Project Services Pty Ltd

THE ORIGINS OF MODERN MANAGEMENT

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This paper is part of our presentation,
The Origins of Modern Project Management
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To read *The Origins of Modern Project Management*:
https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

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Mosaic's complete PM History resource is available from:
https://mosaicprojects.com.au/PMKI-ZSY.php

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Introduction

The management of workers in one form or another has been undertaken for millennia:

- the ancient Egyptians constructed the pyramids some 4500 years ago;
- Sun Tzu wrote about planning and strategy 2500 years ago (every battle is a project to be first won; then fought[i]);
- numerous transcontinental railways were constructed during the 19th century and
- buildings of different sizes and complexity have been erected for as long as mankind has occupied permanent settlements.

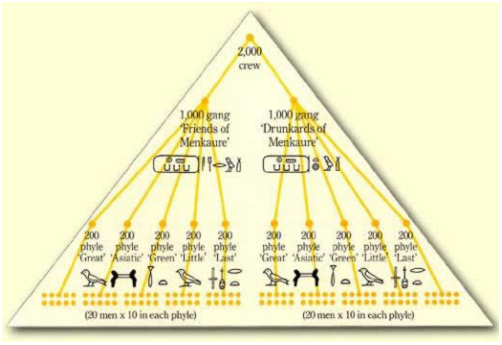
However, it was only in the latter half of the 18th century people started to talk about and codify 'modern management'; earlier endeavours were seen as acts of worship, engineering, nation building, etc. And the people controlling the endeavours called themselves priests, engineers, architects, etc. The rise of the modern manager seems to be linked to the creation of factories as part of the industrial revolution.

This paper will cover the evolution of management science through to the 20th Century that laid the foundations for the development of modern project management as a distinct branch of general management. The contents of this paper were originally included as part of our paper on ***The Origins of Modern Project Management***[1], but have grown to require a paper of its own[2].

The Management of Work from Ancient Times to the 18th Century

Workforce Management

The organisation, division and supervision of workers appears to have stated thousands of years ago. Archaeologists now believe the Great Pyramid of Giza was built by skilled workers who were organized and paid. Tombs of the supervisors have inscriptions that suggest there were two crews of approximately 2000 workers, divided into named gangs of 1000 which in turn were divided into five phyle of 200, which in turn were split into groups of around 20 workers, each group having their own skills-set and leader. In addition to the builders, there were many thousand support people, transport people[3] and quarrymen.



[1] Rather than publish new papers and keep out-of-date information on the PMKI website, we routinely update and augment existing papers of all types as better information becomes available. Download the updated version of ***The Origins of Modern Project Management*** from: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

[2] To see the events discussed in this paper in a comprehensive historical timeline download ***Project Management - A Historical Timeline***: https://mosaicprojects.com.au/PDF_Papers/P212_Historical_Timeline.pdf

[3] The Diary of Merer, discovered in 2013 details some of the work involved in moving stones: https://en.wikipedia.org/wiki/Diary_of_Merer

Other parts of the 'State' were administered in a similar way. From ancient times to the present-day military organisations have used a command hierarchy and the division of the 'army' into various components based on location and/or the type of warrior (cavalry, infantry, etc) and then each 'component' subdivided into units of decreasing size. Both the Egyptian, and then later the Greek and Roman militaries were organised in this way. The Christian Churches, which were founded in the Roman Empire adopted similar organisational structures and these concepts flowed through into early management structures in the industrial age.

The Division of Labour

The division of labour is integral to the concept of hierarchal management described above. Plato recognises (but does not approve of) the division of labour in *The Republic*, authored around 375BCE. *'Well then, how will our state supply these needs? It will need a farmer, a builder, and a weaver, and also, I think, a shoemaker and one or two others to provide for our bodily needs. So that the minimum state would consist of four or five men...*[4]*'*.

Sir William Petty was the first modern writer to take note of the division of labour, in his *Political Arithmetick* (1676), Petty made a practical study of the division of labour, showing its existence and usefulness in Dutch shipyards.

Several other writers subsequently added to the discussion, including:

- Bernard de Mandeville in the second volume of *The Fable of the Bees* (1714)
- Henri-Louis Duhamel du Monceau, in his introduction to *The Art of the Pin-Maker (Art de l'Épinglier)* (1761)
- David Hume in his essay *Of some Remarkable Customs* (1777): *By the partition of employment, our ability increases*…, and
- Adam Smith in *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776). Smith foresaw the essence of industrialism by determining that division of labour represents a substantial increase in productivity, but the level of task division needed to be established through experimental design of the production process.

Industrialisation

The concepts of the division of labour became significantly more important with the change from an agrarian and handicraft economy to one dominated by industry and machine manufacturing. Machines need precisely the right people with the correct skills, and the right resources, to be available, to allow them to work effectively. This level of organisation created the need for modern management.

Industrialisation began in Britain in the 18th century and from there spread to other parts of the world. At the core of this change, was the new organization of work known as the factory. A factory system entails an increased division of labour and the specialization of function.

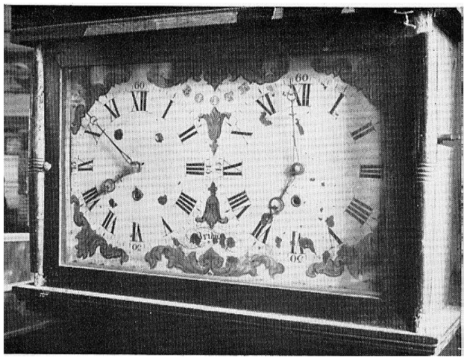
Richard Arkwright is credited with inventing the prototype of the modern factory in 1769. Based on his patented 'water frame' spinning machine, he established Cromford Mill as the world's first

[4] Plato. *The Republic*, p. 103, Penguin Classics edition.

water-powered cotton spinning mill. The idea caught on, and within a few years, the number of mills had grown significantly, then water power was replaced by steam power (removing the dependence on rivers) allowing both the size and number of factories to grow.

