Project Services Pty Ltd

THE ORIGINS OF MODERN PROJECT MANAGEMENT

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See also: *'A Brief History of Scheduling - Back to the Future'*
https://mosaicprojects.com.au/PDF_Papers/P042_History_of_Scheduling.pdf

Mosaic's complete PM History resource is available from:
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Introduction

Projects in one form or another have 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 20th century people started to talk about 'project 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. Whilst the Manhattan Project to build the atomic bomb in the 1940s is generally considered the first 'program', its managers primarily saw their roles either as military officers or scientists.

For the purposes of this paper, there is an important distinction to be drawn between projects: 'a temporary endeavour undertaken to create a unique product, service or result[ii]' and project management or at least the profession and practice of 'modern project management' as it is embodied in the various project management associations around the world. In this context, 'modern project management' is a phrase used by the author and others[iii] to describe the management of projects in the way described by organisations such as the APM[1] (UK) and PMI[2] in their respective 'bodies of knowledge' (BoKs) - both current and former.

This paper will discuss three themes. Firstly, a brief look at the evolving processes of schedule analysis (CPM[3]) and other project management tools - the technology. Second, briefly 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[4] and finally the 'serendipity' that brought these two factors together to create a new profession.

Developing the Technology

The invention of the Critical Path Method (CPM) and Scheduling

Starting with the industrial revolution, management science evolved through the 19th and 20th centuries (discussed in ***The Origins of Modern Management***[4]), and various processes, tools and techniques were developed to help identify and control business functions. Some of these tools directly related to project management included:

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1 Association for Project Management

2 Project Management Institute Inc.

3 Critical Path Method

4 For the primary discussion on this topic see ***The Origins of Modern Management***: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_Management.pdf

- The Barchart, which can trace its origin to 1765. The originator of the 'bar chart' appears to be Joseph Priestley (England, 1733-1804) in his *'Chart of Biography'* and the concept was popularised William Playfair (1759-1823) in his *'Commercial and Political Atlas'* of 1786[5]. Calling this type of chart, a 'Gantt Chart' is a complete misnomer[6].
- Flow-Line scheduling in the 1930s. Among other projects, Flow-Line was used to schedule the construction of the Empire State Building in record time[iv],
- The LOB (Line of Balance) technique developed by the Goodyear Company in the early 1940s and adopted by the U.S. Navy in the early 1950s for the programming and control of both repetitive and non-repetitive projects, and
- Milestone Charts in the 1940s.

The first 'project' to add science to the process of time control was undertaken by Kelley and Walker for E.I. du Pont de Numours. The meeting that approved the funding for this project was held in Newark, Delaware, USA on the 7th May 1957. In 1956 Kelly and Walker had started developing the algorithms that became the 'Activity-on-Arrow' or ADM method of critical path scheduling, and after approval of funding for the development project as they say, the rest is history[v]. The computer program they developed was trialled on plant shutdowns in 1957 and the first paper discussing the critical path method (CPM) of scheduling was published in March 1959[vi].

These developments were closely followed by the development of the PERT system[7]. The US Air Force translated PERT into PEP (Program Evaluation Procedure) and a host of similar systems appeared over the next few years. Whilst CPM and PERT use the same basic approach, including the Activity-on-Arrow network diagram, PERT focused on time as the key variable (what varied was the probability of hitting a milestone or completion date) where CPM 'fixed' time and the cost of achieving the target time varied. The cost variable component of CPM quickly faded from use. The time variable PERT approach lasted longer and was eventually replaced by the more accurate Monte Carlo analysis. Modern tools based on the Monte Carlo approach are capable of calculating time and cost variables at the same time[8].

In Europe, the Operational Research Section[9] of the UK Central Electricity Generating Board (CEGB) was also working on similar ideas to Kelley and Walker in the period 1955 to 1958. They developed the term the 'longest irreducible sequence of events' and applied their system to the shutdown and maintenance of Keadby Power Station, Leicestershire in 1957. The use of CEGB - CPM achieving a saving of 42% compared to the previous overall average time for similar shutdowns[vii]. However, whilst some of the CEGB work may pre-date 7th May 1957 (as did some of Kelley and Walkers), I have been unable to find any data to substantiate a significant

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5 See ***A Brief History of Scheduling***: https://mosaicprojects.com.au/PDF_Papers/P042_History_of_Scheduing.pdf

6 See ***Henry L. Gantt - A Retrospective view of his work***: https://www.mosaicprojects.com.au/PDF_Papers/P158_Henry_L_Gantt.pdf

7 For a detailed review of PERT see WP1087 ***Understanding PERT***: https://mosaicprojects.com.au/WhitePapers/WP1087_PERT.pdf

8 For more on ***schedule risk assessment*** see: https://mosaicprojects.com.au/PMKI-SCH-015.php#Overview

9 Operational Research (OR) is central to the development of CPM scheduling, see ***The origins of PERT and CPM***: https://mosaicprojects.com.au/Mag_Articles/P037_The_Origins_of_CPM.pdf

milestone when work on the CEGB - CPM 'started'. Consequently, as the CEGB-CPM developments remained largely within the CEGB and the first major use of the methodology grew out of the work at du Pont in 1957, I have selected the documented start of the du Pont project as the most clearly defined beginning date for 'critical path scheduling' as we know it[10].

