The Evolution of Project Management

This paper is an attempt to classify the various phases in the development of the practice of project management based on the way the project manager was appointed and the control tools used to manage the project[1]. However, almost every author of project management history has a different view of the major change points[2], and unfortunately there is little agreement.

As a starting point, we have adopted Prof. Peter Morris' distinction between the management of projects and project management[3]. People have been managing projects for millennia, whereas project management only started to emerge as a discipline in the 1940s, evolving into modern project management in the 1960s. Furthermore, it is only during this last *project management* phase, the tools applied to project management started to have an impact on the way projects were managed.

Another difficulty dealing with the earlier phase of *managing projects* is that the degree of sophistication applied to the management occurred in two major waves, the period from the earliest times through to the collapse of the Roman Empire and then the post Roman period. Both the Greeks and the Romans had skilled engineers and architects and a contracting industry capable of delivering sophisticated projects. The construction of the Long Walls in Athens between 461 and 457 BCE was managed by the architect *Callicrates*, who let the works to ten separate contractors. Similarly, the Colosseum was built in the first century CE by four contractors. This level of sophistication disappeared for more than 1000 years after the end of the Roman Empire only reappearing in the late Middle Ages and Renaissance.

Therefore, our take on the major phases of development of project management is driven by fundamental changes in the way the person, or people, responsible for managing the project were appointed with these phases being subdivided when the tools used to support the management of the project changed[4]. We have not been able to define date boundaries for many of the phases discussed below, there is massive overlap between each of the phases and different civilizations and countries advanced at different rates.

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1 To see the phases discussed in this paper in a comprehensive historical timeline covering the last 1000 years download ***Project Management - A Historical Timeline***: https://mosaicprojects.com.au/PDF_Papers/P212_Historical_Timeline.pdf

2 The resource primarily used in compiling this paper are documented at: https://mosaicprojects.com.au/PMKI-ZSY-035.php#Overview

3 Morris, P. W. G. *The Management of Projects.* Thomas Telford, London 1994.

4 **Note:** It Is important to distinguish between the people, tools, and processes used to direct and control the work of the project (the focus of this paper) and the technology used to construct the project's deliverables. The basic processes used to build structures has not changed significantly in the last 4000 years, neither have many of the basic materials used in the construction process. However, the way projects are commissioned, organized and managed does appear to have evolved significantly over time and the phases described in this paper are an attempt to categorize these changes.

The phases of project management

Based on the approach outlined above, the major phases in the development of project management seem to be:

1. **BCE[5] Collective**. This phase saw the building of the first significant structures such as Göbekli Tepe (founded around 9500 BCE) and Stonehenge (founded around 3000 BCE) as well as the building of the earliest permanent settlements. The work to build these monuments extended over hundreds of years and would seem to have been undertaken voluntarily by groups of people working together, probably as a religious activity. There must have been some leadership and coordination but how this was implemented is unclear, the most likely approach was some form of group decision making.

   During this phase, the first permanent settlements were also constructed and specialist building contractors emerged. The *Code of Hammurabi*, a Babylonian legal text composed c. 1755–1750 BC sets out six laws relating to building works including *"If a builder constructs a house for a man but does not make it conform to specifications so that a wall then buckles, that builder shall make that wall sound using his own silver."* Which suggests there were an established group of people who were identified as builders and earned their living building structures for others.

***1** Hemiunu statue at the Roemer and Pelizaeus Museum, Germany*

2. **BCE Anointed**. In the early Bronze Age, the increasing power of emperors, kings, pharaohs, and priests (collectively *rulers*), over populations, changed the way larger projects were commissioned and managed. The *ruler* would decide on the need for a new structure (palace, fort, temple, etc.), arrange the works, and fund the project. The *ruler* typically took a direct interest in how their money was being spent but also typically employed skilled overseers, scribes and artists to undertake the work. Some of these artisans were clearly highly skilled and capable managers.

   Two Egyptian architects are known to history, Imhotep (2667 BCE – 2600 BCE) a brilliant architect, mathematician, physician, astrologer, poet, priest, and Chief Minister to Pharaoh Djoser, and Hemiunu (c. 2570 BCE) a high-ranking official who lived during the reign of Pharaoh Khufu. Hemiunu served as vizier and royal seal bearer to Khufu and one of his many titles was *Overseer of All Construction Projects of the King*, which means among many other projects, he was probably responsible for building the Great Pyramid at Giza.

   The authority of the overseers came directly from the *anointed* ruler they served. Depending on the

[5] **BCE** = Before the Current Era (extended in this paper to include the Roman period through to approximately 400 CE).

civilization, their workforces varied from slaves, through conscripted labourers to paid artisans and contractors.