Cromford Mill, in Derbyshire, England

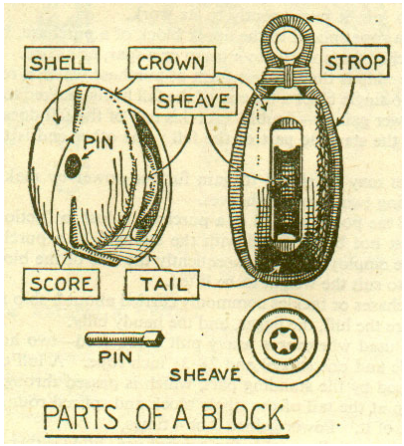
The factory became more than just a larger work unit. It was a system of production resting on a characteristic definition of the functions and responsibilities of the different participants in the productive process. It was considered as a machine, composed of individual entities acting together as parts of a larger, continuously operating mechanism with a central power source (whether water or steam) driving all machines at coordinated rates.



To facilitate this, some mills used a specially-devised mill clock that provided both pacing of the work and tracking of progress with respect to the planned pace. The clock consisted of two similar (or identical) dials. One, showing 'mill time' was turned by the mill, the other showing 'clock time' was regulated by a

pendulum. Being driven by the power source that controlled the rate of the work, the hands of the 'mill time' dial moved according to the amount of work carried out, whereas those of the 'clock dial' measured the passing of time. For an actual work rate in line with the management's target, the time on the mill dial would always agree with the clock time. In a well-regulated mill, these two clocks would never vary by more than a few minutes. In the image shown above, the mill clock (on the right) is almost one hour behind the time shown on the pendulum clock (on the left). If the power source (eg, the water wheel) slowed down, the mill time slowed and because 'time is money' workers had to stay until mill time dial indicated a full day's work had been done.

The first use of a production line (or more accurately batch production) where a series of machines undertake a sequence of set tasks to complete a manufacturing process was the establishment of the Portsmouth Block Mills by Marc Isambard Brunel (father of Isambard Kingdom Brunel), starting in 1803. By 1807 this mill was able to produce up to 130,000 pully blocks a year of different sizes using three production lines for different general sizes of block (small, medium and large), this suggests a production rate of around 20 finished blocks an hour. Each pully block consisted of 4 components that went through a series of distinct manufacturing steps[5]. This type of production did not spread widely in the UK until reintroduced from the USA based on the innovations of Henry Ford.



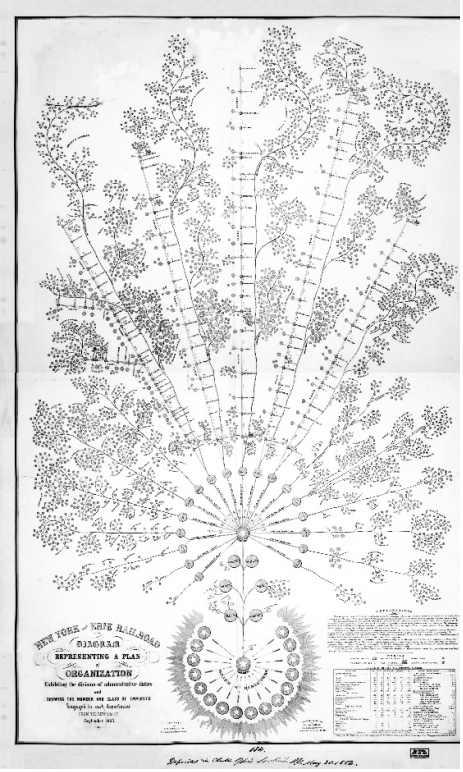
While the production line concept needed Henry Ford to obtain wide-spread acceptance, the pursuit of efficiency and profits within the general factory system, was the driving force behind the development of modern management. Early managers used their intuition, but within 100 years of the first factory, professional managers were routinely employed and their focus was on the optimisation of organisations to maximise profits by increasing productivity and minimising costs. Generalising this desire required the development of modern management (discussed below) and the ability to 'see and explain' the organisation's structure. One solution to the latter problem was the organisation chart.

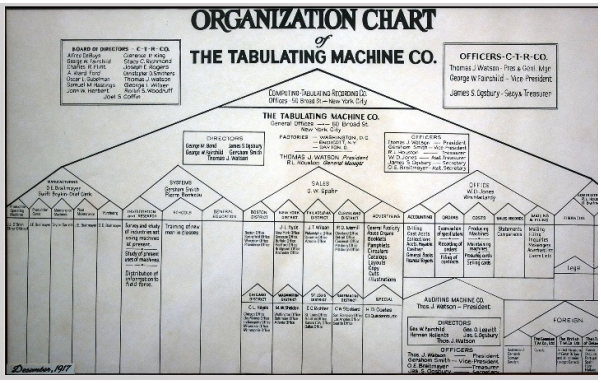
Organisation Charts

The Scottish-American engineer Daniel McCallum (1815–1878) is credited for creating the first organizational charts of American business around 1854. While McCallum's diagram is rather artistic, more WBS like charts were developed early in the 20th century (although not widely used)[6].