The Precedence (PDM) methodology was developed by Dr. John Fondahl as a 'non-computer approach to scheduling' and the results published in 1961 (the initial contract for this work was issued to Stanford University on 1st July 1958[viii]). PDM was developed into a computerised tool by H.B. Zachry Co of Texas and then commercialised by IBM as its 'Project Control System' software[ix]. The initial 'publicity' surrounding scheduling focused on PERT, this was fairly quickly overtaken in the commercial world by CPM (Activity-on-Arrow networking) founded on the work of Kelley and Walker and by the end of the 60s PERT and CPM had merged into a general 'Activity-on-Arrow' networking approach to scheduling. However, by the mid 1970's the trend towards Precedence networking was gaining momentum and by the 1990's Precedence had become the dominant method of scheduling.

The US Government quickly realised schedule control was only part of the answer to successful project delivery. The US Military and NASA developed a range of new tools (or refined the use of existing tools) including among many, the WBS (Work Breakdown Structure), PERT/Cost, PERT-RAMPS (Resource Allocation & Multi-Project Scheduling), etc. leading to the Cost/Schedule Control Systems Criteria (C/SCSC or C/SC^2) developed during the 1960s[x]. This proliferation of systems was opposed by the major US contractors and refinements and simplification occurred, however, the importance of these developments in underpinning the processes of project management were critical and many elements such as the WBS and Earned Value[11] which grew out of this period are now core project management processes and others developed at the same time such as Configuration Management and Value Engineering are gaining in importance. Arguably, with the exception of Risk Management no new principles of cost, design, or schedule control have been developed since Earned Value, Configuration Management, Value Engineering, Precedence Scheduling and Resource allocation in the mid 1960s[xi].

Some of the more recent developments in this area that post-date the 1994 Morris book used as a reference for much of this section, include Critical Chain, Earned Schedule and portfolio management tools. Whether these constitute 'new principles' or are merely improvements on existing processes remains to be seen.

If the central hypothesis defined in this paper is proved, the 7th May 2007 was not only the 50th anniversary of the development of 'critical path scheduling', but also the 50th anniversary of the start of 'modern project management' as we know and practice it.

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[10] The development of scheduling is discussed in depth in ***A Brief History of Scheduling, The Origins of Bar Charting***, and other papers, see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#Overview

[11] The modern 'Earned Value' standards in the USA, Australia, etc have developed from the C/SCSC systems promulgated by the US Military, for more on the history of Earned Value see ***The Origins and History of Earned Value Management:*** https://mosaicprojects.com.au/PDF_Papers/P207_EVM_History.pdf

Similarly, some of the earliest 'standards' for WBS were US 'MIL Standards', see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#WBS

The invention of the 'Iron Triangle' – Time, Cost and Output

Dr Martin Barnes (UK) first described the 'iron triangle' of time, cost and output (the correct scope at the correct quality) in a course he developed in 1969 called 'Time and Money in Contract Control'[12]; interestingly, even then the course was not entitled 'project control'[xii].

Whilst all three elements have always been important, the evolution of scope and cost control into relatively precise processes occurred with the industrial revolution in the 18th Century. Whilst time control was important, and many projects such as the Crystal Palace[13] were built in remarkably short times, 'scheduling' lacked science and recognition until very much later.

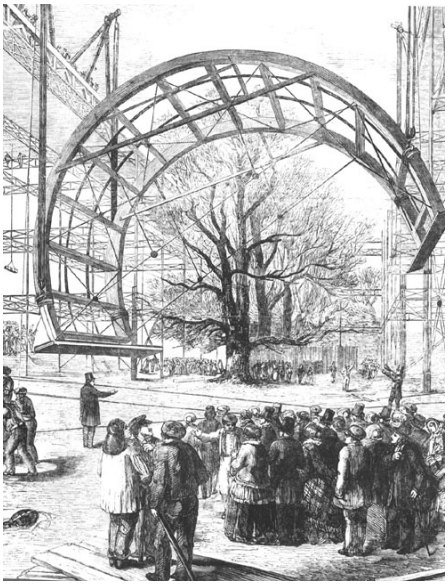

Figure 1 - Raising a main roof truss, Crystal Palace 1851

This situation continued, despite advances in process/production controls and the use of the 'modern bar chart'[14]. In fact, there was no general recognition of scheduling as a special 'project

[12] In 1968, Dr. Barnes went on to develop a Fortran mainframe computer program that integrated cost, time and resources and could show the effect of decisions about the work and how it affected both cost and time simultaneously. He commercialised this in 1971 with John Gillespie as a COBOL version; the program was called the ***Project Cost Model*** (PCM), it treated a project as a plan which produced both the cost and time forecasts, broken down into (or built up from?) plans for doing each activity which led to a budget and a programme. Dr. Barnes said "You could do 'what ifs' and all the other clever things but it was quite difficult as the input was all on punched cards and the only output was voluminous line printer output. Nevertheless, we sold it to some quite big project outfits such as the CEGB and Costain in the UK and Anglo-American in South Africa - at a huge price. We are talking early 1970s".

[13] The Crystal Palace, a building the size of a modern shopping mall: 1848 feet [563.3 meters] long, 408 feet [124.4 meters] wide and 108 feet [32.9 meters] high, was built in eight and a half months starting on 15 July 1850, opening on 1st May 1851. For more on the 'governance and control' of this project see: https://mosaicprojects.com.au/PDF_Papers/P180-Project_Governance-Building_the_Crystal_Palace.pdf

[14] For more discussion on the links between early industrial 'production control' systems and scheduling see: ***A Brief History of Scheduling***: https://mosaicprojects.com.au/PDF_Papers/P042_History_of_Scheduling.pdf

management process' until the marketing of CPM by Mauchly and Associates brought this third element of the 'iron triangle' to the public attention in the early 1960s and Dr. Barnes did the connecting a few years later.

