

A Short History of Modern Project Management ^{1, 2, 3, 4}

By Alan Stretton

When people talk about the history of project management, it is quite common for the Egyptian Pyramids (or the like) to be exemplified as early historical projects. But there is rather widespread agreement that what could be validly called modern project management had its genesis in the 1950s. In the ensuing years, many distinctive project management tools, techniques and concepts have been, and are being, developed - particularly as the areas of application of project-based management have been proliferating so widely. This short history of modern project management focuses on mainstream issues and developments in the past forty-odd years. It also attempts to identify emerging trends in concepts and practices in project management at the time of writing (1994). The majority of the reference materials are US-sourced, with some references to early Australian developments in which the author was personally involved.

1. The 1950s

1.1 Earlier 1950s: Bechtel (USA)

Bechtel (1989) records that

¹ *Editor's note: Second Editions are previously published papers that have continued relevance in today's project management world, or which were originally published in conference proceedings or in a language other than English. Original publication acknowledged; authors retain copyright. This paper was originally prepared for a Modern Project Management Course at the University of Technology, Sydney, Australia, by professor Alan Stretton in the early 1990s. The paper was also originally published by the Australian Institute of Project Management (AIPM) in instalments in the "Australian Project Manager", Part 1 in Vol 14, No 1, March 1994; Part 2 in Vol 14, No 2, July 1994; and Part 3 in Vol 14, No 3, October 1994. It was also republished in the October 2007 edition of PM World Today. It is republished again here with the author's permission.*

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³ Author's note 1 to 2007 version: Shortly after this paper was written (in late 1993), Peter Morris published a book entitled The Management of Projects (London, Telford, 1994) which included a very thoroughly researched and detailed history of modern project management. This book is likely to be regarded as the definitive work on project management history for many years, and to be an essential source for future historians. The book is an excellent "read", and is highly recommended, not only for its historical coverage, but also for Morris' very detailed analysis of the current situation and future prospects for project management.

⁴ Author's note 2 to this version: There have been several good histories of project management written since my 2007 "Short History" reprint – particularly another book by Peter Morris in 2013 on "Reconstructing Project Management." So I had some doubts about the value of another reprint of my history, which was originally published in 1994. But two prominent reviewers believe that it still has some historic value, partly because it includes some early Australian initiatives, together with a personalised perspective of developments in which I was personally involved, and/or unearthed in early explorations.

Bechtel first used the term Project Manager in our international work beginning in the 1950's. This use didn't entail a Project Manager operating in a matrix organization as we know it today, but rather the assignment of a great deal of responsibility to an individual operating in a remote, strange and often hostile environment, usually with a self-contained autonomous team.

He also records that the 1951-53 Transmountain Oil Pipeline in Canada was the first project in which Bechtel, as an organization, actually functioned as the project manager - although, as he hastens to explain, they didn't call it project management then. But "the approach and organization was a forerunner of what was to come".

Bechtel discusses the problems in getting the company's divisions to shift to a project management approach in the early 1961s as follows:

They [the divisions] were accustomed to having the Project Engineer be the Project Manager in the early stages of a job and the Constuction Manager or Site Superintendent on the latter phase of the work. The change to recognizing the Project Manager role and having someone in that position full-time through the life of the job has not always been an easy one.

There is one particular theme which emerges from the above, and that is the concept, and the initiation of the practice, of the individual Project Manager (or the project organisation as the Project Manager) having total responsibility throughout the entire project, from inception to completion - i.e. "undivided responsibility" for the prosecution of the total project.

1.2 Mid-1950s: Civil & Civic (Australia)

Civil & Civic (C&C), which later became a recognised leader in project management in the Australian building industry, was formed as a construction company in 1951, and broadened into design-and-construct (1953) and property developer (1954). It came into project management in a somewhat similar way to Bechtel. At that time in Australia there were no established concepts or practice of managing the design process, or value analysis, design efficiency/effectiveness, or the like. As recorded from a later seminar (Civil & Civic, 1976),

Consultants, particularly architects, enjoyed a powerful almost God-like position. Teamwork and performance to time/cost criteria were virtually ignored.

In 1954-55, C&C first project managed the design of a major subdivision project which the company itself was developing. It is recorded that,

By persistent analysis and investigation of design aspects, a 40% reduction was achieved in site costs [based on consultants' designs and projected capital expenditure] and the project converted from a marginal investment to a successful venture" (Civil & Civic, 1969).

From that point, C&C appointed its own "project engineers" to manage the design phases of all its own development projects.