[5] For more information see *Portsmouth Block Mills*: https://en-academic.com/dic.nsf/enwiki/434527

[6] For more on the history of organization charts see ***The Origins of WBS & Management Charts***: https://mosaicprojects.com.au/PDF_Papers/P207_WBS_History.pdf





Go to :
https://mosaicprojects.com.au/PMKI-ZSY-020.php#WBS

And click on either chart to download a larger version.
Source Wikipedia.

These charts are the exception, rather than the rule but show a shift in thinking from 'working the man' prevalent from the earliest days of organised society onward; to 'manning the work' and optimising the way the organisation is structured.

The Development of Modern Management Theory

General Management Theories

Management science evolved through the 19th and 20th centuries in response to 'waves' of innovation in business and society (see Figure 1 below). Modern project management uses many of the ideas and techniques developed from these evolving general management concepts and experiences[7].

As discussed above, the Industrial Revolution brought about the emergence of large-scale businesses with an intrinsic need for professional managers; and early military and church organizations provided the leadership models adopted to control these enterprises. From these beginnings, the foundations of modern management were progressively developed around the

[7] The ***development of modern project management*** is discussed in: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

world. However, it was the developments in American management theories that particularly underpinned the beginnings of modern project management[8].

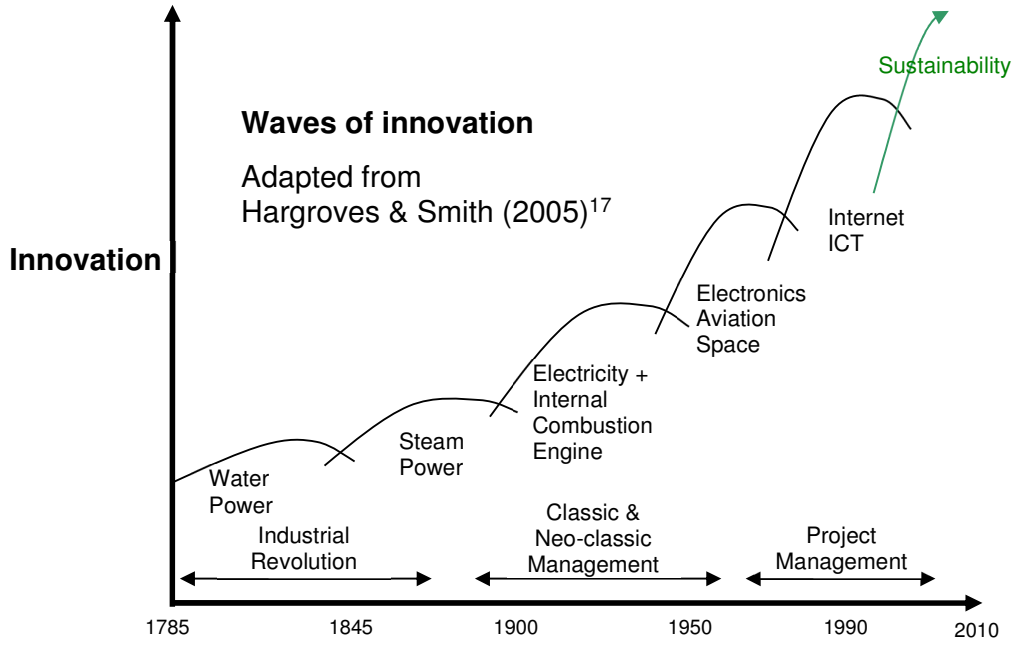


Figure 1[ii]

The categories below are based on the 1975 book by Raymond E. Miles, *Theories of Management: Implications for Organizational Behaviour*[iii]. In this book, he popularised a useful model of the evolution of management theory in the United States. His model includes the 'classical', 'human relations', and 'human resources' management phases summarised below.

Pre-Classical Developments[iv]

The genesis of the ideas that led to the development of modern project management can arguably be traced back to the protestant reformation of the 15th century[9]. The Protestants and later the Puritans introduced a number of ideas including 'reductionism[10]', 'individualism[11]' and the

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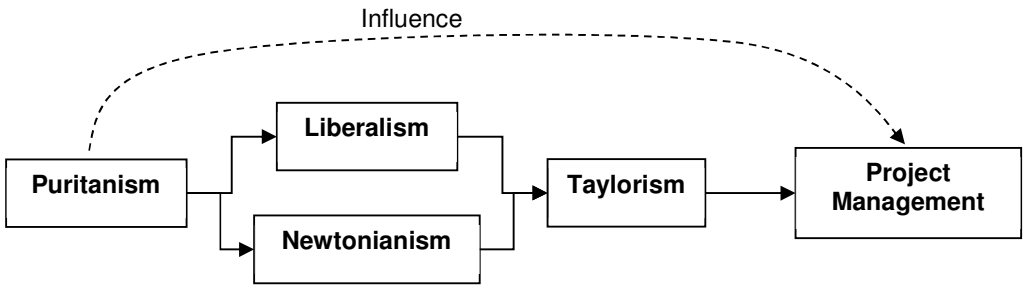
8 See ***The Origins of Modern Project Management***: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

9 Financial management is a key element of management control. Fra Luca Bartolomeo de Pacioli published his treatise on double entry accounting in 1494, in Venice; the same bookkeeping system we use today! The ability to account effectively underpinned the success of Venice as a powerful trading state through the Renaissance and its spread certainly assisted in the development of companies during the Industrial Revolution.

10 ***Reductionism*** = Removing unnecessary elements of a process or 'ceremony' and then breaking the process down into its smallest task or unit to 'understand' how it works.

11 ***Individualism*** = we are active, independent agents who can manage risks. These ideas are made into 'real things' by social actions contingent upon the availability of a language to describe them.

