1980) Frederick W. Taylor and the Rise of Scientific Management Madison Wisconsin, University of Wisconsin Press p 29

362 Scientific management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, p.1

archive.org/details/scientificmanageootayl

279 www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

417 Shop Management, By Frederick Winslow Taylor, Publisher Harper and Brothers New York and London 1911 p. 14
archive.org/details/shopmanagement01tayl

333 Management Principles for Health Professionals, By Joan Gratto Liebler, Charles R. McConnell Publisher: Jones & Bartlett Learning; 6 edition (May 18, 2011) p. 58

269 Frederick W. Taylor: The Father of Scientific Management : Myth and Reality
By Charles D. Wrege and Ronald G. Greenwood, Publisher: Business One Irwin (June 1991) p.54

270 Crossen, Cynthia (November 6, 2006). “Early Industry Expert Soon Realized a Staff Has Its Own Efficiency”. Wall Street Journal.
online.wsj.com/article/SB116277621193713997.html

326 Shop Management By Frederick Winslow Taylor, Introduction by Henry Towne, Publisher Harper and Brothers New York and London 1911

284 Gary Hamel: Management Revolution, Posted by Doug Goldstein pksimplex.blogspot.com/2009/10/gary-hamel-management-revolution.html

366 Charles D. Wrege and Amadeo G. Perroni, "Taylor's Pig Tale: A Historical Analysis of Frederick W. Taylor's Pig-Iron experiments" in: Academy of Management Journal, 17 (March 1974), 6-27

317 Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 127-128 archive.org/details/costkeepingandsooevangoog

276 Techniques of Scientific Management www.managementstudyguide.com/techniques_scientificmanagement.htm

274 F. W. Taylor's Scientific Management Theory - kalyan-city.blogspot.com/2011/06/frederick-taylor-principles-of.html

455 Frederick Winslow Taylor (1856-1915) www.eldritchpress.org/fwt/taylor.html

456 Toronto Globe and Mail, (1995) January 26, pp. B26

434 ibid., p. 39

265 Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

267 Questions on Organizational Behavior Stephen W. Hartman, Ph.D. iris.nyit.edu/~shartman/mba0299/120_0299.htm

266 The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

268 Frederick Winslow Taylor: Father of Modern Management Frederick Winslow Taylor: Father of Modern Management, www.mgmtguru.com/mgt301/301_Lecture1Page8.htm

273 Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 pp. 109-110 archive.org/details/costkeepingscienooevanrich

278 Frederick W. Taylor: The Father of Scientific Management : Myth and Reality By Charles D. Wrege and Ronald G. Greenwood, Publisher: Business One Irwin (June 1991) p.255

453 Frederick Taylor- the biggest bastard ever, www.youtube.com/watch?v=Wa4_ihxT9rI

326 Shop Management By Frederick Winslow Taylor, Introduction by Henry Towne, Publisher Harper and Brothers New York and London 1911 archive.org/details/shopmanagement01tayl

338 In Search of the Lost Grail of Middle Management: The Renaissance of Middle Managers, By Quentin R. Skrabec University Press of America (15 Dec 2003) p.4

337 Frederick Taylor and the Public Administration Community: A Reevaluation By Hindy L. Schachter Publisher: State University of New York Press; SUNY Series in Public Administration edition (November 1989) p. 28

339 Management Principles, Practices and Techniques Second Edition
By N.S. Gupta and Alka Gupta, Published by Atlantic Publishers & Distributors 1986 p. 71

342 The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe
Publisher: John Wiley & Sons New York (1890) pp. 59-60
archive.org/details/costofmanufacturoometc

202 en.wikipedia.org/wiki/Charles_Babbage

341 Handbook of Cost Management, By Roman L. Weil, Michael W. Mahe, Publisher: Wiley; 2 edition (May 30, 2005) p. 736

343 The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe
Publisher: John Wiley & Sons New York (1890) pp. 152-155
archive.org/details/costofmanufacturoometc

340 Shop Management, By Frederick Winslow Taylor, Publisher Harper and Brothers New York and London 1911 p. 202
archive.org/details/shopmanagement01tayl

275 BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

444 Steel worker housing in South Bethlehem, PA, circa 1935. explorepahistory.com/displayimage.php?imgId=1-2-C00

365 en.wikipedia.org/wiki/Henry_Noll

336 Frederick W. Taylor, father of scientific management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p. 402
archive.org/details/frederickwtaylor01copl

334 ibid., pp. 3-8

264 ibid., p.117

449 ibid., pp. 9-10

328 en.wikipedia.org/wiki/The_Principles_of_Scientific_Management_(monograph)

423 Investigation of Taylor System of Shop Management: Hearings Before the Committee on Labor of the House of Representatives, Author: United States Congress. House . Committee on Labor , Samuel Gompers, Publisher: U. S. Gov. Prnt. Off. Year: 1911 p.35
archive.org/details/investigationta00gompgoog

281 en.wikipedia.org/wiki/Frederick_Winslow_Taylor

454 en.wikipedia.org/wiki/White-collar_worker

368 Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.37
archive.org/details/frederickwtaylor02copl

445 ibid., p.4

446 ibid., p.390

447 ibid., pp. 14-16

369 ibid., pp. 43-49

370 ibid., p.55

329 ibid., p.372

330 ibid., pp. 382-383

448 ibid., pp. 346-349

450 ibid., pp. 340-344

451 ibid., p.391

282 “QUALITY: QUO VADIS?”, The Swiss Deming Institute (December 2006): Ernst C. Glauser, p. 10
www.deming.ch/downloads/E_quo_vadis.pdf Used with kind permission.