Project Management 'Scope Creep'

The understanding of what is involved in project management is continuing to evolve, expand and segregate. There are now recognised disciplines of Program and Portfolio management in addition to 'project management'. And while the integration and control of time, cost and scope is still the essence of 'modern project management', other elements such as quality, risk, technology, stakeholder management, and communication, have been added over the years with supporting tools, techniques and processes.

The evolution of project management seems to have mirrored the evolution in general management (discussed in ***The Origins of Modern Management***[15]); starting with a focus on 'scientific' (or hard) processes in the early years, moving to a softer-skills focus in the 21st century. This trend is clearly demonstrated by analysis of papers published in the International Journal of Project Management[xiii] which shows a drop from 49% to 12% for task focused papers (scheduling, etc), offset by increases in papers on 'soft' subjects such as leadership and stakeholder management.

Similarly, many of the new 'tools' entering the market in the 21st century are directed towards collaboration, communication and stakeholder management including the innovative ***Stakeholder Circle*** system[16].

Project Management Methodologies

As the 'scope' of project management expanded, various methodologies were developed to formalise the way organisations managed their projects. The popularity of 'methodologies' grew rapidly from the beginning of the 1970s into the 1980s[17]. However, since the turn of the century, the focus seems to have shifted from organisations buying expensive 'methodologies' from commercial vendors towards adopting the use of maturity models such as P3M3 and OPM3[18].

The core of any methodology is its process descriptions; these processes are typically implemented by the consistent use of templates, forms and software, and the overall methodology is supported and developed by some form of PMO[19]. Most methodologies were (and still are) internal to their organisations; they describe 'how we do business here'. Others that were commercialised and marketed have had varying degrees of success (and generally fairly short

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15 See ***The Origins of Modern Management***: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_Management.pdf

16 For more on the ***Stakeholder Circle*** see: https://mosaicprojects.com.au/PMKI-TPI-076.php

17 For more on ***methodologies*** see: https://mosaicprojects.com.au/PMKI-ORG-050.php#Process1

18 For more on ***maturity models*** see: https://mosaicprojects.com.au/PMKI-ORG-050.php#Process2

19 PMO = Project Management Office, for a range of papers focused on PMOs see: https://mosaicprojects.com.au/PMKI-ORG-045.php

lives closely coupled to their supporting software systems); a notable exception is the PRINCE2 methodology.

The forerunner of PRINCE, PROMPT (Project, Resource, Organisation, Management and Planning Technique) was originally developed by a British company called Simpact Systems Ltd in 1975. PROMPTII was adopted by the UK's CCTA (Central Computer and Telecommunications Agency) in 1979, as the default methodology for all UK government information systems projects. In 1989, PRINCE was created from PROMPTII and was made 'public domain'. PRINCE replaced PROMPTII as the default methodology in the UK and started to spread internationally. In 1996, PRINCE2 was published by the CCTA's replacement, the Office for Government Commerce (OGC) following extensive consultation with users. Today the PRINCE2 methodology is commercialised by AXELOS, a joint venture company, created in 2013 by the Cabinet Office on behalf of Her Majesty's Government (HMG) in the United Kingdom and Capita PLC, to manage, develop and grow their Global Best Practice portfolio[20]. PRINCE2 is widely used in government throughout Europe and Australia and is being increasingly adopted by commercial organisations.

Technology Conclusion

An effective methodology is the ultimate 'tool' to help organisations consistently deliver successful projects, programs and portfolios. However, whilst every profession has its special tools and techniques, the possession of these artefacts alone is insufficient to create a profession. A knowledge framework and an organisational framework are also needed.

Management History[21]

The Role of 'Project Manager'

The appointment of people as 'project managers' only started to emerge in the 20th century. In earlier times, the leadership of the project endeavour moved from a generalist role held by Master Builders or coordinating architects such as Wren, who were responsible for all aspects of design and delivery including cost control and time management[22]; to more specialist roles in the 18th and 19th centuries which included the separation of the architectural design function from the management of the construction processes undertaken by general contractors, with responsibilities assigned by contract, to 'program' and then 'project' management in the 20th century.

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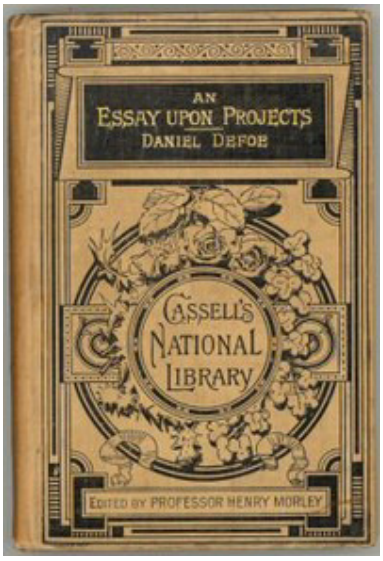
20 See: https://www.axelos.com/best-practice-solutions

21 For a more ***expansive history of management*** see: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_Management.pdf

22 St Paul's Cathedral was built between 1677 and 1711 by Sir Christopher Wren (1632 – 1723). It was the first English Cathedral to be built within a single lifetime under the design and direction of a single Architect. Wren designed the building, had authority to adapt the design to overcome construction challenges and oversaw the work of 41 separate contractors employed to complete the work.