'protestant work ethic' (PWE)[12] that resonate strongly in the spirit of modern project management. From the perspective of the evolution of modern project management, these ideas were then incorporated into two key philosophies; Liberalism and Newtonianism (see Figure 2).



For a full discussion of this diagram see 'The impact of Puritan ideology on aspects of project management'. International Journal of Project Management 25 (2007) 10-20[18]

Figure 2

Liberalism included the ideas of capitalism (Adam Smith), the division of labour, and that an industrious lifestyle would lead to wealthy societies. In the *'Wealth of Nations'* Smith advocated breaking the production of goods into tiny tasks that can be undertaken by people following simple instructions. *'Why hire a talented pin maker when ten factory workers using machines and working together can produce a thousand times more pins than the artisan working alone?'* An overall benefit for all was assumed, based on the concept that doing good and sympathy for others created happiness whilst rejecting them created misery. Therefore the 'self interest' of the factory owner was synonymous with benevolence, and as a consequence, directs his 'selfish interest' to the benefit of society as a whole. Smith's work laid the foundation for the development of free trade and government policy in the industrial revolution.

Newtonianism marks the era of scientific enquiry. Newton saw the world as a harmonious mechanism controlled by a universal law. Applying scientific observations to parts of the whole would allow understanding and insights to occur and eventually a complete understanding of the 'clockwork universe'.

Discoveries made during the 'scientific revolution' of the 17th century underpinned the industrial revolution of the 18th century. Islamic scholars developed what's now seen as the 'scientific approach' during the Islamic *'golden age'* from the 8th to the 13th century. This concept was refined by Francis Bacon (1561 – 1662) in his *Novum Organum*, published in 1620 at the start of the 'scientific revolution'. Bacon defined the essence of inductive reasoning which underpins the 'scientific method' to this day, his approach involved:

- Gathering all of the evidence,
- Reaching a conclusion based on the facts alone,

[12] ***PWE*** = Prior to the protestant reformation most people saw work as a necessary evil (or at least as only a means to an end). For Protestants, serving God included participating in, and working hard at, worldly activities as this was part of God's design and purpose for each individual. And the accumulation of wealth is God's reward for diligent hard work! This concept was originally formalised by Maximilian Karl Emil Weber (Max Weber) in his essay *The Protestant Ethic and the Spirit of Capitalism*, 1905.

- Ensuring the data was collected using measurable and observable processes,
- The rigorous testing of hypothesis.

Whilst inductive reasoning dominated the scientific revolution an alternative approach to discerning the truth based on deductive reasoning was advocated by Rene Descartes (1596 – 1650). Deductive reasoning begins with an idea; Descartes approach was:

- Propose a premise,
- Gather evidence for and against the premise,
- Sift the evidence and reach a conclusion.

Deductive reasoning is based on the Socratic Approach to testing the truth of a statement[13].

Both of these approaches described above sought to eliminate bias and assessments based on opinion, untested belief, or prejudice, to determine the real 'truth'. The scientific method assumes the universe operates in a defined and predictable way which only needs the right evidence to understand. Newton was a strong supporter of Bacon's scientific method and inductive reasoning.

Robert Owen (1771-1858) and Charles Babbage (1792-1871) were two of the early management thinkers. Owen recognised people should not be considered as if they were simple machinery and introduced improved working conditions into his Scottish cotton mill. He used observation and rewards to encourage sustained, motivated production.

Babbage was interested in work specialisation and motivation; as well as being an eminent mathematician credited with developing the forerunner of the modern computer[14]. He developed systems to measure production and paid bonuses based on performance. These ideas were published in his book, *On The Economy Of Machinery and Manufactures'* (1832). Over 10,000 copies were sold possibly making this the first 'management best seller'? He advocated the careful division of labour, assigning high-skill tasks to high-cost (skilled) workers and other tasks to lower paid workers.

Andrew Ure (1778-1857) was a Scottish doctor who wrote *The Philosophy of Manufactures*, published in 1835. In this book he introduces the concepts underpinning the governance of organisations through to the current day[15]: *THE object of manufactures is to modify the productions of nature into articles of necessity, convenience, or luxury, by the most economical and unerring means. They have all three principles of action, or three organic systems; the mechanical, the moral, and*

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[13] For more on the ***Socratic approach*** see page 7 of WP1013, Problem Solving: https://mosaicprojects.com.au/WhitePapers/WP1013_Problem_Solving.pdf

[14] A colleague of Babbage, Ada Lovelace used her mathematical skills to describe how Babbage's proposed 'Analytical Engine' could be used to calculate a series of Bernoulli numbers. These 'notes' are considered the first algorithm encoded for processing by a machine (ie, a computer program): https://en.wikipedia.org/wiki/Ada_Lovelace

[15] Quote from: Ure, Andrew (1835). *The Philosophy of Manufactures: or, An Exposition of the Scientific, Moral, and Commercial Economy of the Factory System of Great Britain*. London: Charles Knight. Chapter II, paragraph 1.

the commercial….. They have also three interests to subserve, that of the operative, the master, and the state, and must seek their perfection in the due development and administration of each. The mechanical being should always be subordinated to the moral constitution, and both should cooperate to the commercial efficiency. Three distinct powers concur to their vitality, labour, science, capital; the first destined to move, the second to direct, and the third to sustain. When the whole are in harmony, they form a body qualified to discharge its manifold functions by an intrinsic self-governing agency, like those of organic life.

The phraseology used by Ure is dated but the sentiments expressed echo both the 'triple bottom line' and the tenets of governance found in modern business. He is also likely to be one of the earliest teachers of management science at the Andersonian Institute in Glasgow.

