A HISTORICAL OVERVIEW OF PROJECT MANAGEMENT

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1. Introduction

The building of the Pyramids and the Great Wall of China, the design and construction of the Acropolis, cathedrals, mosques, statues and amphitheatres were all managed projects (Morris, 1994), and therefore *project management* of some sort has been with us for some time (Baccarini, 2001). At certain points in the development and evolution of human civilisation the methodologies of this management have changed in order to reflect productive, economic and political changes. The objectives, and constraints of the Pyramid builders were so enormously different from what ours would be today for the same tasks, that an entirely different project management methodology would be required. However, in spite of this variance some constraints would remain, such as time, cost, availability of skilled labour, etc., and with the appearance of industrial societies the close relation between time and cost became increasingly apparent. Time management was becoming a pivotal factor in all great projects, and as early as the 15th and 16th centuries, large architectural projects "*emphasised the importance of timely completion*" (Morris, 1994).

2. Origins of *labour-time* concepts

> *"The daily timepiece is the cattle clock, the round of pastoral tasks, and the time of day and the passage of time through a day are…primarily the succession of these tasks and their relation to one another"* Evans- Pritchard (1940).

Until the arrival of the industrial revolution, concepts of time were limited to the *duration* of certain tasks. The time to boil an egg, for example, was the duration of singing one *Ave Maria* aloud (Thompson, 1991). Farmers and pastoralists could quite accurately estimate the time of day by how close they were to completing certain routine tasks (grazing, milking, fastening, etc). For many traditional communities, even today, this mode of time-keeping is still in use. The Kaabyle tribesmen of Algeria consider undue haste to reflect a lack of decorum and a sign of diabolical ambition, "*the devil's mill*" (Thompson, 1991).

This method of relating labour to time is referred to as *task orientation* by E.P. Thompson (1991) who included an article about time and work-discipline in his book: *Customs in Common*. Task orientation was the necessary concept to adopt in times and under conditions where the working day inevitably needed to stretch and shrink according to daily circumstances. While Thompson clearly interprets this as a necessity of the times, he fails to expand on the concept: fishermen and seamen for example were clearly dependent on phenomena that were *not* related to the time of task-completion: tides. The same would apply to hunters (seasonal prey), and a whole range of seasonal occupations. These are reliant on a rotation of seasonal conditions that Henri Lefebvre (1958) identifies as "*cyclical time*" in contra-distinction to "*linear time*".

Time in those days, and under those conditions, did not possess any intrinsic value. The value of the time used was only considered in relation to the completion of the necessary tasks. It mattered little if the milking took 4 hours instead of 3, providing the grazing time

was not decreased in consequence. If at the end of the day, the farmer was 1 hour late for *hir* supper, this might even go unnoticed.

Further, Thompson stops shy of identifying the corollary of the task orientation concept. While certain tasks' completion had a fixed market value regardless of the time taken to complete them, as early as 1661 value was also attached to certain jobs in terms of the actual time they took to complete, as Best (1857) indicates: "*the Cunnigarth with its bottomes is 4 large* ***dayworkes***". Clearly, these "*dayworkes*" were precursors of our modern "*man-hours*", or of Brooks' *"mythical man-month*" (Brooks,1982).

By the end of the 16th Century, most English parishes had church clocks, though the sundial remained in use until the 19th Century (usually to actually set the clocks). The emergence of Puritanism and its accompanying work ethic prompted landowners (and their subservient churches) to ensure that labourers (at least those who lived within hearing distance of church bells) rose early, turned in early, came to church (to hear sermons) and did not waste time in "sloth, idleness, or *soldiering* (deliberately under-producing)" Taylor (1911). In 1658 the invention of the pendulum brought accurate clocks to most households, however watches were so expensive that only the gentry used them (Atkins & Overall, 1812). It was neither expedient nor (therefore) well regarded for workmen to know the time of day, and factory foremen would often confiscate watches or timepieces found in the possession of workers (Thompson, 1991). Bosses therefore could (and frequently did) stretch working days and shrink rest and meal times by covert, physical manipulation of the factory clocks, (Anon., 1887).

By now the onset of the industrial revolution demanded a greater synchronisation of labour and processes. Clocks were becoming the urgent new need of developing industrial capitalism (Thompson, 1991). Although Thompson correctly recognises this development he incorrectly, or perhaps incompletely identifies its causes. Labour at this stage involved only a very slight need for synchronisation, and task orientation in industry and farming was still overwhelmingly prevalent (Thomas, 1964). In fact clocks were used much more to extract maximum value from a workman's day than they were to synchronise industrial activities (although the 2 are of course closely related). This becomes increasingly apparent by the mid 1700s, when a much more disciplined industrial capitalism began introducing time sheets, time-keepers, informers, fines, etc. (Thompson, 1991). Finally, "clocking in" was introduced (and persists to this day) in 1750 in Derby.