Sophisticated contractual arrangements for the execution of major building works were in use 2500 years ago. The Long Walls in Athens were managed by the Architect Callicrates with the work let to ten contractors. A few centuries later the Colosseum was built by four contractors. These contracts contained detailed specifications of the work and requirements for guarantees, methods of payment and completion time were usually important considerations[23]. Much of this sophistication was lost with the collapse of the Roman Empire in the 5th century and only started to re-emerge in Europe during the Renaissance. These trends continued into the 17th and 18th centuries with contractual transactions forming an important part of the realisation of most projects.



Daniel Defoe published: ***An essay upon projects*** in 1697[24] which discusses projects from the year 1680 onwards (but also recognises there were earlier projects). The essay discusses the Projectors (in today's language entrepreneurs) responsible for raising funds for their pet projects, often in less than flattering terms, and the role of banks and finance. However, whilst Defoe discusses project finances, and in some cases labour requirements, he does not mention processes for the management of time or the management of the work of the 'projects'. The same is true for much of the 'industrial revolution'; the Bridgewater Canal was opened in 1761, followed by 100s of miles of others in a period of around 60 years, until the railways took over from 1825 onwards. These projects and later ones such as the Crystal Palace (1850) had to have been effectively managed as well as designed and fabricated – there were time and cost constraints on the builders/engineers and 1000s of workers deployed but there are few indications of how the work was planned and managed[25].

As mentioned above, by the 18th century the professions of (design) Engineer and Architect had evolved into professional societies and those who built the projects were contractually and organisationally separate from the designers[xiv].

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[23] As governments do today, the Romans outsourced most of their major works to contractors, with both public accountability and a legal framework as key governance constraints. What was significantly different was the consequences of failure! If a project went badly wrong in Roman times, the responsible public official would suffer a major career limiting event that could affect the prospects of his descendants for generations to come. Whilst the retribution applied to the contractor could be even more serious including death as well as retribution for generations to come. Rome was not built in a day but their empire did last for close to 1000 years [*Frontinus – A Project Manager from the Roman Empire Era by Walker & Dart (Project Management Journal Vol.42, No.5, 4-16*].

[24] Daniel Defoe uses the term "projector" to refer to people that "project" into the future and thus make their ideas real. A true projector is "he who, having by fair and plain principles of sense, honesty, and ingenuity brought any contrivance to a suitable perfection, makes out what he pretends to, picks nobody's pocket, puts his project in execution, and contents himself with the real produce as the profit of his invention.

[25] For more on ***the management of the Crystal Palace*** project see: https://mosaicprojects.com.au/PDF_Papers/P180-Project_Governance-Building_the_Crystal_Palace.pdf

The concept of 'project management' emerged in the 20th century. One of the earliest examples was the U.S. Bureau of Reclamations 'project office' with a 'project engineer' in charge of a complete project. The U.S. aircraft industry in the 1920s and 30s developed the role of project coordinator. And one of the earliest business management roles that could be defined as 'project management' was the role of Proctor and Gamble's 'brand managers' in the mid to late 1920's.

Proctor and Gamble's managers were responsible for the overall marketing, planning and control of a product and *the integration of those functions influencing the success of the venture*. By the 1930's the US Air Force was also starting to use 'project offices' to monitor the progress of aircraft developments and process engineering companies such as Exxon had begun to develop the 'Project Engineer' function to follow a project as it progressed through various functional departments[xv].

The USAF was establishing 'joint project offices' from 1951. The first for the B47 bomber was set up in Feb. 1951; these offices focused on coordination between engineering and production with a focus on systems management. By 1954 the practice was extended to 'Weapons system Project Offices (WSPOs)'. During the 1950's project and program management was very closely aligned with 'systems management' in the US military. The Navy 'Special Projects Office' (SPO) for the Fleet Ballistic Missile program (Polaris) was created on Nov. 17th 1955, this organisation developed PERT (Program Evaluation and Review Technique) in 1957/58.

Around 1953-54 McDonnell Aircraft formally created the position of 'project manager' with primary responsibility for organisation and staffing and around the same time Martin Marietta established one of the first 'matrix organisations'. These early developments are definitely a pre-cursor to the shift from functional organisation structures to the general use of matrix management, and are close to project management, but lack the emphasis on implementation and the processes found in modern project management. The concepts grew out of the development of general management theory.

In the construction industries, Bechtel first used the term 'project manager' in the 1950s and the 'Trans Mountain Oil Pipeline' in Canada (1951-53) was the first project on which the company functioned as the project manager. However, the idea of having a project manager responsible for the whole project from design through construction to commissioning was still meeting resistance in Bechtel in the early 1960s. In Australia, Civil & Civic Pty Ltd had adopted the ideas of 'project management' by the mid 1950s and was marketing its capability to clients by 1958. By the end of the 1950s the idea of appointing a 'project manager' either as an individual or as an organisation to take full and undivided responsibility for achieving the project objectives had arrived and was starting to spread[26].

General Management Theories[27]

Management science evolved through the 19th and 20th centuries in response to 'waves' of innovation in business and society (see Figure 2 below). Modern project management uses many

[26] See '*A short history of project management: part one: the 1950s and 60s,*' The Australian Project Manager 14 (1): 36-37 by Alan Stretton (1994) for more details.