American managers were also starting to develop principles and theories. Daniel Craig McCallum (1815 – 1878), a Scottish-born American railroad engineer became general manager of the New York and Erie Railroad. He set down a set of general principles of management, and is credited for having developed the first modern organizational chart. McCallum presented the following general principles for the formation of an efficient system of operations, reprinted in Vose (1857)[16]:

1. *First. A proper division of responsibilities.*
2. *Second. Sufficient power conferred to enable the same to be fully carried out, that such responsibilities may be real in their character.*
3. *Third. The means of knowing whether such responsibilities are faithfully executed.*
4. *Fourth. Great promptness in the report of all derelictions of duty, that evils may at once be corrected.*
5. *Fifth. Such information to be obtained through a system of daily reports and checks that will not embarrass principal officers nor lessen their influence with their subordinates.*
6. *Sixth. The adoption of a system, as a whole, which will not only enable the general superintendent to detect errors immediately, but will also point out the delinquent.*

Vose (1857, p. 416) added, *that all subordinates should be accountable to, and directed by, their immediate superiors only. Each officer must have authority, with the approval of the general superintendent, to appoint all persons for whose acts he is held responsible, and to dismiss any subordinate when in his judgment the interests of the company demand it.*

The industrial revolution also used many of the tools and techniques of modern project management, entrepreneurs such as Eli Whitney, James Watt and Matthew Bolton developed:

- Standardised production and interchangeable parts,
- Quality control,
- Cost Accounting[17], and
- Production planning.

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[16] George Leonard Vose. *Handbook of Railroad Construction: For the Use of American Engineers. Containing the Necessary Rules, Tables, and Formulæ for the Location, Construction, Equipment, and Management of Railroads, as Built in the United States.* J. Munroe, 1857.

[17] For more on ***The Origins and History of Cost Engineering*** see: https://mosaicprojects.com.au/PDF_Papers/P207_Cost_History.pdf

All of these philosophies influenced the scientific management theories of Taylor. Taylor was undoubtedly influenced by his Quaker roots (Protestantism), worked in an intensely capitalistic society (Liberalism) and used the scientific approach of Newtonianism in his work developing the 'Classical School' of scientific management.

Classical School

The Classical school of thought began around 1900 and continued into the 1920s. It focuses on efficiency and includes scientific, bureaucratic and administrative management. Scientific management focuses on the "one best way" to do a job. Bureaucratic management relies on a rational set of structuring guidelines, such as rules and procedures, authority[18], hierarchy, and a clear division of labour. Administrative management emphasizes the flow of information in the operation of the organisation. All of these traits are important to 'modern project management'. Henry R. Towne was one of the earliest pioneers of this approach, he recorded the quickest time each task was done in his American lock-making workshop and made this the productivity benchmark. If workers finished quickly compared to the benchmark, he paid them a gain-sharing premium[19]. He saw the role of an engineering manager as no only solving problems, but solving them economically. He outlined his concepts to the 1905 graduating class at Purdue University in 1905. Some of Towne's business partner, Linus Yale Jnr., lock designs still sell today.

Scientific Management

Scientific management focuses on efficient task performance and the worker / machine relationship. It assumes productivity can be increased by increasing the efficiency of production processes. In 1911, Frederick Taylor, known as the Father of Scientific Management, published Principles of Scientific Management in which he proposed work methods designed to increase worker productivity[20]. One of his famous experiments had to do with increasing the output of a worker loading pig iron to a rail car. Taylor broke the job down into its smallest constituent movements and timed each movement with a stopwatch. The job was redesigned with a reduced number of motions as well as reduced effort and a reduced risk of error. The Taylor model gave rise to dramatic productivity increases.

This 'reductionist' approach to complex endeavours, supported by the division of labour is central scientific management as well as to many modern project management processes such as developing the 'Work Breakdown Structure[21]' (WBS) and scheduling.

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[18] To understand the use of ***power and authority*** see: https://mosaicprojects.com.au/WhitePapers/WP1095_Understanding_Power_Authority.pdf

[19] Incentive payments were a core part of the way productivity was managed within the 'classical schools' of management. For more on ***incentive payments*** see: https://mosaicprojects.com.au/Mag_Articles/SA1066_Incentivation_and_Performance.pdf

[20] Scientific management focused on 'one right way' of doing tasks, a strict hierarchy with decision making reserved for management and the use of pay for performance (piece rates). This system is often described as 'command and control', based on 'military organisations'. However, some 60 years before Taylor's work, Generalfeldmarschall Helmuth von Moltke had introduced *auftragstaktik* to the Prussian military allowing for flexibility in decision making. See: https://mosaicprojects.wordpress.com/2010/07/30/command-or-control/

[21] For more on the ***origins of the WBS***, see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#WBS

Frank and Lillian Gilbreth built on Taylor's work; they also believed that there was one best way to perform an operation. However, this 'one best way' could be replaced when a better way was discovered. The Gilbreths defined the concept of 'motion study' based on dividing work into the most fundamental elements possible, studying those elements separately and in relation to one another (they frequently used movie cameras); and from these studied elements, when timed, building methods of least waste. They defined 'time and motion' study as a searching scientific analysis of methods and equipment used (or planned to be used) in doing a piece of work; using the information gained to develop in practical detail the best way of doing it, and a determination of the time required. They made it easier for workers to do their jobs by organising the work place efficiently, realised comfortable workers were more efficient and encouraged workers to 'buy-in' to new processes by asking their opinions.