3. **BCE Contractors**. This phase is a subset of the *BCE Anointed* phase to recognize the emergence of substantial contracting organizations in the Greek and Roman world. The oversight of a project was typically directly tied back to the emperor, or ruler, through appointed officials (usually unpaid), or a patron, but the work was undertaken by a contractor working to a written contract that defined the scope, quality, time and costs for the work. The technical capabilities of the organizations that built the Colosseum and many other Roman structures would not be recreated for over 1000 years. This phase in the development of the management of projects came to an end with the collapse of the Western Empire in the 5th century CE[6].

4. **Anointed.** Following the collapse of the Roman Empire, the way projects were undertaken reverted to the 'anointed' mode. Kings or Bishops would decide on the need for a new castle, cathedral or other facility and either oversee the work directly, or appoint a trusted noble, or artisan, to manage the endeavour on their behalf. This approach continued into the 17th century. As in the 'BCE Anointed' classification, many of the people *anointed* by the ruler to undertake projects were either exceptionally skilled, or employed skilled people. Some examples[7] include:

   William I (William the Conqueror) appointed Bishop Walkelin as Bishop of Winchester in 1070, and Walkelin sponsored the construction of Winchester Cathedral. The actual building work started in 1079, led by Hugh of Chilcomb, a mason hired by the Bishop (he was allocated 2 ploughlands). It seems likely that other English Norman cathedrals were built using the same management approach, and that the habit of attributing the building of cathedrals to Bishops has caused this to be forgotten.

   A couple of hundred years later, Edward I *anointed* Master James of St George[8] to design and build six castles in newly conquered North Wales between 1283 and 1330. The castles formed a defensive system to subdue the Welsh, and their construction overlapped in time, so this commission could be described as a programme and James of St George would have had a project manager at each site. The quality of the design and construction clearly indicates the skills of the people involved in the work.

[6] **Note**: The collapse of the Western Empire did not entirely close of this phase. The Eastern Roman Empire morphed into the Byzantian Empire that continued through to the fall of Constantinople in 1453, this empire continued many Roman traditions, and also passed across much of their knowledge to the Arab Califate that occupied parts of Spain for many centuries which in turn transferred knowledge of the Greeks and Roman civilizations back into Europe. Both the Byzantian Empire and the Arab Califate built many imposing structures and monuments.

[7] A number of the examples below have been provided by Martin Hopkinson, who's input is appreciated.

[8] Master James of St George was a skilled architect from the County of Savoy, a Dukedom in the modern French, Italian, Swiss borderlands. Edward I spent time in the Dukedom on his way back for the crusades in 1272 and may have met Master James, or was at least aware of his work.

Another example is the construction of the first dry dock at Portsmouth, England, this project was managed, designed, and built by architect Sir Reginald Bray a trusted councillor of King Henry VII[9]. Work began on 14th July 1495 and was completed by 17th April 1496.

This same general approach to project development was adopted by wealthy private individuals. For example, the initial phase of the construction of Hampton Court Palace was directed and funded by Cardinal Thomas Wolsey as his personal residence with works starting in 1514 and completing in 1529. Before completion, ownership of the palace had been transferred to Henry VIII.

Certain overseers are mentioned in the project's accounts such as James Bettes, *master of the works* and Mr. Henry Williams, *surveyor of the works*. Bettes role involved a degree of management responsibility and Williams probably more nearly fulfilling the duties of a modern architect. However, how much authority was delegated, and how much was retained by Cardinal Wolsey is far from clear; Wolsey seems to have been a very 'hands-on' project developer.

The construction of Hampton Court made extensive use of specialist contractors, for example all of the bricks used were manufactured on site which suggests by the 16th century contractors were starting to reappear capable of undertaking significant volumes of work.

5. **Appointed Professionals.** The introduction of accounting practices in the 1430s and the professionalization of engineering, architectural, and master builder roles led to a shift in the way public and private works were managed. The first change was in the organization funding the project and appointing the manager, while a *ruler* may still be in the background, the responsibility for the project increasingly became the responsibility of a government, corporation, or company that funded the project and employed the manager. The employer, would normally create a committee and increasingly, a qualified professional was selected and appointed to undertake a project based on either reputation or a competitive process.

   Some examples include the construction of the world-famous dome of the Cathedral of Florence. At 45.5 meters in diameter and a total height of more than 116 meters, the dome is the largest masonry vault in the world. It was built between 1420 and 1436 by Filippo Brunelleschi, following the delayed acceptance of his proposal, originally presented in 1418 in response to a competition launched by the *Signoria*[10] to complete the cathedral. Work on the cathedral had started some 150 years earlier in 1296 but had ceased on the death of the original architect, no one knows how he intended to build the dome.

   The reconstruction of St Paul's Cathedral after the Great Fire of 1666 used a similar approach. Sir Christopher Wren was commissioned to rebuild the cathedral (and many other buildings) based on his standing and reputation. The rebuilding work did not start until 1673 after several redesigns.