[27] For a comprehensive discussion of ***the evolution of general management theories*** see: https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_Management.pdf

of the ideas and techniques developed from these evolving general management concepts and experiences.

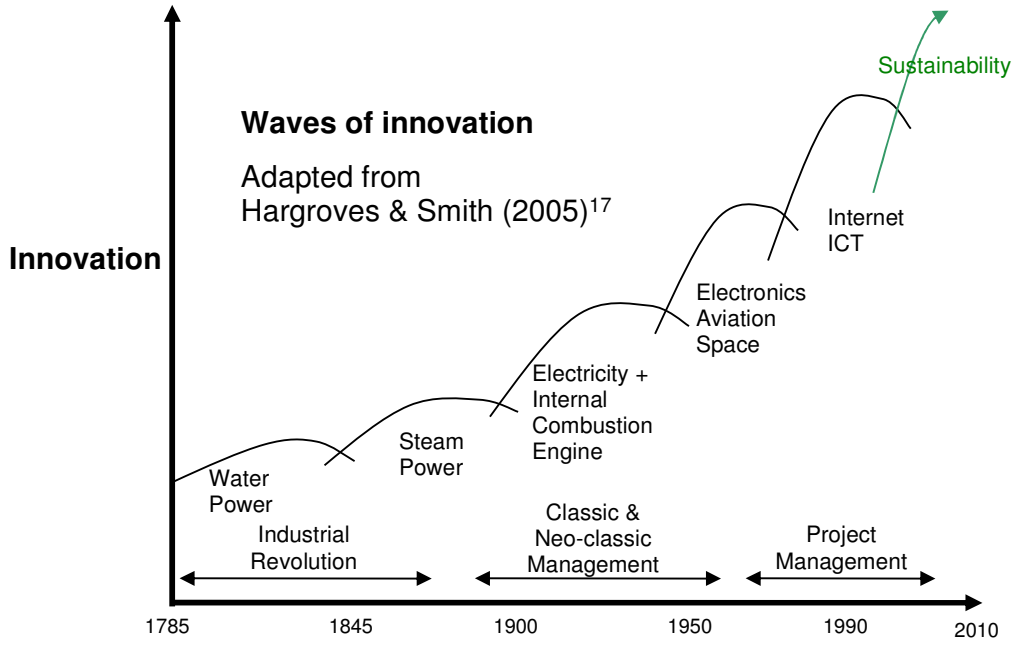

Figure 2[xvi]

Certainly, 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. However, neither the tools described above nor the general management theory outlined in this section, either on their own or in combination, would have been sufficient to create the emerging profession of 'modern project management'. The creation of our profession is described below.

Creating the Profession of 'Modern Project Management'

Definition of a 'Profession'

The various attributed or traits generally considered necessary for a discipline to be considered a profession are:

- practitioners are required to meet formal educational and entry requirements,
- autonomy over the terms and conditions of practice,
- a code of ethics,
- a commitment to service ideals,
- a monopoly over a discrete body of knowledge and related skills[xvii].

Within this context, project management is best described as an 'emerging profession' whilst there is a defined 'body of knowledge' different associations around the world have somewhat divergent views on their content. Only some bodies require formal educational and entry requirements (eg, AIPM[28]) others have none (eg PMI[29]). Formal certifications exist (eg PMI's PMP credential) but certification is not a prerequisite to practice. Whilst most associations have a commitment to service ideals, only a very small proportion of project management partitioners belong to an association. Similarly, whilst there is a 'project management body of knowledge' and project management research taking place, the support of academia for the concept of project management as a separate academic school is at best limited despite the emergence of research conferences and refereed journals over the last 25 years. And the debate over the existence of a 'theory of project management' is only just beginning[xviii].

The premise underlying this paper is that if project management is not already a profession, it will definitely emerge as one over the next few years; and this emerging profession is the creation of the project management associations that have progressively worked to refine and define the essence of 'modern project management'. At the present time, there is definitely a carder of professional project managers (many of who hold professional indemnity insurance), but the broader question of is project management a fully-fledged profession remains open[30].

The Profession of 'Modern Project Management'

Projects have existed for as long as people have set out to accomplish a specific objective with limited resources. However, until relatively recently, these 'objectives' were not seen as projects; they were seen as acts of worship, engineering, nation building, war, etc., and the people controlling the endeavours called themselves priests, engineers, architects, generals, etc. The use of the terms, 'project' and 'project management' have only become common within the last 70 years and largely align with the growth of 'project management associations'. Despite the abundance of projects in earlier times, no one talked about 'project management' until the 1950s; and the spread of discussions around and about project management seems to have closely followed the spread of scheduling in the 1960s. Certainly, the advent of scheduling as a

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28 AIPM = Australian Institute of Project Management.

29 PMI = Project Management Institute (USA)

30 The question of ***how close is project management is to becoming a profession*** is discussed in: https://mosaicprojects.com.au/Mag_Articles/SA1049_Professional_Project_Management.pdf

discipline completed the iron triangle of time, cost and scope; as defined by Dr. Martin Barnes in 1969.

Given the embodiment of 'modern project management' is the major 'project management associations' such as IPMA[31] and PMI, the forces that created these associations also created 'modern project management' and as this paper will demonstrate, these bodies were essentially founded by schedulers.