It was a natural extension of the above for C&C to then market itself as a Project Manager to external clients, taking full responsibility for the execution of all phases of projects, from inception

to completion. This move was initiated in 1958, but really substantial market penetration was not achieved until towards the mid-60s, after which time the demand for what they then described as "project management services" had put the organization at the "cutting edge" of innovation and performance in the industry. This seemed to reflect a circumstance which was nicely described by Cleland (1991) - admittedly at another time, and in another context, thus - "Project management is clearly an idea whose time has come".

In the Australian building industry in particular, the time was indeed ripe for the introduction of project management approaches. This should have been seen by consultants, and particularly architects, as an opportunity to enhance their skills and provide additional value-adding services to potential customers. The architects resisted the introduction of project management approaches with considerable energy - and lost. Consulting engineers and management consultants were slow to perceive and act on the opportunity, but towards the end of the 1970s they had become actively involved in project management in Australia.

1.3 Later 1950s: Network Analysis and Planning Techniques

As is probably too well known to need much elaboration in this brief history of modern project management, the two pioneering techniques for project planning and monitoring, commonly called the Critical Path Method (CPM), and Project Evaluation Review Technique (PERT), were developed in the USA, but quite independently, in the late 1950s. As the developers of CPM, Kelley and Walker, observe (Kelley & Walker, 1989)

The fact that PERT was developed independently of CPM, shows not only that the time was ripe for CPM, but given the opportunity, any number of different people might have invented it.

In fact, there were three overlapping but independent development efforts going on at the time. In order of initiation, they were:

1.4 CPM (Critical Path Method) [Arrow Diagramming; "Activity-on-Branch" Networks]

What came to be known as CPM (this name was adopted for marketing purposes around May, 1959) was developed in a period of 27 months, from December, 1956, through February, 1959, in the Integrated Engineering Control Group (a "think tank" group) at E I du Pont de Nemours, at Newark, Delaware, in conjunction with a group at Remington Rand Univac headed by John Mauchly. This effort specifically addressed du Pont's "construction scheduling problem" in their very large engineering business (over \$90m in 1956 dollars). As Kelley & Walker expressed it

The CPM development was capped with the results of applying it to turnarounds at du Pont's Louisville plant...by cutting average turnaround downtime by some 25% through CPM, production to sales was increased enough in the first year to more than underwrite the CPM development.

The CPM network focuses on activities, which are represented by "arrows". This configuration came about as a direct consequence of the initial development of a parametric linear programming model to tackle du Pont's construction scheduling problem.

CPM was first mentioned publicly in March 1959, in an article in Business Week (Astrachan, 1959); but official presentations by the developers did not take place until the final two months of 1959. In early 1959, Kelley and Walker left du Pont, and joined John Mauchly to form Mauchly Associates. Their first public presentations of CPM were in a 5-day workshop in Philadelphia on 16-20 November, and a paper to the 1959 Eastern Joint Computer Conference in Boston, on 1-3 December.

1.5 PERT (Project Evaluation Review Technique)

According to Fazar (1962), formal work on PERT began on 6 February 1958. As Archibald (1987) records it:

....the US Navy Special Projects Office, under Admiral Red Raborn, working with the consulting firm of Booz, Allen and Hamilton ... developed the basic concepts of PERT. The objective was to create a management method for handling the hundreds of contractors who would be designing, constructing and testing the POLARIS submarine and missile systems..... The Navy laid the PERT requirements on the POLARIS contractors early in 1959.

In the PERT network, the emphasis was put on project events or milestones instead of the project activities - ie by defining certain key progress points to be used for overall management control. The other distinctive characteristic of PERT was the use of probabilistic duration estimates.

PERT was developed rather more rapidly than CPM, although it is not clear from the author's (admittedly non-exhaustive) literature search, exactly when it was fully implemented. But it is assumed from Archibald's record above that it was indeed in early 1959.

1.6 PDM (Precedence Diagramming Method) ["Activity-on-Node" Networks]

The networking method which later came to be called PDM was initiated on 1 July, 1958, with the award of a research contract by the US Bureau of Yards and Docks to Stanford University's Civil Engineering Department, essentially tackling the same type of "time-cost trade-off" problem as du Pont and the US Navy were already involved in. However, Stanford University's John Fondahl, who led their effort, did not become aware of these other efforts until mid-1959, by which time his "circle and connecting line" model (later called "activity-on-node" networks, which describes their configuration) had been developed to a point where he assessed that it was simpler than the other models (Fondahl, 1987).