By 1772 clocks were being introduced in schools and universities (Powell, 1772) not only to control and organise students' timetables, but also (and perhaps especially) to regulate and maximise the labour of teachers.

The widespread appearance of the factory clock soon ushered in the practice of "clocking-in". The 1st generation of time-controlled workers were taught by their masters the importance of time-management in the new work ethos. The 2nd generation turned the weapon back onto the bosses by forming *short-time committees* and the 10-hour Movement, and the 3rd generation started striking for overtime pay, double-time and time-and-a-half, and won them. Both sides had learned a lesson they would never forget through the evolution of industrial capitalism to this day: *Time is Money*! (Franklin,1748).

Established religions quickly jumped to the aid of the beleaguered bosses. During the Reformation, Catholicism (more suited to protecting the rulers of slave-based and feudal societies) had already been violently replaced in much of the advanced industrial world by a variety of flavours of Protestantism (more socially appropriate to a capitalistic economy), from Lutherism to Evangelism. The Methodists', whose very name emphasises the husbandry of time (Thompson, 1991), admonished sluggishness, time-wasting and oversleeping of workmen and labourers ("*Oh sirs, sleep now and awake in hell*" Heywood, 1690). One moralist was alarmed to discover that after concluding a 15-hour day, workers were left with "*several hours in the day to be spent nearly as they please*!" (Foster, 1821). New labour habits were formed, new work disciplines imposed. Through the 19th Century, western reformist religions directed a concerted, continuous propaganda assault at workers, propounding time-thrift. "*Without time-discipline*" declares Thompson "*we could not have the insistent energies of the workingman*". Clearly religions, particularly Puritanism, in response to the needs of rising industrial capitalism, converted people to the new valuations of time (Thompson, 1991).

3. Taylorism and Scientific Management

> *"The conservation of our national resources is only preliminary to the larger question of national efficiency."* President T. Roosevelt, 1910.

The dawn of the 20th century saw industrial capitalism firmly entrenched in most of the western world. Task orientation, discussed above was no longer a viable, cost effective concept so far as workmen's productivity was concerned. The new buzzword was "*efficiency*" both at a local level and a national level, and scientific methods were sought to attempt to improve industrial efficiency.

Many academics, researchers, industrialists, economists and managers jumped on the *efficiency* bandwagon, and a large volume of material was published in an attempt to identify the most cost effective methods of what became known as "*scientific management*". One of the earliest works on the subject was *The Principles of Scientific Management*, (Taylor, 1911), and while much of the underlying ideology of the book would today be considered at the very least *politically incorrect,* it does provide valuable insights into the mechanisms of the earliest attempts at scientific management of industrial processes. Taylor had no academic background but started life himself as an industrial worker in a metallurgical factory. His transition from the shop floor to the lower echelons of management occurred through the *dubious* moral method of acting as an informer on fellow workers for the benefit of management; but his rapid ascension to executive positions was due to his concerted intellectual efforts to devise methods to curtail the influence of trade unions on factory workers, while extracting the maximum value from workmen's labour, at the lowest possible labour costs. This premise being the underlying ideology of industrial capitalism to this day, Taylor's work was extremely relevant to the development of scientific management.

It was previously assumed that in order for a particular factory or workshop to succeed, it was necessary only to find the right manager, and leave the *methods* to him. Similarly, if the 'right' workers were found for the job, they could be relied on to bring to the industry not only their own skills and methods, but even in many cases their own tools (Taylor,

