

## A Brief History of Scheduling

The science of ‘scheduling’ as defined by Critical Path Analysis (CPA) celebrated its 50<sup>th</sup> Anniversary in 2007. In 1956/57 Kelly and Walker started developing the algorithms that became the ‘Activity-on-Arrow’ or ADM scheduling methodology for DuPont. The program they developed was trialled on plant shutdowns in 1957 and their first paper on critical path scheduling was published in March 1959. The PERT system was developed at around the same time but lagged CPM by 6 to 12 months (although the term ‘critical path’ was invented by the PERT team). Later the Precedence (PDM) methodology was developed by Dr. John Fondahl in 1961 as a ‘non-computer’ alternative to CPM and the Meta Potential Method (MPM) was developed independently in Europe. Arguably, the evolution of modern project management is a direct consequence of the need to make effective use of the data generated by the schedulers in an attempt to manage and control the critical path.

The evolution of CPM scheduling closely tracked the development of computers. The initial systems were complex mainframe behemoths, typically taking a new scheduler many months to learn to use. These systems migrated to the ‘mini computers’ of the 1970s and 80s but remained expensive, encouraging the widespread use of manual scheduling techniques, with only the larger (or more sophisticated) organisations being able to afford a central scheduling office and the supporting computer systems.

The advent of the ‘micro computer’ (ie, personal computer, or PC) in the late 1980s changed scheduling for ever. The evolution of PC based scheduling move project controls from an environment where a skilled cadre of schedulers operating expensive systems made sure the scheduling was ‘right’ (and the organisation ‘owned’ the data) to a situation where anyone could learn to drive a scheduling software package, schedules became ‘islands of data’ sitting on peoples’ desktops and the overall quality of scheduling plummeted.

Current trends back to ‘Enterprise’ systems supported by PMOs seem to be redressing the balance and offering the best of both worlds. From the technology perspective, information is managed centrally, but is easily available on anyone’s desktop via web enabled and networked systems. From the skills perspective PMOs are re-developing career paths for schedulers and supporting the development of scheduling standards within organisations.

### Pre 1956

The concept of ‘scheduling’ is not new; the pyramids are over 3000 years old, the granite beams needed to roof the burial chamber in the Great Pyramid required a workforce of several hundred, working for 10 years to hack them from their quarry by pounding the granite with a harder rock, dolomite. Teams were sent to the quarries in sufficient time to ensure the beams were available when needed on the construction site. Similar organisation can be seen on many other major projects since!

These activities could have been accomplished without some form of schedule; ie, the understanding of activities and sequencing. However, whilst the managers, priests and military leaders controlling the organisations responsible for accomplishing the ‘works’ must have an appreciation of ‘scheduling’ (or at least the successful ones would have) there is little evidence of formal processes.

Modern schedule control tools can trace their origins to 1765. The originator of the ‘bar chart’ appears to be Joseph Priestley (England, 1733-1804); his *‘Chart of Biography’* plotted some 2000 famous lifetimes on a time scaled chart “...a longer or a shorter space of time may be most commodiously and advantageously represented by a longer or a shorter line.”



*A Specimen of a Chart of Biography.*

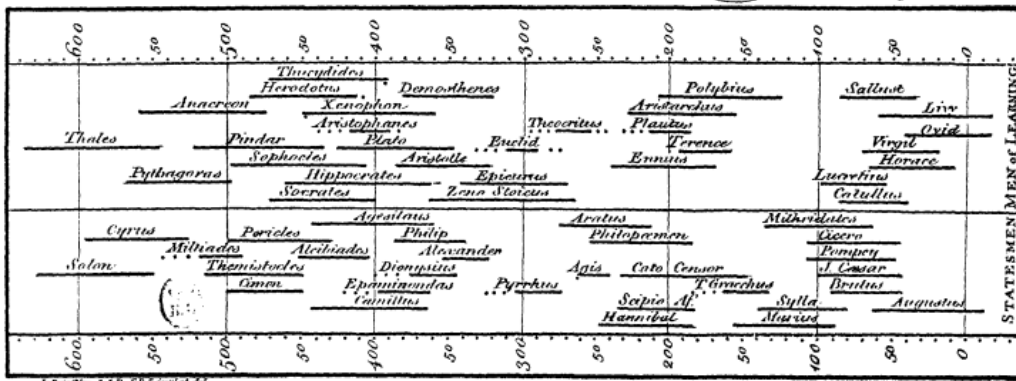


Figure 1 – Joseph Priestly: Chart of Biography

Priestley’s ideas were picked up by William Playfair (1759-1823) in his ‘*Commercial and Political Atlas*’ of 1786. Playfair is credited with developing a range of statistical charts including the line, bar (histogram), and pie charts. The *Atlas* contained 43 time-series plots and one histogram.