204 Giddens, Anthony; Held, David (1982). Classes, Power and Conflict: Classical and Contemporary Debates. University of California Press. p. 155. ISBN 978-0-520-04627-6. Retrieved 18 April 2013.

277 The principles of scientific management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers
pp. 122-125
archive.org/details/principlesofscieootaylrich

452 ibid., p.38

443 ibid., p.128

293 An A-Z of business quotations, Labour, Aug 31st 2012, 13:12 by B.R.
www.economist.com/blogs/schumpeter/2012/08/z-business-quotations-3

280 Henry L. Gantt and Frederick Taylor: The Pioneers of Scientific Management, Peter B. Darmody, PSP, 2007 AACE International Transactions, p.1

500 Rethinking Lean Service, John Seddon,
The Systems Thinking Review, 7th Aug 2009
www.thesystemsthinkingreview.co.uk/index.php?pg=18&backto=1&utwkstoryid=186

286 THE ONE BEST WAY: Frederick Winslow Taylor and the Enigma of Efficiency, Robert Kanigel
www.robertkanigel.com/_i__b_the_one_best_way__b___frederick_winslow_taylor_and_the_enigma_of_efficienc_57916.htm

Interior of a Machine Shop, The principles of industrial management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company p. 154
archive.org/details/principlesofinduoodunc

Henry Robinson Towne (1844-1924), Class of 1865, portrait photograph, Date: circa 1900, Source: University of Pennsylvania, Author: Unknown, Permission (Reusing this file) PD-US
en.wikipedia.org/wiki/File:Henry_Robinson_Towne.jpg

Frederick Winslow Taylor 1873, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick, Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap. commons.wikimedia.org/wiki/File:F._Taylor_at_1873.jpg

Lathe Operator at Midvale Steel, Kheel Center for Labor-Management Documentation and Archives, M.P. Catherwood Library, Cornell University. www.ilr.cornell.edu/library/kheel/resources/images/citing.jpg

Observation Sheet, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company P. 132. archive.org/details/costkeepingandsooevangoog

Shop Observation Card for Recording Stopwatch Time Studies, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company P. 205
archive.org/details/costkeepingandsooevangoog

Time Note for Standardized Clerical Operations, Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.257
archive.org/details/frederickwtaylor01copl

Example of an Instruction Card, Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. p. 264. archive.org/details/cu31924013870724

Taylor's Functional Foremanship, Techniques of Scientific Management
www.managementstudyguide.com/images/functional_foreman.jpg

Table showing the economy of paying high wages under the differential rate, Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 p.110
archive.org/details/costkeepingscienooevanrich

Frederick Winslow Taylor 1886, Source: Gaugler, Eduard (Hrsg.): Taylor, Frederick Winslow : The principles of scientific management ; Vademecum zu dem Klassiker der Wissenschaftlichen Betriebsführung. Düsseldorf: Verlag Wirtschaft und Finanzen, 1996. Author: Grap commons.wikimedia.org/wiki/File:F._Taylor_at_1886.jpg

Taylor Rubber Stamp, Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.391
archive.org/details/frederickwtaylor01copl

The Cost of Manufacturers and the Administration of Workshops, by Henry Metcalfe, Publisher: John Wiley & Sons New York (1890) Title Page. archive.org/details/costofmanufacturoometc

Work Report, The Cost of Manufacturers and the Administration of Workshops, by Henry Metcalfe, Publisher: John Wiley & Sons New York (1890) p.60. archive.org/details/costofmanufacturoometc

Service Card, The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe, Publisher: John Wiley & Sons New York (1890) p. 157. archive.org/details/costofmanufacturoometc

Organization of an Arsenal, The Cost of Manufacturers and the Administration of Workshops, by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) p.27. archive.org/details/costofmanufacturoometc

Steel Worker Housing in South Bethlehem, PA, circa 1935.
explorepahistory.com/displayimage.php?imgId=1-2-C00

Bethlehem Steel Company Executives with Taylor, Frederick W. Taylor, father of scientific management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.84
archive.org/details/frederickwtaylor02copl

Frederick Taylor, Wikipedia en.wikipedia.org/wiki/File:Frederick_Winslow_Taylor_crop.jpg PD-OLD

Men Sitting on Sack of Pig Iron, Jones & Laughlin South Side Works, Pittsburgh, PA, 1885. Creator: Frederick T. Gretton, Frederick T. Gretton Photographs, 1857-1953, MSP 328, Library and Archives Division, Senator John Heinz History Center, By kind permission
images.library.pitt.edu/cgi-bin/i/image/image-idx?q1=Men%20sitting%20on%20stack%20of%20pig%20iron;view=entry;cc=hpichswp;entryid=x-msp328.b001.f14.101

The Principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers Front Cover. archive.org/details/principlesofscieootaylrich

Peter Drucker, Photograph Courtesy of The Drucker Institute at Claremont Graduate University

Movie Frederick Taylor's Pig Iron Carrying Experiment, Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. www.archive.org/details/OriginalFilm_2

Alexander Church
Matthew Boulton
James Watt
Matthew Robinson Boulton
James Watt Jr.
Lyndall Urwick
Henry Robinson Towne
Linus Yale Jr.
Frederick A. Halsey
Frederick Taylor
Henry Worthington
Ferrell and Jones
Wilfred Lewis
Coleman Sellers
William Sellrs
Holden A. Evans
Captain Henry Metcalfe
Secretary Whitney
Catherine Drinker Bowen
Robert P. Linderman
Carl Barth
Henry Noll “Schmidt”
Dr. C.L. Johnstonbaugh
Martha Banta
Louis Brandeis
Harrington Emerson
Frank B. Gilbreth
Robert T. Kent
Henry Gantt
James O’Connell
Colonel E. D. Meier