Based on these observations, it would appear that:

1. The catalyst for the spread of discussions on project management was the formation of the 'project management associations'; and
2. the formation of these associations was triggered by the spread of scheduling (or more importantly professional schedulers) in the early 1960s, therefore
3. the genesis of modern project management was the schedulers need to create forums to discuss and develop their new discipline.

Well over 50% of the people in each of the groups that founded PMI in the USA, INTERNET in Europe (now IPMA) and the UK branch of INTERNET (now APM) were schedulers and a large proportion of the remainder cost engineers. Recollections of early conferences and the early publications from these bodies suggest that their focus was almost exclusively on project controls and in particular 'critical path scheduling'. It is therefore, reasonable to argue that the spread of scheduling linked to the need to make effective use of the data generated by the schedulers as they calculated their critical paths, was the catalyst that created modern project management.

The two key distinguishing features of the early project management associations were a focus on techniques (initially scheduling and cost control) rather than outcomes (eg, engineered structures) and the cross industry nature of the early membership which led to the creation of 'modern project management' as a profession in its own right rather than as a branch of engineering, building or some other industry.

Therefore, assuming the central hypothesis in this paper holds true, that *'the spread of scheduling was the genesis of modern project management'*; then the 50th anniversary of the start of the project that created 'modern project management' was the 7th May 2007.

The role of the Associations in creating 'modern project management'

Once founded, it was (and still is) the various project management associations that led the development of a defined and documented 'project management body of knowledge'. Only after the body of knowledge was formulated, did it become possible to define project management competencies, formally examine project management knowledge and start the process of creating a true profession of project management.

Over the last 30 to 40 years, initially supported by practitioners and more lately by most of academia, the project management associations have:

- developed a generally consistent view of the processes involved in 'project management',

[31] IPMA = International Project Management Association

- encoded these views into 'Bodies of Knowledge' (BoKs),
- described competent behaviours and are now certifying knowledgeable and/or competent 'Project Managers',
- conducted both academic and practitioner focused conferences around the world,
- sponsored research into various aspects of project management, and
- worked to create a global community of 'project managers'.

Academia has supported this process with the development of research programs, refereed journals, research conferences (often in partnership with the associations), the publication of learned articles and the development of various undergraduate and post graduate qualifications in project management.

The central theme running through the various BoKs is that project management is an integrative process that focuses on the project lifecycle from initiation (or concept) through to the transfer of the 'product' created by the project to the client and closure of the project. It has at its core the balancing of the 'iron triangle' of time, cost and output (scope / quality), and the objective of project management is the completion of the project, as efficiently as possible, to the satisfaction of the project's stakeholders.

The first endeavour to develop a BoK was approved by the PMI Board in 1981, was published in August 1983[32] and PMI's first certifications were awarded in 1984. The next version of the PMBOK appeared in August 1986 and an updated version was published August 1987 initially in a PMI Journal and then as the first standalone publication[33]. The PMBOK has been under review on a regular basis since this time[34] and in the last couple of decades similar documents have been created by Associations in the UK (APM BoK), Japan, etc.

Despite the steady expansion of knowledge areas covered by the BoKs to include the integration and management elements such as risk, quality and communications, as they apply to the project, and the development of allied standards such as program and portfolio management, the foundation techniques for modern project management remain the integration and control of time, cost and 'output'. All three facets must be present within a defined life cycle for a management process to be considered project management.

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[32] This project was known as the 'Ethics, Standards and Accreditation (ESA) project. The project developed a Code of Ethics, the BoK with 6 knowledge areas (scope, cost, time, quality, human resources and communications) and guidelines for the accreditation of courses offered by academic institutions and the certification of individuals.

[33] The 1986 - 87 version of the PMBOK added the concept of a project framework and added risk and procurement management as separate knowledge areas to the document. *'The project Management Body of Knowledge'* was published in August 1987.

[34] The next update was initiated in 1991 and published in 1996. The title was changed to *'A Guide to the Project Management Body of Knowledge (PMBOK Guide ®)'.* This was followed by the 2000 update and then the *'Third Edition'* in 2004. PMI are now publishing an updated version of the *PMBOK* every 4 years, 2008, 2012, etc.

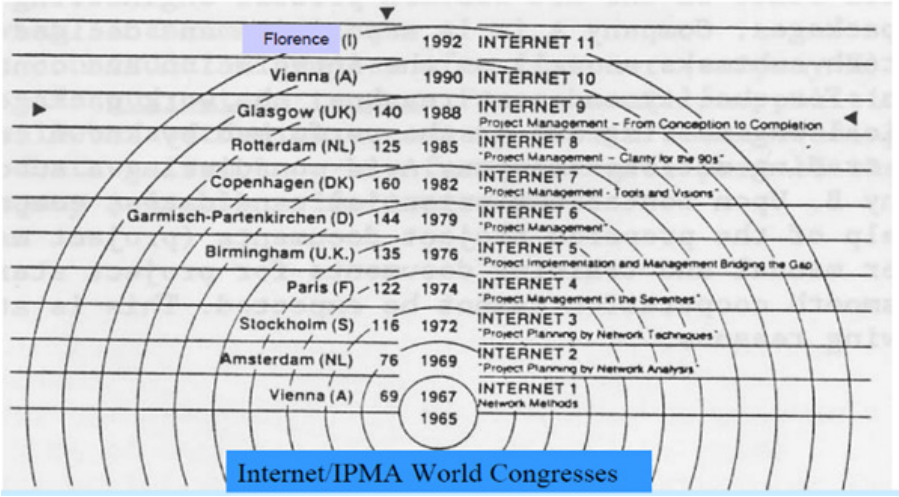
The Associations:

The Project Management Institute (PMI), the International Project Management Association (IPMA) and its constituent national associations such as the Association for Project Management (APM) in the UK and the Australian Institute of Project Management (AIPM) together with independent national associations such as the Engineering Advancement Association of Japan (ENAA) are the current flag bearers for the profession of modern project management. This section will briefly describe the start of three of these associations.