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9 For more on the construction of the dry dock, see: https://mosaicprojects.com.au/Mag_Articles/AA018_The_first_Dry-Docks.pdf

10 The *Signoria of Florence* was the government of the medieval and Renaissance Republic of Florence, between 1250 and 1532.

The building contractor for the work on St. Pauls was the master builder Thomas Strong who worked together with Wren on the project for 35 years. In later years John James, who had been working for Wren on the building of Greenwich Hospital, was appointed senior site manager. However, while Wren personally supervised the building work, visiting the site every Saturday, he was not responsible for paying for the works. Wren received an annual salary of £200 from the government for his involvement through to completion in 1710.

This type of arrangement seems to have been the normal way of managing projects through to the 19th century. Most of the early canal and railway projects were built by engineers engaged by the Crown, a corporation, or commercial company for a fee. The engineer, designed, estimated, and managed the works including hiring the workers, but the principle paid the costs[11].

6. **Appointed Contractors.** The shift to a main contractor taking full responsibility for the works including delivering the agreed scope on time, for an agreed cost, seems to be an 19th century development. The Institution of Civil Engineers (ICE) was founded in 1818 and the (now) Chartered Institute of Building (CIOB) in 1834. Both were (and still are) member-based organizations, but several of their founding members owned substantial contracting organizations, some of which are still in business today[12].

   One early documented example of this approach was the construction of the Crystal Palace in London for the Great Exhibition which opened on 1st May 1851. Sketch plans were approved on the 11th June 1850 and with the 'design' approved, tenders were sought from industry. The proposal from Fox, Henderson and Co was accepted. Work started on the 15th July 1850, possession of site was granted on the 30th July, the first column was erected on the 26th September and the formal contract signed on the 31st October. The building, a glazed structure 1848 feet [563.3 meters] long, 408 ft [124.4 m] wide and 108 ft [32.9 m] high, with a roofed area of 772,784 sq.ft. [71,794m^2] was completed 8 ½ months later ready for the opening of The Great Exhibition on the 1st May 1851[13].

   The use of contractors to manage projects in shipbuilding, construction, engineering and other disciplines seems to be standard practice by the start of the 20th century, but no one called themselves project managers at this time.

7. **Paleo[14] Project Coordination and Leadership – 1920s to 1950s.** The modern concept of project management as a cross discipline function that required leading, coordinating, or managing the work of others started to emerge in the 1920s. Through to the end of WW2, these early project functions were primarily coordination roles, but by the 1950s, the concept of a project manager responsible for delivering a project was becoming more widespread[15].

   The 20th century was characterized by the rapid development of management and financial practices and controls. These developments were initially focused on factories and organizations,

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11 For more on the ***early canal and railway projects*** see the papers at: https://mosaicprojects.com.au/PMKI-ZSY-005.php#Process2

12 For more on the ***founding members of CIOB*** see: https://mosaicprojects.com.au/PDF-Gen/CIOB_Book.pdf

13 For more on the ***construction of the Crystal Palace*** see: https://mosaicprojects.com.au/PDF_Papers/P180-Project_Governance-Building_the_Crystal_Palace.pdf

14 Paleo is used in this context as meaning 'early' or 'primitive'.

15 For more on the ***development of management and then project management***, see the papers at: https://mosaicprojects.com.au/PMKI-ZSY-005.php#Overview

but increasingly transferred across to the management of projects.

From earliest times, through to the end of this period, the control tools used by the person managing the project showed static representations of cost and other project data. The sophistication of both the management data, and its representation in reports improved over the centuries, but the controls processes remained focused on reactive management actions to correct observed deviations from the plan:

- Cost controls improved with the introduction of financial accounting in the 15th century, cost accounting in the 16th century, and cost engineering in the 19th century[16].
- Time controls are less well documented, but bar charts seem to have been in use from the 19th century on[17].

The people managing projects (priests, builders, engineers, or other authority figures, including the early project managers) were undoubtedly interested in assessing the time and cost needed to complete their project but any determination of the projected completion time and/or cost was be a subjective assessment based on the information to date and the person's experience.

8. **Modern Project Management Phase 1 – Convergence (1960s to 2010s)**. The concept of project management as a single unified practice capable of successfully delivering most projects, most of the time, emerged in the 1960s and saw a rapid expansion of project management world-wide. The general concepts of project management were defined in a series of standards and guides that were remarkably consistent. Consequently, there appeared to be one correct way of running all types of projects successfully, which could be described in a series of processes or practices that only needed tailoring to meet the specific needs of each project. It was assumed project failure could be overcome by applying the defined processes more effectively.

   The two characteristic of project control tools in this period were initially the creation of dynamic scheduling systems, quickly followed by predictive systems. The tools used largely deterministic information to predict future outcomes.