The social aspects of management recognised by Lillian Gilbreth were also central to the work of Mary Parker Follett[22] (1868 - 1933). She pioneered the understanding of lateral processes within hierarchical organizations (which recognition led directly to the formation of matrix-style organizations, the first of which was DuPont, in the 1920s), the importance of informal processes within organizations, and the idea of the "authority of expertise". Her 'matrix' view of organisations included the concept of 'integration', or non-coercive power-sharing based on the concept of 'power with', rather than 'power over' colleagues and a win-win philosophy. These concepts modified the typology of authority developed by her German contemporary, Max Weber (see below).

Follett recognised the holistic nature of community (including the community within an organisation) and advanced the idea of 'reciprocal relationships' in understanding the dynamic aspects of the individual in relationship to others. Similarly, her approach to conflict was to embrace it as a mechanism of diversity and an opportunity to develop integrated solutions rather than simply compromising. These traits underpin much of modern stakeholder theory which is central to the practice of project management (particularly in the realms of 'Agile' and 'Complex Project Management').

Henry Gantt (1861-1919) also belonged to this school. He developed a range of charts focused on comparing planned (or intended) production with actual production with the expectation of identifying the causes of any variance. He also developed motivational schemes, emphasising the greater effectiveness of rewards for good work over penalties for poor work. Gantt developed a pay incentive system with a guaranteed minimum wage and bonus systems; he also focused on the importance of the qualities of leadership and management skills in building effective industrial organizations[23].

Bureaucratic Management Theory

German sociologist and political economist Max Weber developed *Bureaucratic Management Theory* (published after his death in 1922 by his wife) and early understandings of how hierarchies worked. Weber's bureaucratic model is impersonal and focuses on authority (either:

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[22] Lillian Gilbreth and Mary Parker Follett were important in another way, they were two of the earliest women to have a management career and have the need to manage a high profile business career with a home life.

[23] For more on the work of Henry Gantt and access to his books, see: ***Henry L. Gantt - A Retrospective view of his work***: https://mosaicprojects.com.au/PMKI-ZSY-025.php

rational-legal, traditional or charismatic) and structure (the 'organisation chart[24]'). Bureaucracies are founded on legal or rational authority; efficiency in bureaucracies comes from:

- clearly defined and specialized functions,
- use of legal authority,
- hierarchical form,
- written rules and procedures,
- technically trained bureaucrats,
- appointment to positions based on technical expertise,
- promotions based on competence, and
- clearly defined career paths (a bit like a well developed PMO).

Weber recognised bureaucratic management theory lacked the flexibility to respond quickly to change, but at the time they outperformed many other forms of organisation and introduced the concepts of fairness and equality of opportunity into the workplace. He also recognised a healthy bureaucracy needed entrepreneurs and politicians to counteract the behaviour of bureaucrats.

Administrative / Process Management

Administrative management emphasises the manager and the functions of management. Henri Fayol (1841-1925), known as the Father of Modern Management, wrote ***General and Industrial Management*** (1916). His six functions of managers were to: forecast, plan, organise, command, coordinate, and control[25]. His fourteen principles of management included division of work[26], authority and responsibility, discipline, unity of command, unity of direction, subordination of individual interests to general interests, remuneration of personnel, centralization, scalar chain, order, equity, stability of tenure of personnel, initiative, and esprit de corps (union is strength). All of these elements resonate strongly in the core elements of the project management body of knowledge and underpin the modern concept of management.

Human Relations Movement

Behavioural or human relations management emerged in the 1920s and dealt with the human aspects of organizations. It has been referred to as the neoclassical school because it was initially a reaction to the shortcomings of the classical approaches to management. The human relations

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[24] For examples of ***early organization charts*** see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#WBS

[25] For more on ***Fayol's definition of management*** see: https://mosaicprojects.com.au/WhitePapers/WP1094_Defining_Management.pdf

[26] Adam Smith and Henri Fayol did not invent the concepts of the division of labour and management; the origins of these concepts go back to the ancient Greeks. Around 400BC, Socrates analysed the relative similarities between military and political (public) leadership and private management; he viewed management as a distinct skill, different from other technical areas. Aristotle and Plato further developed this work, some of the management skills they defined include: delegation, leadership, the specialisation of work and the division of labour.

movement began with the Hawthorne Studies[27] which were conducted by Elton Mayo between 1924 and 1933. The illumination experiments tried to determine whether better lighting would lead to increased productivity. Surprisingly, both the control group and the experimental group produced more whether the lights were turned up or down. It was discovered that this increased productivity was a result of the attention received by the group (known as the Hawthorne Effect). The Hawthorne Studies are significant because they demonstrated the important influence of human factors on worker productivity. Mayo's ground-breaking findings were that workers were social beings with emotions and feelings, and if respected they would try to do a better job. This led to staff canteens, employee welfare offices and better communication. He also notes 'informal work groups' (teams) grew naturally and could be used by management to benefit the organisation.

Chester Barnard developed the concepts of strategic planning and the acceptance theory of authority. Strategic planning is the formulation of major plans or strategies, which guide the organization in pursuit of major objectives. Barnard taught that the three top functions of the executive were to:

- establish and maintain an effective communication system,
- hire and retain effective personnel, and
- motivate those personnel.

His Acceptance Theory of Authority states that managers only have as much authority as employees allow them to have. The acceptance of authority depends on four conditions:

- employees must understand what the manager wants them to do,
- employees must be able to comply with their directive,
- employees must think that the directive is in keeping with organisational objectives, and
- employees must think that the directive is not contrary to their personal goals.

Barnard believed that each person has a zone of indifference or a range within which he or she would willingly accept orders without consciously questioning authority. It was up to the organization to provide sufficient inducements to broaden each employee's zone of indifference so that the manager's orders would be obeyed.