The report "A Non-Computer Approach to the Critical Path Method for the Construction Industry" (Fondahl, 1961) was published in November 1961. In the proposed time-cost procedure he featured the use of "Precedence" matrices and utilised the concept of "Lag" values. Fondahl's method came to be termed "precedence diagramming" from around 1964.

This is a very short survey of the early development of CPM/PERT/PDM. This latter terminology is clumsy, and in the following the author follows the reasonably established practice of using the generic expressions "network planning", "network analysis", and other expressions including the word "network", to collectively embrace these techniques.

1.7 Summary of Developments in Project Management in the 1950s

- *There emerged a perceived need to appoint a Project Manager (whether an individual or an organisation) to take full and undivided responsibility for achieving the project objectives.*
- *The primary technical development in project management in this period was in network techniques, which were initially concerned with planning and control of project times - ie with project time management.*

2. The 1960s

2.1 PERT, PERT/COST and C/SCSC

Kelley & Walker (1989) assert that

....there's a good chance CPM and PERT would have been relegated to oblivion had it not been for the Polaris Missile Program, and John W Mauchly's insistence on bringing CPM to the commercial marketplace.

And, elsewhere in the same paper they say that

The promotion of PERT by the Navy and its imposition on Polaris contractors was the principal cause of a phenomenal short-term growth in the use of network methods.

However, there were problems with PERT. With regard to the effectiveness of PERT, Archibald (1987) records his assessment as follows:

....grand claims were made that PERT enabled the Navy to complete the program some years earlier than it would have otherwise. I don't believe that these claims are entirely true, based on my experience. PERT probably did some good as far as planning and scheduling is concerned.... but both the Navy and Lockheed, as the missile systems integrator, failed to recognize the area of greatest payoff: integrating the schedules of the many contractors.

Snyder (1987) records that

In June 1962, Mitre Corporation published the DOD/NASA PERT/COST GUIDE which included a directive by Secretary McNamara for each of the services to test this new concept. Representatives of defense contractors across the country met and formed the PERT/COST Coordinating Council.

Archibald (1987) observes that

In the mid-1960's there was such a negative reaction by defense contractors to the "onerous" requirements of PERT/Cost that the whole concept of network planning and critical path scheduling was almost killed off, at least in the defense industry. There were admittedly a lot of problems with the PERT/Cost approach as it was laid on by DOD and NASA, including

inflexibility and overzealousness. The development of the Cost/Scheduling Control System Criteria [C/SCSC] approach by the government followed this setback, and over the years this has been made to stick and has produced good results.

Thus, from around the mid-60s, C/SCSC began to take over from PERT and PERT/Cost as the primary project control tool in both DOD and NASA.

2.2 Developments with CPM and PDM

Mauchly's push into the commercial market was ultimately very successful, particularly in the construction industry. As Archibald (1987) observed:

The construction industry (at least the industry leaders) kept on using network planning since the beginning and did not seem to go through quite the same setbacks as in aerospace.

Fondahl (1987) recalls that

Due to the active efforts of the early consulting firms in the field and the contract specifications by government agencies for its use, arrow diagramming, at an early date, became the "standard" method in the U.S.....the arrow diagram had been considered a necessity for computer methods, and alternative methods as suitable for manual applications only. With the introduction of computer programs based on precedence diagramming this began to change.....*Engineering News-Record* published an article in their May 6, 1965 edition entitled "Contractors Shift from Arrow Diagramming to Precedence Diagramming for CPM".

2.3 Extensions to PERT/CPM/PDM

The earliest extension to CPM was resource leveling, which Kelley & Walker describe as

perhaps the key unsolved technical problem when we started up Mauchly Associates.

They developed RPSM (Resources Planning and Scheduling Method), while CEIR developed RAMPS (Resource Allocation and Multi Project Scheduling). All such programs developed to that time were computer-based, and of rather limited utility.

Integration of cost control into network scheduling was also proceeding for all three network types. The fate of PERT/Cost in DOD and NASA was briefly mentioned above. Fondahl developed a time-cost trade-off method for his PDM approach. IBM developed the 1401 LESS program (Least Cost Estimating and Scheduling).

As Snyder (1987) records it,

By the mid to late 60's cost control, resource scheduling, the identification of 'problems' and the merger of PERT/CPM into 'project management' were well under way.