1911). It was also widely believed that good managers were "born" with certain qualities, talents or affinities, much like musicians or sportsmen. This idea has not entirely vanished, and some theorists today still subscribe to the view that good managers guarantee project success. Thomas and Pinto (1999) have developed a theory that describes all project management strategies as a function of good time-management. In a paper titled "Project Leadership: A Question of Timing", they discuss temporal alignment and project leadership; they examine the importance of temporal skills, the concepts of time warping and "chunking" time, they explore polychronicity, and conclude that the relationship between project management and time orientation has many practical implications. As a direct consequence of this approach their almost exclusive focus on the project manager's "temporal skills" (or the amount, or block of time he/she is able to capture mentally) reduces concepts of project management almost to the "congenital" talents or natural mental predispositions of the project manager, rather than the effective application of procedures. Taylor's first major controversial assertion was that, while the "*best man will eventually rise to the top anyway*" (Taylor, 1911) good management was the result of scientific training. However, the lack of a theoretical background for much of Taylorism becomes clearly apparent when it asserts that the interests of workers and employers are in fact identical, "*efficiency benefits both employer and workman,…greatest prosperity is achieved when an individual has reached his highest state of efficiency*" (Taylor, 1911). Had this assertion been true, we would today (nearly a century later) be living in an industrial relations utopia, having developed *high-tech* scientific management technologies to levels barely dreamed of in 1911. The basic premise of Taylor's rationale was that it is possible to give the workmen higher wages and the employer lower labour costs, *at the same time* (Taylor, 1911). Unfortunately this rested on the assumption that employers are all philanthropic, humanitarian moralists who wish nothing better than to advance society as a whole, resolve human conflict, and better the condition of all citizens. This having proved not to be the case, bosses were left with the scientific tools to increase productivity, and no obligation to improve wages. Taylor's disciples were driven by a vision of truth that would place managerial control on a footing of absolute objectivity, "*impervious to the commotion of class conflict or the stench of sweating bodies*." (Zuboff, 1951). It can be argued that to this day, *Taylorism'*s legacy has been one of sustained exploitation of the working classes, with the resultant industrial conflict, trade union militancy, political extremism and polarisation of wealth between rich and poor.

Notwithstanding the flavour of the basic socio-political tenets of Taylorism, many of the mechanisms explored in "The Principles of Scientific Management", (Taylor, 1911) have in retrospect proved effective in so far as they have often resulted in improved productivity. Perhaps the most important of these mechanisms has been the establishment of Time-and-Motion studies for the manufacturing industries. Taylor defines efficiency as "*each worker working at the fastest pace, doing the highest class of work his skills allow*", (Taylor, 1911). However he contends, with a reasonable amount of supporting evidence, that many workers were deliberately under-performing. Indeed he goes further by declaring that a national (even international) mentality predominated among workmen who claimed that it was against their own best interests to work to maximum efficiency. Claiming workers believed that improved efficiency would result in redundancies and sackings (not an unreasonable assumption today), he states that trade unions and labour organisations not only promote this view but in some cases even aggressively coerce workers to deliberately under-perform (Taylor, 1911). History has proved Taylor wrong on both these counts. In the 1st place, increased productivity *has* resulted over the years in

increased redundancies and sackings, and in the 2nd place, modern trade unions actively participate with employers in enterprise bargaining and productivity agreements.

However Taylor also identifies other factors as contributing to low efficiency, some of which show more veracity than the "*natural laziness*" of workmen (Taylor, 1911). They include bad management systems, use of *rule-of-thumb* methods, inefficient tools and technologies, insufficient rest breaks for workers, too long work days and lack of physical collaboration on tasks between workmen and management:

1. He breaks down ***bad management systems*** into a number of components, salient among which is bad time-management. He suggests accurate records should be made and maintained of the amount of work and efficiency each man is capable of and argues that the old system of "*initiative and incentive*" is deficient, since it leaves the onus of improving efficiency wholly on the workman, without providing him with the necessary science (or even in some cases tools) to do this. Once optimum objectives have been scientifically established, the workman should be paid substantial bonuses each time he achieves these objectives, while those who consistently fail to meet these objectives should be "*weeded out*" periodically, and assigned to other (lesser) tasks.

2. *Time-and-motion* studies, perhaps Taylorism's most acclaimed contribution to scientific management, must replace ***rule-of-thumb*** methods of performing tasks. This involves hiring experts who, armed with a stopwatch, time-measure every component of a particular task from start to completion. A scientific analysis is then conducted of the returned data and unnecessary or slow movements are eliminated and/or replaced by time-efficient ones. A change in attitude is also required to accompany these changes in technology in order for them to be effective.

   Taylor's apparent ideological inclination should not detract from his scientific analysis. In relation to time-study, he recommends a series of steps that are still used to conduct time-study research today:

   i. select a sample worker population (preferably in different workplaces)
   ii. study the exact series of movements and operations, and the implements used
   iii. study the time required for each movement or operation
   iv. eliminate false, slow or useless movements
   v. collect into 1 series the quickest and best movements
   vi. standardise tools and implements

   Inevitably this led him to treat workers' human bodies as machines, " *a source of effort and a source of skill*" (Zuboff, 1951). Other authors have argued that while the logic that motivated the early purveyors and adapters of scientific management has continued to dominate into the 20th century, Taylorism's logic "*must undergo a fundamental reevaluation as information technology is widely adapted to production activities"* (Zuboff, 1951). Taylorism, by confusing *effort* and *progress* had wrongly assumed that men and hours (or men and

months) were interchangeable, creating the "*mythical man-month"* (Brooks, 1982).