Human Resources School

Beginning in the early 1950s, the human resources school represented a substantial progression from human relations. The behavioural approach did not always increase productivity. Thus, motivation[28] and leadership[29] techniques became a topic of great interest. The human resources school understands that employees are very creative and competent, and that much of their talent is largely untapped by their employers. Employees want meaningful work; they want to contribute; they want to participate in decision making and leadership functions.

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27 The Human relations movement was founded by Australian born psychologist, George Mayo. The Hawthorn studies are his most famous piece of research.

28 For more on the ***evolution of motivation*** see: https://mosaicprojects.com.au/Mag_Articles/SA1032_The_Evolution_of_Motivation.pdf

29 For more on ***leadership*** see: https://mosaicprojects.com.au/WhitePapers/WP1014_Leadership.pdf

Systems Theory & Contingency View

Systems theory and a contingency view helped integrate the theories of management in the 1960s.

Systems Theory

During the 1940s and World War II, systems analysis emerged. This viewpoint uses systems concepts and quantitative approaches from mathematics, statistics, engineering, and other related fields to solve problems.

From a management perspective, a system is an interrelated and interdependent set of elements functioning as a whole. It is composed of inputs from the environment (material or human resources), transformation processes to change the inputs into finished goods (technological and managerial processes), outputs of those finished goods into the environment (products or services), and feedback (reactions from the environment). Systems develop synergy; this is a condition in which the combined and coordinated actions of the parts of a system achieve more than all the parts could have achieved acting independently. Project management is concerned with managing a complex 'system' with multiple inputs, outputs and complex, interrelated processes and consequently benefits from analysis using the systems approach[30].

Contingency View

In the mid-1960s, the contingency view of management emerged and provides a framework for integrating the full spectrum of management knowledge and thought. This view emphasizes optimising the fit between organization processes and the characteristics of each particular situation. It is based on the assumption that different situations and conditions require the application of different management techniques and proposes adjusting the structure of the organization to manage various possible or chance events.

The contingency approach assumes that how an organization is best managed is contingent on its situation at the time, both internally and environmentally. Therefore, managerial behaviour is dependent on a wide variety of elements and questions the use of universal management practices; instead, it advocates using selected and appropriate traditional, behavioural, and systems viewpoints independently or in combination to deal with various circumstances as they arise.

Operations Research

Whilst not strictly a 'management theory', Operations Research (OR) supports management decision making and has a critical part in the story of 'modern project management', it is an interdisciplinary science which deploys methods including mathematical optimisation to decision making in complex real-world problems concerned with the coordination and execution of the operations within an organisation.

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[30] For more on ***system thinking*** see: https://www.mosaicprojects.com.au/WhitePapers/WP1044_Systems_Thinking.pdf

OR started in the late 1930s and has grown and expanded tremendously. It appears to be the catalyst that triggered the start of CPM scheduling[v]. Critically, OR was an area of interest to Jim Kelley, he was scheduled to give a paper to the Case Institute operations research conference in January 1957 when he was seconded to the du Pont team being assembled by Morgan Walker that lead to the development of CPM (see Kelley and Walker above) [31].

The relatively coordinated developments of various CPM systems in the USA, UK and Europe and the documented links between OR and several of these developments strongly suggest that OR concepts and processes such as linear programming spawned the concepts of CPM and the inter-society communications led to the early cross pollination of ideas between the pioneers prior to the emergence of 'project management' organisations such as INTERNET and PMI[32].

Emerging Management Positions

Since the 1960s, new management viewpoints have emerged.

- **Quality management** emphasizes achieving customer satisfaction by providing the right quality goods and services that are fit for their intended purpose[33].
- **Reengineering** the organization redesigns the processes that are crucial to customer satisfaction.
- **Chaos theory**[34] models the corporation as a complex adaptive system that interacts and evolves with its surroundings. Many seemingly random movements in nature exhibit structured patterns. Living systems operate at their most robust and efficient level in the narrow space between stability and disorder - poised at "the edge of chaos."
- **Project / program and portfolio management (PPP).**
  Project management describes the tools, techniques, process and structures suited to accomplishing the objectives of a defined project. This branch of PPP is currently the best developed although arguably 'program management' evolved first[35]. The use of 'project management' did not gain wide acceptance until the 1960s and it is likely the first book with project management in its title was 'Project Management' by John Stanley Baumgartner, published by R.D. Erwin in 1963[vi]. Certainly, the first 'BoKs' published in the 1990s focused almost exclusively on projects.

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31 For more on ***the role of OR in the development of CPM scheduling*** see: https://mosaicprojects.com.au/Mag_Articles/P037_The_Origins_of_CPM.pdf

32 The development of scheduling is discussed in ***A Brief History of Scheduling***: https://mosaicprojects.com.au/PDF_Papers/P042_History_of_Scheduing.pdf

33 American thinkers such as Deming and Juran conceived the theory of quality management but it was the Japanese who perfected it. One leader Prof. Kaoru Ishikawa introduced the concept of *'quality circles'*, developed the Ishikawa (fishbone) diagram, advocated for continuously upgradeable standards (continuous improvement), required rigorous statistical controls and believed quality control starts and ends with training. Quality must be a company-wide focus driven by senior management and implemented by a 'happy workforce'. These ideas have returned to the West in concepts such as the "Toyota Way' and Six Sigma. See: https://mosaicprojects.com.au/PMKI-PBK-030.php

34 See also ***'A Simple View of Complexity in Project Management'***: https://mosaicprojects.com.au/PDF_Papers/P070_A_Simple_View_of_Complexity.pdf

35 For more on the ***development of the function of project manager*** see: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf (page 9).