2.4 Developments within Civil & Civic

To the best of the author's knowledge, Civil & Civic pioneered the use of network techniques in Australia. Its first CPM program was developed in April, 1962, to support a large tender which the company was submitting. This was initiated by a new employee (Eric Watson) who had been working with Bechtel, and was familiar with arrow diagrams. CPM had featured substantially in the technical literature from the USA and had attracted a good deal of interest from C&C's engineers - but this literature had insufficient detail to allow one to immediately start developing networks. Watson showed several key people, including the author, how to develop CPM networks, and, because the author had the organisational authority to "push" their use on construction projects, CPM networks began to be developed for an increasing number of the company's building construction projects.

By October 1962, a copy of Fondahl's pioneering 1961 report on his non-computer approach had been obtained. This was in more than sufficient detail to allow one to develop precedence networks, and the planners in C&C's design department immediately began to use it. They had to plan and monitor a large number of projects in a rather dynamic environment and found precedence networks much better suited to this situation than arrow diagrams.

Arrow diagrams continued to be used on several C&C construction projects into 1963. The majority of the time calculations were done manually, although some use was made of a GE225 CPM computer program. But arrow diagrams were not particularly "user friendly", and the majority of the construction site managers did not find it easy to embrace "ownership" of CPM as a primary planning tool. Additionally, in complex semi-repetitive situations, logic errors brought about by the "double dummy" problem (which is a particularly difficult problem for people who are inexperienced in CPM to identify, let alone solve) convinced the author that it was unrealistic to have construction site managers voluntarily include CPM arrow diagrams in their "kit of tools".

At this stage the author revisited Fondahl's PDM approach, and C&C's design department experience with it. He was readily persuaded that PDM should be tried on construction projects and initiated the first of these in July 1963. The rest is history. The construction site managers took to this approach like ducks to water, and PDM had become the norm, and officially established as such, well before the end of 1963.

In the late 60s (and beyond) in Australia we had similar problems to those recorded by Fondahl. There was a concerted push by many government agencies and authorities to have contractors in the building and construction industry produce and upgrade computer-processed arrow diagrams on government funded contracts. In the longer term, events overran the arrow diagrams, and PDM became a virtual standard in Australia.

2.5 The Formation of Professional Project Management Bodies

The two major professional project management bodies, one European, and the other North American were established in the 1960s - which indicates the extent of the development of project management through the 1960s, primarily thanks to PERT, CPM and PDM.

- **IPMA (International Project Management Association - formerly INTERNET)**

INTERNET was formed in 1965, originally as a forum for European network planning practitioners to exchange knowledge and experience. It is now essentially an "umbrella" organisation, covering 15 (mainly European) national project management associations. There are currently some 8500 individual members in the INTERNET group.

- **PMI (Project Management Institute)**

North America's PMI was formed in 1969, and currently has some 8000 individual members, but mainly from the USA and Canada. PMI has some 50 chapters, including one in South Africa.

2.6 Summary of Developments in Project Management in the 1960s

- *Project cost management (and its associated project resource scheduling), was added to project time management as a distinctive project management technique, and integration of the two was proceeding*
- *The net effect of a decade of focus on network techniques was that project management was closely identified with, and for some was synonymous with, the use of network techniques for project planning, scheduling and controlling*
- *Project management was still primarily identified with the construction, defence and aerospace industries*
- *Professional project management bodies were formed independently in Europe and North America*

3. The 1970s

The 1970s saw an unprecedented expansion in project management application areas, and in the development of project management as a distinctive discipline in its own right.

3.1 A Proliferation of Project Management Application Areas

In relation to expansion of project management application areas, by 1979, Harold Kerzner was able to say:

Twenty years ago, project management was confined to the Department of Defense contractors and construction companies. Today, the concept behind project management has spread to virtually all industries, including defense, construction, pharmaceuticals, chemicals, banking, accounting, advertising, law, state and government agencies, and the United Nations.
(Kerzner, 1979)

Snyder (1987) noted that,

In the 1970's, the writings on project management took two significant new directions. We might call this period one of 'applications' and 'professional recognition'. New names joined the list as a wide variety of applications surfaced.

3.2 Writings on Project Management "Applications"

Snyder points out that

These people were writing the 'how to' of the project management business. Experience was beginning to replace ideas. Results were starting to reinforce concepts.

A perusal of Kerzner's very extensive (284 entries) Project Management/Systems Management Bibliography (Kerzner, 1979) certainly tends to support Snyder's observation. The bibliography records contributions in many application areas, included high-tech projects, development assistance, aeronautics, aerospace, R&D, data processing, information technology, building and contracting, weapons systems, military, process industries, public works, and automotive engineering.