INTERNET / IPMA

IPMA (International Project Management Association) is the third name for this most international of associations. The first name was IMSA (International Management Systems Association).

In 1964, a European aircraft project manager, Pierre Koch of France, invited Dick Vullinghs from The Netherlands and Roland Gutsch from Germany to discuss the benefits of the Critical Path Method (CPM) as a management approach. This group was chaired by Yves Eugene from AFIRO (Association Française d´Informatique et de Recherche Opérationnelle).



1965 This group of people founded the IMSA, independent from companies and officially located in Switzerland, the most respected and politically neutral country in Western Europe.

1967 The Czechoslovak Project Management Science Group invited to join the first "all-state" conference on the "Methods of Network Analysis" in Prague. PhD Vladimira Machova was the host. Then, with the sponsorship of the International Computer Centre in Rome, managed by Professor Claude Berge, the first International World Congress took place in Vienna in 1967.

Professor Arnold Kaufmann had earlier suggested an INTERnational NETwork-INTERNET – after the Vienna congress INTERNET became the official association name.

Recollections of early conferences and publications suggest that in the early years INTERNET's focus was almost exclusively on project controls and 'scheduling'. What is now the Association for Project Management (APM) started out as the UK branch of INTERNET. Dr Martin Barnes (APM member #10) recalls: "I went to the INTERNET congress in Stockholm [1972] and can confirm at that time and at that congress everybody was talking about network analysis, nothing else, and the phrase 'project management' was just not in use. Very soon after the Stockholm congress we set up INTERNET (UK)[35]. For some years it concerned itself with little other than network analysis.[xix]"

The 6th INTERNET Congress held 1979 in Garmisch-Partenkirchen (Germany) was where the concept of PM as comprehensive discipline started and the international discussion started to shift from planning techniques to the concept of overall and holistic PM. Four streams were included:
- General concepts of project management, project selection;
- Implementation of project management techniques (Scheduling, resourcing, cost control),
- Project performance measurement techniques. Project information Systems;
- Organizational concepts of project management, analysis of completed projects, special problems of project management.

The conference was designed and organized by Roland Gutsch together with Prof. Dr. Heinz Schelle and Prof. Dr. Hasso Reschke. In the course of the conference the German Project Management Association GPM was founded which is now one of the largest in Europe.

By the 10th meeting in Vienna in 1990 this expansion of focus had really kicked in with the agenda formally including the expanded concept of 'project management' as a holistic, integrated process. This expanded format also had the effect of dramatically increasing attendance at the congress with a flow-on to increased interest in the member associations.

The emergence of a totally different 'internet' and this shifting focus prompted the name changes to IPMA (International Project Management Association) and APM (Association for Project Management) respectively. IPMA is now primarily an umbrella organisation for some 40+ national associations from around the world, APM is the UK member of IPMA and AIPM is the Australian member.

PMI

PMI was founded in October 1969 at the Georgia Institute of Technology as a non-profit organisation[36]. Of the ten people involved in the organising group, a significant majority

[35] The UK branch of INTERNET (now the APM), was originated by the 'pioneering seven' whose meeting at an INTERNET (later IPMA) expert seminar in Zurich in 1971 inspired them to start a UK branch, which held its first meeting in London in May 1972. The first executive meeting on INTERNET(UK) was held in the lobby of the Sheraton Hotel, Stockholm on the 13th May 1972 during the 3rd annual world congress of INTERNET. Jack Grimshaw was the original chairman, others in the founding group included Dr Jim Gordon and Dennis Gower. Annual membership fees were set at £1, and within a month membership had reached 78 (PMI at the time were charging £7).

[36] Discussions started in 1964 between Jim Snyder and Gordon Davies that eventually lead to the formation of PMI. These informal conversations led to meetings at the 'Three Threes' restaurant, Smedley St., Pennsylvania in Dec. 1967 and at the Roosevelt Hotel, New Orleans in February 1968 in which the first congress and structure of PMI were determined. PMI was formed during its first Seminar held on the 9th & 10th October 1969.

including Jim Snyder, J. Gordon Davies and Eric Jenett were 'schedulers'. Whilst the PMI founding group and the early PMI Board took pains to avoid limiting the PMI concept to the CPM and to the construction industry[37], at the second PMI congress in 1970 more than half the papers were CPM schedule oriented[xx]. In addition to the people mentioned above, Russ Archibald (PMI member #6) published one of the early books on scheduling and he, together with Stu Ockman, former President of the PMI College of Scheduling were at the first PMI congress in 1969[xxi].