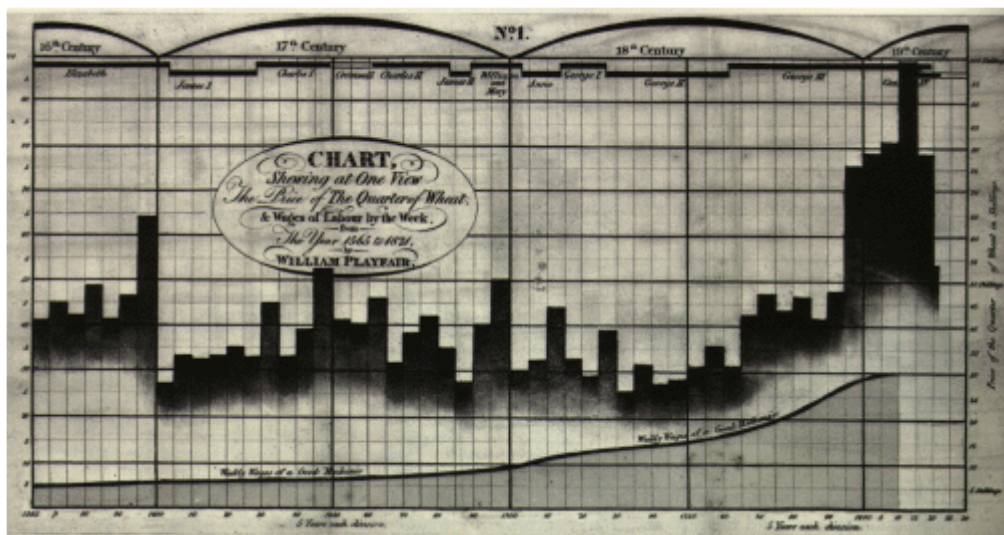


Figure 2 – One of Playfair’s Charts from the 1801 edition of his Atlas

Following on from Playfair; another European, Karol Adamiecki<sup>1</sup> - a Polish management researcher, developed the Harmonogram (or Harmonygraph) in 1896. The time-phasing and duration of the activities is shown by a vertical ‘sliding tab’ (essentially the same as a ‘bar’ in a barchart); of greater significance the Harmonygraph also tabulates each activities predecessors and successors (‘from’ and ‘to’) making it a distinct predecessor to the CPM and PERT systems developed some 60 years later.

By the early 1900s, sophisticated barcharts and resource histograms were in use in Europe<sup>1</sup>, and a few years later, Henry L. Gantt, popularised the Gantt Chart in the USA through his books<sup>2</sup>.

<sup>1</sup> Reports of a mountain railway project in 1911 show the level of sophistication in European charts (see pages 233 & 234 of the magazine for the diagrams): [http://www.mosaicprojects.com.au/PDF\\_Papers/P042\\_Barchart\\_Origins.pdf](http://www.mosaicprojects.com.au/PDF_Papers/P042_Barchart_Origins.pdf)

<sup>2</sup> For a retrospective on Gantt’s work and PDFs of his books see: [http://www.mosaicprojects.com.au/Resources\\_Papers\\_158.html](http://www.mosaicprojects.com.au/Resources_Papers_158.html)



Other techniques dating from the early part of the 20<sup>th</sup> century include Line of Balance (flow line) used on the Empire State Building (1930s) and Milestone charts which were in regular use by the 1950s.

The key problem with Milestones and barcharts is all of the dates and durations are based on heuristics (rules of thumb) and/or experience. It was possible to identify slippage but any assessment of the impact of a delay was based on a personal view of the data rather than analysis. As a consequence when schedule slippage became apparent on major contracts, the tendency was to flood the work with labour and 'buy time' frequently at a very high premium.

The key value contributed by CPM and PERT systems was the ability to model future outcomes based on progress to date and optimise the use of scarce resources.

## Conclusions

The evolution of scheduling has been a fascinating journey:

- Kelley and Walker set out to solve the time-cost conundrum and invented CPM. For most organisations the resolution of time-cost issues is still in the 'too hard' basket!
- The PERT project invented the name 'Critical Path', and everyone else borrowed it.
- Dr. John Fondahl invented a non-computer methodology for scheduling that is now used by every computer package world wide!
- Whilst Kelley and Walkers CPM system that was developed for computers is virtually extinct.

This brief summary has been taken from the full paper of the same name; downloadable from [http://www.mosaicprojects.com.au/Resources\\_Papers\\_042.html](http://www.mosaicprojects.com.au/Resources_Papers_042.html) - I'm regularly updating this paper as more interesting facts come to light.

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<sup>i</sup> Morris P.W.G. (1994) 'The Management of Projects' Thomas Telford Ltd, London. p7.