3.3 "Professional Definition"

As already noted, PMI was formed in 1969, as a professional society, and Snyder was one of the founders. His record of this aspect of the 1970s is both interesting and authoritative.

Three papers helped give meaning to the "professional definition" period. "The Accidental Profession," by Gordon Davis, "Defining a Project Management System," by David Cleland and "Certification of Project Managers - Fantasy or Reality?," by Desmond Cook were early papers looking at project management and the project manager as new professionals.

A series of other papers looking at the role of project managers, organizational methods for project management and managerial strategies profiled a new industry, a new field for research and a new management style - a new profession.

We now look at some of the key project management issues of the 1970s which emerge from the literature of that decade.

3.4 Projects and the Systems Approach

Arguably the two most influential authors (actually three) in eleven years roughly spanning the 1970s, namely Cleland & King (1968) and Kerzner (1979) specifically approached their analyses of project engineering from a systems perspective.

Cleland & King say that

The modern analytical approach to the strategic planning aspects of management is most often termed *systems analysis*. In the execution process, similar ideas are applied under the label *project management* (or alternatively *systems management*, *program management*, or *product management*, depending on the environment)".

Elsewhere they say that

The systems concept in management decision making virtually necessitates the use of objective analysis of decision problems.

Many of the distinctive project management techniques which were developed or refined during the 1970s appear to owe much to the rational problem-solving approaches which were characteristic of the systems concepts of the time. These include WBS (Work Breakdown Structure), OBS (Organisation Breakdown Structure), responsibility assignment matrices (eg Linear Responsibility Charts), and "earned value" methods.

In discussing systems theory and business, Kerzner talked of

the creation of a management technique which is able to cut across the many organizational disciplines - such as finance, manufacturing, engineering, marketing, etc. - while still carrying out the functions of management. This technique has come to be called Systems Management, Project Management or Matrix Management (the terms are used interchangeably).

3.5 Project and Matrix Organisations; Conflict Management

Both Cleland & King, and Kerzner, devote substantial attention to project planning and control, as one would expect. But they also focus particular attention on organisational concepts and structures for project management, including matrix organisation structures, which (as Kerzner's observation above indicates), came for many people to be synonymous with project management. Other project management literature of the 70s is also much concerned with organisation structures for project management, and particularly matrix management - including problems associated with the latter, in which conflict management is most conspicuously addressed.

3.6 Project Management in Australia

The Project Managers Forum (PMF) was formed in Australia in 1976. Initial activities centred on NSW, but interest in project management was so extensive that PMF soon formed itself into a national body, with Chapters in Qld, NSW, ACT, Vic and SA. There was a strong building/construction orientation initially, but this was slowly diluted in time. Preoccupation with network planning techniques gave way to the broader perspective that planning and control constitute only a part of the total project management task. [PMF changed its constitution and name to the Australian Institute of Project Management (AIPM) in the late 1980s]

The author became interested in the broader aspects of project management mainly through having observed over the years that good project managers do not necessarily make good general managers, and vice versa. So he began to investigate the differences between the two forms of management in the 1970s, and the distinctive attributes of projects which caused those differences. He found that many others have also investigated these questions. It is interesting to see that Snyder (1987) records that as long ago as 1958, Norden

clarified that there was indeed a difference between ordinary production type work and something which was clearly becoming identified as project type work.

3.7 Summary of Developments in Project Management in the 1970s

- *The spread of project management applications from construction, defence and aerospace into virtually every industry*
- *The emergence and/or refinement of a much wider range of tools and techniques, including WBS, OBS, responsibility assignment matrices, and "earned value" methods*
- *The investigation and adoption of various organisational forms to undertake projects (particularly matrix forms)*
- *Concern with the management of conflict on projects*
- *An increasing recognition of the distinctive nature of project management as an avocation/profession*
- *The formation of the Project Managers Forum in Australia*

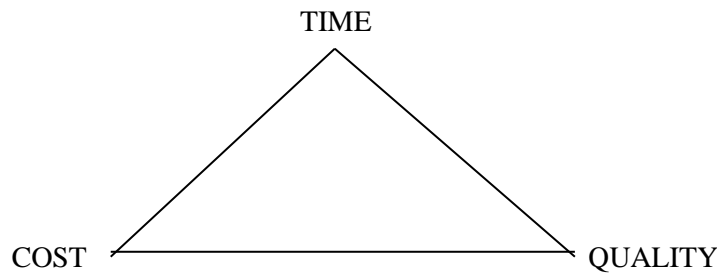
4. The 1980s and early 1990s

Whereas the decade of the 70s saw the proliferation of individual applications of project management, and many extensions and refinements of project management tools and techniques, the decade of the 80s was more one of trying to integrate the emerging experience from the many different application areas into principles and practices which were applicable to most projects in most application areas (sometimes referred to as "generic"). The most conspicuous of these efforts was the North American PMI's (Project Management Institute's) development of its Project Management Body of Knowledge (PMBOK).