Program management describes the coordinated management of a number of related projects to achieve a specified outcome or benefit[36]. The 'Manhattan Project' to create the atomic bomb occurred in the 1940s was arguably the first 'program'[37] and the US military were describing numerous other 'programs' (eg, the 'Atlas Program') from the early 1950s. Defence industry adapted to align with their military clients; in the early 1950s the McDonnell Aircraft Company started to move from a 'functional' structure to a matrix organisation with the appointment of 20 'company wide program managers'[vii]. By 1958, a 'general manager' of program managers had been appointed and a true matrix structure developed with functional disciplines interacting with numerous aircraft programs, with each program typically reporting to a single client in the military[38].

Portfolio management is the newest branch of PPP[39]. Portfolio management focuses on the selection of the 'right' projects and programs to best meet an organisation's strategic objectives within its capacity and capability limits.

PM Transition to soft sills. The first concepts of project management embedded a traditional, scientific, instrumental and universalist approach focused on 'best practice'. The limitations of this approach were identified in the mid-1980s. European and Scandinavian 'schools' focused on leadership and reconstructing project management in terms of temporary organisations and the need for adaptation depending on the nature of the project, complexity and the culture the project operates within. In the 21st century, the concept of a 'project' has been widened to consider political and sociological perspectives including the concept of the 'management of projects'.

- **The management of projects** is an emerging concept focused on the critical role of the organisation's executives and senior management to efficiently govern and manage the organisation's overall 'project delivery capabilities[40]' from the initiation of concepts and ideas that may become projects through to the realisation of the expected value from each investment in a project or program.
- **Complexity** A project will create a unique product, over a period of time by utilising a combination of specialised skills, tools and resources. In complex projects, the character of the product can be expected to change as the project moves through its various phases[41].

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36 For more on ***program management*** see: https://mosaicprojects.com.au/PMKI-ORG-030.php

37 The project was led by General Groves (his leadership is seen as vital). Groves identified five elements leading to its success: there was a clear objective, the 'project' was divided into 'tasks' that together would achieve the objective, there was clear direction of the project at all levels, authority was delegated with appropriate authority, existing resources were used where ever possible, there was full backing from the government. The words used are Groves, modern usage would describe a program of works decomposed into projects – all of the other factors including the full support of the sponsor are still essential for successful project and program delivery.

38 For more on ***program management*** see: https://mosaicprojects.com.au/PMKI-ORG-030.php

39 For more on ***portfolio management*** see: https://mosaicprojects.com.au/PMKI-ORG-025.php

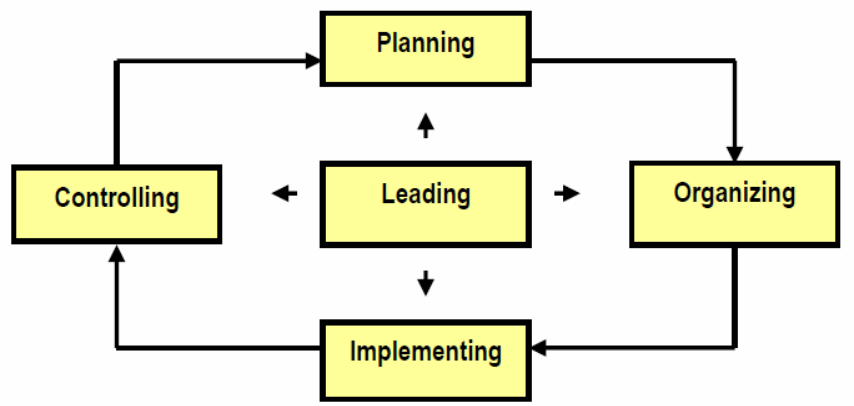
40 For more on ***Project Delivery Capability*** see: https://mosaicprojects.com.au/WhitePapers/WP1074_PPP_Taxonomy.pdf

41 For more on ***complexity*** see: https://mosaicprojects.com.au/PMKI-ORG-040.php

Conclusion

This paper considers the development of general management from the perspective of its influence on the discipline of 'project management'; it is not intended as a comprehensive study of management. This paper, in conjunction with ***The Origins of Modern Project Management***[42], demonstrate that the development of general management theory in the USA through to the 1960s was a critical underpinning for the creation of 'modern project management'. Its roots can arguably be traced back to the Protestant reformation of the 15th Century and most of the ideas implicit in the early days of our profession (from the 1960s to 1980s) are firmly rooted in the ideas of Scientific Management.

The functions of management are generally agreed to be the functions of *planning, organizing, leading & staffing, executing or implementing and controlling* the organisation; and these basic functions underpin project management.



By the 1970s the focus of 'project management' was spreading from its roots in scheduling and its 'home' in the defence and construction industries to embrace 'all industries' and the emerging recognition of the distinctive nature of project management as a specialist management discipline if not a profession was recognised by a number of leading writers. The creation of the profession of project management is discussed in ***The Origins of Modern Project Management***.

References

[i] Chin-Ning Chu at PMI Global Congress, Bangkok 2006

[ii] Hargroves K, Smith M. The Natural Advantage of Nations. Earthscan, London 2005 p17

[iii] Miles, R.E. Theories of Management: Implications for Organizational Behavior. 1975. McGraw-Hill New York

[42] See: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

[iv] Whitty S.J., Schulz, M.F. The impact of Puritan ideology on aspects of project management. International Journal of Project Management (2007), 25 (1) 10-20

[v] See discussion by Prasad Velaga at: https://www.linkedin.com/pulse/some-similarity-between-critical-path-method-dynamic-prasad-velaga.

[vi] Archibald R. Email dated 26/11/2005*.

[vii] Bugos G.E. Programming the American Aerospace Industry, 1954 - 1964. Business and Economic History (1993) 22(1) 210-222

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