   Dynamic tools. This phase of development started in the late 1950s with the creation of PERT and CPM schedules[18], these scheduling tools use a dynamic network to reschedule future work based on progress to date. Predictions can be enhanced by the use of 3-point estimates (as in PERT), or Monte Carlo analysis applied to a CPM schedule. Similar cost control system based in Excel, or more sophisticated tools, applied a similar approach to project cost engineering. While these dynamic tools provide an assessment of future outcomes, the underlaying assumption is future work will occur as planned unless the people running the controls system chose to make specific changes. This class of tool is still central to the practice of project management.

   Predictive tools. Largely in parallel to the development of the dynamic tools, a predictive tool in the form of Earned Value Performance Management (EVM)[19] was developed in the late 1960s[20].

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16 For more on the ***evolution of cost controls*** see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#Process1

17 For more on the ***evolution of schedule control tools*** see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#Overview

18 **Note**: CPM and PERT did not enter the general project management market until the early 1960s.

19 For more on the ***evolution of EVM*** see: https://mosaicprojects.com.au/PMKI-ZSY-020.php#EVM

20 **Note**: EVM did not enter the general project management market until the 1970s and remains a relatively niche tool.

EVM uses the performance to date to firstly assess the performance of the project management at the work package, control account, and overall project levels, and based on this performance, scale the cost of future work to develop an independent estimate at completion. In 2003, the ability to use EVM data to predict the project's completion date with a similar degree of accuracy to the cost forecasts was introduced by the development of Earned Schedule (ES). EVM and ES remain the premier predictive tools in the project controls arsenal.

This phase of development saw the creation of 'modern project management' as the pioneers of computer assisted project controls worked together to form the various project management institutes (including PMI in October 1969), and the institutes in turn defined and codified the practice of 'modern project management'. As a result, the people managing projects were increasingly identified as project managers, and project management is now expected to be proactive, working to minimize the negative effect of future problems identified using the dynamic and predictive tools, as well as dealing with any current negative variances.

9. **Modern Project Management Phase 2 – Divergence (2010s to the present time)**. The publication of the *Manifesto for Agile Software Development*[21] in 2001 started the trend towards divergence in the way projects are managed. By 2010 the International Standards Organization (ISO) recognized project management could not be defined by a set of processes and voted to shift towards defining the objectives of project management in future standards. This approach describes what project management is supposed to achieve, rather than defining a limited set of processes that should be used to manage a project. By 2020 this approach was embedded in the ISO standards for project management and had spread to many of the other significant guides. The current challenge for project management organizations is working out how to manage the increasing levels of entropy within the practice of project management. There are now multiple different approaches to the management of a project and different constructs on the role of the project manager, the way project teams operate, and even the objectives of the project management process, ranging from agile, through traditional, to complex project management[22].

   The concept of a project, run by a project manager, to create value for a client was assumed to be consistent by most people for most of this period. However, even this assumption now appears to be being challenged by the increasing projectization of businesses and organizations and the way project controls are being embedded in project (or product) delivery systems.

   Intelligent tools. The next generation of project controls is starting to emerge, these tools are predicted to be integrated, adaptive, and intelligent, with a focus on maximizing the efficient use of the project's resources. They will use machine learning, and be integrated into the systems used to design and develop the project's outputs rather than operating as standalone processes. One example is the emergence of 5D BIM in the construction/engineering industries[23]. A three-dimensional design is integrated with the schedule (4D) and cost information (5D) to provide a single system accessed and used by everyone involved in the design, construction, and future maintenance of a building or facility. Project control tools with embedded intelligence are also

[21] Read the ***Manifesto for Agile Software Development*** at: https://agilemanifesto.org/

[22] The various styles of project management that are emerging are discussed in ***The Entropy at the Heart of Project Management***: https://www.projectmanagement.com/blog-post/71935/the-entropy-at-the-heart-of-project-management

[23] For more on ***BIM (Building Information Modelling)*** see:

emerging. These developments are too new to have much impact on the nature of project management today, but by the end of the 2020s we are likely to see as much change in the way projects are managed as occurred in the 1960s.

Conclusion

The management of projects appears to have evolved from a non-specific function undertaken by people *anointed* or *appointed* to deliver a project with no formal training in project management through to a defined discipline in the first decade of the 21st century. From earliest times, through to the 1960s, the people managing projects were primarily seen as experts in the discipline related to the work, railway engineers, temple/cathedral builders, etc. In the decades each side of 2000, project management started to emerge as a coherent discipline, which could be considered an emerging profession.

However, developments in the last decade are at the least creating a number of project management professions built around different delivery paradigms including agile, traditional, and complexity approaches to managing projects. And maybe within the next decade or so the concept of projects being 'special' may disappear altogether with the various techniques simply being part of the processes used by general management in different industries.

It would appear we are living in *interesting times*.

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