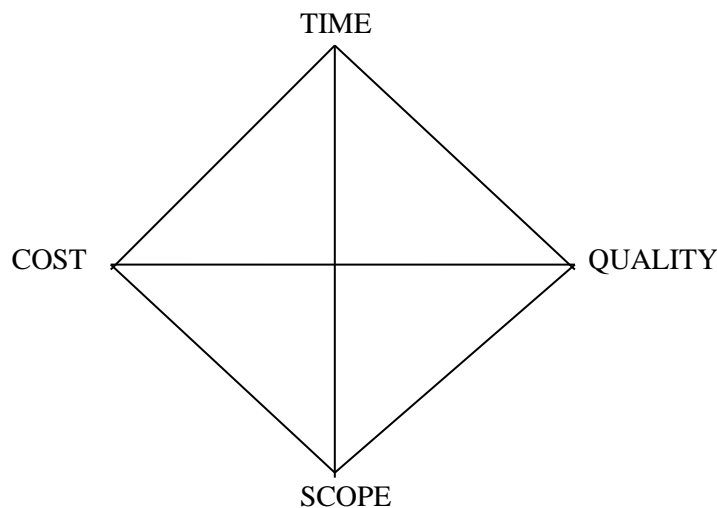
4.1 PMI's ESA Report

Professionalisation of project management, and associated issues, had been frequently discussed within PMI during the 1970s. However, it was not until 1981 that a formal proposal to pursue the topic in a systematic way was presented and endorsed by the PMI Board. The ensuing effort was known as the Ethics, Standards and Accreditation project (ESA). The resulting report was accepted by the PMI Board, and was published in the Project Management Quarterly of August 1983, as a special report. This early version of the PMBOK essentially comprised six project management (PM) "functions", namely the management of project cost, time, quality, scope, human resources and communications.

The ESA Report added four PM "functions" to the traditional project time and cost management functions. The addition of project *quality* management was more or less in line with the conventional wisdom that the three primary project objectives are *time, cost and quality* - and that, in practice, there are generally trade-offs to be made between these three objectives, as is typically shown in the form of a triangle, with a marker indicating where the priorities of the time may lie, as illustrated below. [In more recent times, new dimensions have been added to the function of project quality management, as will be discussed later].



The addition of project *scope* management appears to be in recognition of the fact that a project's scope objectives need as precise definition as the other three - and that trade-offs amongst objectives can, and often do, involve changes in a project's scope, which create particular project management challenges. The four-fold trade-off is sometimes illustrated by the following type of figure.



The PM "functions" project *human resources and communications* management are interesting additions. They are certainly significant components of the project management task. However, unlike the management of project time, cost, quality, and scope, there does not appear to have been any comprehensive development of specifically project-oriented tools, techniques or concepts in project human resources and communications management in the project management literature. Generally speaking, the attributes which are particular and/or unique to projects appear to be treated as an "add-on" to more general non-project knowledge and practices in these two areas. Although perhaps implicit in human resources management, the question of leadership in the project situation has received little systematic attention.

4.2 PMI's PMBOK

The first complete version of PMI's Project Management Body of Knowledge (PMBOK) appeared in the August 1986 edition of the Project Management Journal. This was a substantially more developed version of the PMBOK than the 1983 ESA Report. In this version, a seventh PM

"function", project *contract/procurement* management, had been added, together with some introductory and framework material.

As with human resources and communications management, project contract/procurement management has been an integral part of the management of many, if not most, projects. However, there does not appear to have been any comprehensive development of specifically project-oriented tools, techniques or concepts in project contract/procurement management in the project management literature. The relevant attributes which are particular and/or unique to projects appear to be treated as an "add-on" to more general non-project knowledge and practices in contract/procurement management.