Hugh Woodward, former editor of PMForum recalls: "My understanding is that PMI formed around a common interest in scheduling. In fact there was some thought the organisation would be called the project scheduling association[xxii]." PMI has grown into a multi-national member-based organisation with more than half million members and Chapters in virtually every major country around the world. PMI's first credential the PMP (Project Management Professional) was launched in 1984 supported by a 'body of knowledge' - today the PMP has over 1,000,000 credential holders and the *PMBOK® Guide* is one of the world's standard texts on project management[38].

Project Management Forum / AIPM[39]

The Australian Institute of Project Management was founded as the Project Management Forum in 1976, holding its first public meeting in Sydney on the 9th November that year[40]. This association was probably the first to formally focus on 'project management' from the beginning (rather than CPM), although again, the majority of the 19 people who started the 'forum' were project schedulers and cost engineers[xxiii]. The change in focus can be attributed to the later date this association was formed, and the shift in knowledge and thinking that was occurring around the world from 'pure CPM' to the wider view of 'project management'[41].

Conclusions

Based on the research outlined in this paper, it is entirely reasonable to argue that the evolution of modern project management is a direct consequence of the need of professional schedulers for a forum to discuss and develop their new discipline, combined with the need to make effective use of the data generated by schedulers in an attempt to identify, manage and control their 'critical paths' (not to mention the expectations a schedule generates in the minds of senior managers).

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37 From an interview with Russ Archibald, PMI Founder: *Initially, the discussion was primarily focused on PERT, CPM, and related planning and scheduling methods and systems. In fact the January 29 1968 letter from Ned Engman … says "we are discussing forming a National CPM Society." At our later meetings in New Orleans we had long discussions on the scope and name of the association and gradually the group moved toward a consensus that we should be targeting the broader subject of project management.* Published in PM World Today – October 2008 (Vol X, Issue X)

38 For more on the development of the PMP credential and the associated 'body of knowledge' see: https://mosaicprojects.wordpress.com/2014/10/31/the-pmp-examination-is-30-years-old/

39 Note: AIPM joined the IPMA as the Australian national association in 2010

40 For a brief history of the AIPM see: https://www.aipm.com.au/resources/history-of-pm-in-australia

41 The AIPM and IPMA have tended to focus on project management competency rather then 'knowledge' - the AIPM published its first 'National Competency Standard for Project Management in 1996.

These needs and requirements led directly to the formation of the early associations that evolved into today's 'project management associations', and then to the development of a defined and documented 'project management body of knowledge' by these associations.

After the body of knowledge was formulated, it became possible for the associations to define project management competencies, formally examine project management knowledge and start the process of creating a true profession of project management.

Project management has evolved in its specialist area along very similar lines to general management theory. In the early days, project management closely mirrored the 'classical school' of management with a focus on 'scientific' processes (scope, time and cost). More recently the emphasis has shifted towards the 'soft skills' more closely aligned with the 'human relations' and 'human resources' schools of management theory including more focus on stakeholders, communications and leadership. One wonders if the next phase will mirror the chaos theory (or have we already arrived?).

Finally, I believe this paper has identified the reason for the 'sudden' development of 'CMP' like tools at the CEGB in the UK, the Polaris SPO and du Pont in the period 1956 to 1961. These developments can be directly linked to their roots in Operations Research (OR) and the development of computers. In particular books and conferences focusing on OR would have provided the conduit for the spread of the ideas underpinning CPM.

Therefore, in conclusion I believe this paper has clearly demonstrated that the spread of CPM and the arrival of professional schedulers was the genesis of 'modern project management', and the 50th anniversary of its beginning was the 7th May 2007; 50 years to the day after du Pont committed funds to the project to develop its CPM software and methodology.

Concluding Comments

One major drawback in the origins of project management outlined in this paper was the focus on tools and systems that lasted from the 1960s through into the 1990s. Only in the 21st century has the people side of project management started to move into prominence despite the fact it is people who create, design manage and execute the project for another group of people, the 'customers'. This emphasis on people does not change the need for project management tools such as schedules, rather changes the focus of their use from a 'command and control' approach to a collaborative, consensus-leadership role[1]. The definition of 'success' also requires expanding beyond the 'iron triangle' of time cost and output to include stakeholder satisfaction[2]. The third paper in this series, *Trends in Modern Project Management, Past, Present & Future*[3] considers these issues and the future direction of our profession.

The other 'missing link' that has now been addressed is the strategic issues associated with program and portfolio management[4]. The publication of standards for Portfolio and Program management by PMI and work by others in the UK has started to effectively position projects and project management within the overall spectrum of corporate governance.

Concluding Comments references

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[3] For more on this see**: *Trends in Modern Project Management, Past, Present & Future*** - https://mosaicprojects.com.au/PDF_Papers/P061_Trends_in_Modern_PM.pdf

[4] For more on this see: ***Understanding Programs and Projects - Oh, there's a difference*** - https://mosaicprojects.com.au/PDF_Papers/P078_Programs_Projects_Full_Paper.pdf

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[xxii] Woodward H. Email dated 26/11/2005*.

[xxiii] Hovey B. Email dated 27/4/2006 (AIPM historian). Doyle B. Interview 15/1/2007 (PMF Founding Secretary).

* An email based discussion including, among others, Russell Archibald, Eric Jenett, Stuart Ockman, James (Jim) O'Brien, Hugh Woodward, Jon Wickwire, J. Gordon Davies and Fran M Webster, ran through November 2005. The quotes included in this paper were part of this discussion. There were no dissenting comments from any of the group regarding the formation of PMI primarily by 'schedulers'.

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