The next version of the PMBOK first appeared as the PMNETwork insertion in the Project Management Journal of August 1987; and was subsequently published as a separate document in its own right. In this version, an eighth PM "function", project *risk* management, was added, together with an expanded discussion of the framework. A substantial literature has been developed specifically on risk management on projects, with project-specific tools, techniques and concepts. Project risk management is thus an important addition to the family of PM "functions".

The PMBOK also represents one of the more significant efforts to represent project management as a structured discipline and approach, rather than as a collection of tools and techniques. This is to be furthered in the new version - *Guide to the PMBOK* - which retains the eight PM "functions" - now termed "knowledge areas" - but has changed the exposition of each into an input - process (tools and techniques) - output mode.

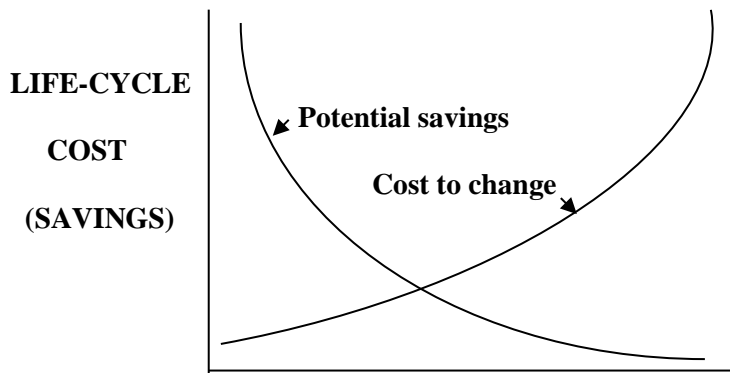
4.3 Increased Emphasis on the "Front End" of Projects

Before the 1980s, the emphasis in project management tools and techniques had tended to be on the execution or implementation phases of projects. But that situation was changing, and in the 80s increasing emphasis was being placed on the "front end" of projects. As Barnes & Wearne (1993) express it:

The evolution of techniques of project management has moved progressively from concentration upon the problems apparent at the tail end towards the front end - from downstream to upstream. The emphasis for project management now is [to] start with attention to a project's needs and risks as a whole so as to anticipate the potential problems and shrink the risks.

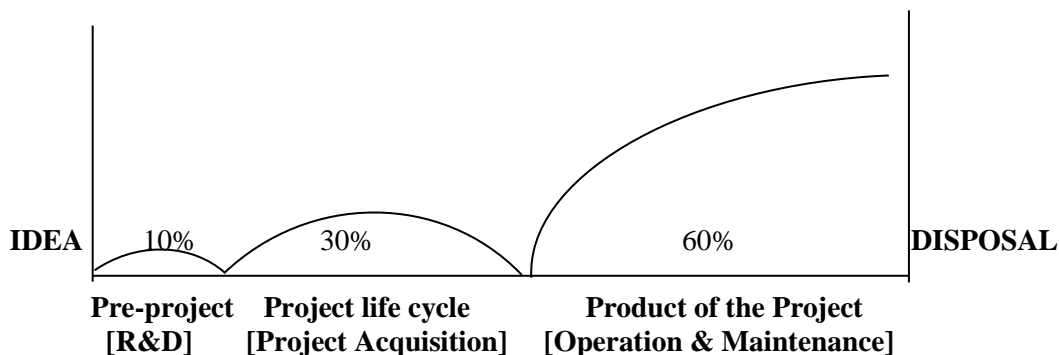
So, during the 1980s, increasing attention was directed towards needs determination, feasibility studies, value analysis, risk management, and project startup generally. The advent of powerful PCs and LANs facilitated "front end" analyses (as well as putting current control information in the hands of the people at the workface).

This increased focus on the front end of projects helped redress the previous imbalance in effective project management of the project life cycle, as the following figure (adapted from Sievert, 1991) illustrates.



4.4 Towards "Product" (verses Project) Life Cycle Costing

As an extension of the above, there were increasing pressures to look at projects themselves in their broader contexts. One example of this is the increasing emphasis placed on "product" life cycle costing (rather than only project life cycle costing). In the following figure (adapted from Ireland, 1991), the suggestive relative cost percentages (of total "product" cost) illustrate the point that it may pay to put more effort (cost) into the project life cycle phase, to achieve a better overall product cost over its complete life cycle.



4.5 Increased Focus on Factors External to the Project

During the 1980s, there was a profound increase in the number and influence of "external" factors on projects. For example, the number and influence of stakeholders and other "interested parties" on projects continued to increase, putting increasing pressures on project managers to find acceptable solutions to the (often legitimately) conflicting needs and objectives of the various stakeholders and other interested parties. This is a prominent component of what is referred to by some as project *interface* management, and by others as project management *integration*.

Another group of external factors which became increasingly important for many projects were physical environmental constraints, one of the most publicised of which have been "green" issues.

4.6 Project Management as a Means of Responding to, and of Initiating, Change

Also, during the 1980s, the perception of project management as an appropriate methodology for responding to change, and as the most appropriate vehicle for initiating and achieving change, gained wide acceptance. An example of this is the increasing use of project management approaches to implement corporate strategic planning, and the development of "management by projects", or "project-based management", as a mainstream management approach (discussed further in the next section).

4.7 Impacts of Computer Technologies

The development of cheap and powerful PCs, which can be networked as in LANs, has given people at the project "workface" superior capability for controlling their own work, as well as coordinating with other project contributors, and a central office. New and powerful programs have been developed to facilitate these processes. It is not yet clear what Artificial Intelligence processes such as expert systems will further contribute to these processes.

4.8 Certification/Registration Programs for Project Managers

The first concrete steps to develop a certification program for project managers were taken by PMI in 1982, when questionnaires to PMI members soliciting their views on certification were distributed. In the words of Frame (1990), "An overwhelming proportion of respondents approved the development of a certification process for PMI".

A certification program was developed and approved by the PMI Board in October 1983. The first exam was administered in Philadelphia in October 1984. In its later version, the exam comprises 320 multi-choice questions - forty for each of the eight PM "functions". A satisfactory response and satisfaction of certain other criteria earns one the post-nominal PMP (Project Management Professional) certification.

[It should be noted at this point that the American concept of professionalism and the Australian perception (inherited from the British) are very different. The stringent and high entry-level standards which membership of a professional association implies in Australia appear to be irrelevant in the US scene. Therefore, the PMP designation does not qualify as a professional qualification in Australia].

By the end of the 1980s both the Association of Project Managers in the UK (the British national association of INTERNET), and the Australian Institute of Project Management (the successor to the Project Managers Forum) had begun planning for certification/registration of project managers.

4.9 Summary of Developments in Project Management in the 1980s and early 1990s

- *Increased efforts to represent project management as a structured discipline and approach (eg, PMI's PMBOK)*

- *The addition of the management of project scope, quality, risk, human resources, communications and contract/procurement to time and cost as significant project management "functions"*
- *Increased emphasis on managing the "front end" of projects, including clients needs determination, feasibility studies, value analysis, risk management, and project startup generally*
- *A more balanced approach to managing the entire project life cycle*
- *An increased emphasis on "product" (verses project) life cycle costing*
- *An increased focus on managing factors external to the project, particularly stakeholders and other interested parties, and physical environmental constraints*
- *The perception of project management as an appropriate methodology for responding to, and initiating change*
- *The development of certification/registration programs for project managers.*

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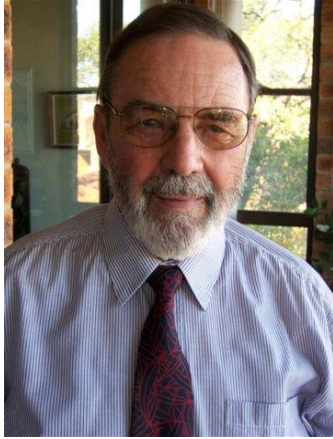
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Alan Stretton is one of the pioneers of modern project management. He is currently a member of the Faculty Corps for the University of Management & Technology (UMT), USA. In 2006 he retired from a position as Adjunct Professor of Project Management in the Faculty of Design, Architecture and Building at the University of Technology, Sydney (UTS), Australia, which he joined in 1988 to develop and deliver a Master of Project Management program.

Prior to joining UTS, Mr. Stretton worked in the building and construction industries in Australia, New Zealand and the USA for some 38 years, which included the project management of construction, R&D, introduction of information and control systems, internal management education programs and organizational change projects. He has degrees in Civil Engineering (BE, Tasmania) and Mathematics (MA, Oxford), and an honorary PhD in strategy, programme and project management (ESC, Lille, France).

Alan was Chairman of the Standards (PMBOK) Committee of the Project Management Institute (PMI®) from late 1989 to early 1992. He held a similar position with the Australian Institute of Project Management (AIPM) and was elected a Life Fellow of AIPM in 1996. He was a member of the Core Working Group in the development of the Australian National Competency Standards for Project Management. He has published 250+ professional articles and papers.

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