3. **Inefficient tools and technologies** have been used in the past because it has often been left to the workman to provide both. By standardising these, it is argued, management not only ensures that the most effective are used for each task, but allows for a flexibility of the labour force making it easy to move workers from one workspace or workgroup to another with minimal disruption of procedures. However, by considering workers as machines, Taylorism developed the logic that *bad machines can be replaced by good ones,* leading to developments in automation technology (Zuboff, 1951). Machines were beginning to replace men.

4. A readjustment of the **length of the workday** is one issue which history has vindicated Taylor on. He has argued that beyond 10 hours a day, workers cease to be truly productive. He even provides experimental data proving that, providing no reduction in wages was imposed, workers could produce as much in a 10-hour day as they did in $10^{1/2}$ or 11 hours. Many cases of reducing hours *"actually resulted in higher output (less time wasted)"* (Taylor, 1911).

5. In relation to the payment of **bonus wages** for achieving objectives of higher productivity, Taylor urges these payments be made immediately. Workers, like animals, he argues cannot relate to a reward much later for a task completed now (Taylor, 1911).

Industrial society, characterised at that time by a new romance with science, a profound belief in progress and a professionalisation of the managerial class embraced this philosophy enthusiastically and "*Frederick Taylor's scientific management was born"*. (Zuboff, 1951). Other theorists of scientific management, such as Gilbreth and Gantt also contributed to the enthusiasm, as did Weber's work on bureaucracy (Morris, 1994), but Taylorism was widely adopted, expounding the creed of "*penetrating, explicating and rationalising the labor process*" (Zuboff, 1951).

4. The 2nd World War

The 2nd World War was a landmark era in the history of scientific management, and the birth date of project management as we know it today. Military operations often required clear objectives, careful planning, good leadership, reliable communications and control, all of which characterise good project management (Morris, 1994). Researchers point to 3 important developments of the war that can clearly be categorised as having been project managed, and perhaps of being the very seeds of modern project management. These are Operation "Overlord", which included D-Day and the Battle of Normandy, the Manhattan Project (one of the greatest research and development (R&D) projects ever undertaken) and Operational Research, which involved the collection and analysis of data on everyday operations using scientific principles of research and investigation (Morris, 1994). The Manhattan Project, which involved the development of the first atomic bomb, is commonly presented as the *"first evidence of modern project management."* (Baccarini, 2001). While many considered the Manhattan Project as presenting problems, incurring great costs and having little chance of success, it's final, resounding success was entirely

due to effective project management (Groves, 1962). Modern theorists of project management generally concur that running overtime or over-budget are not indications of project failure, and a distinction must be made between *project success* and *successful project management.* Munns and Bjeirmi (1996), were the first to distinguish between *the project* and *project management*, and to demonstrate how the confusion between the 2 may affect their relationship. They identified different individuals involved in the project and project management, together with their objectives, expectations and influences, and demonstrated how a better appreciation of the distinction between the 2 will bring a higher rate of project success. The work of Mc Daniel and Liu (1986), which has primarily focused on project *scheduling* techniques, assumed that better scheduling would result in better management, and thus successful completion. However, most of their work while referring to success/failure factors as *critical factors* focuses on the reasons for project *failure* rather than project *success*. They assume that if a project's completion time exceeded its due date, overran its budget or did not satisfy performance criteria, it was deemed a failure. However other research (Avots,1969) shows that success or failure is much more complex. Delays are common, and project managers may pay penalties that increase overall costs, yet these projects are still considered successful. Munns and Bjeirmi (1996), suggest there are many projects which were considered reasonably successful despite not being completed on time or being over-budget, such as the Thames Barrier, the Fulmar North Sea Oil project, and the Concorde airplane.

After World War II the US implemented defence projects that required organisations to break the existing functional boundaries "*and find new ways to accomplish complex work*" (Cleland, 1998). Government involvement at that time was light and taxes were low. It was also therefore, the era of the entrepreneur and private financier who owned railways, power, mining, telephone companies and automobile and aircraft industries. Clearly there was a need for modern project management in order to adjust or update scientific management in step with the new industrial, economic and political environment.

5. The development of Systems Management

Little progress in project management methodology was achieved in the decade after the war. However by the late 1950s huge advances were being made with the development of PERT (Project Evaluation Review Technique and CPM (Critical Path Method), as well as the widespread adoption of Systems Management and Engineering (Baccarini, 2001). The earliest obvious development of Program and Project Management began in the early 1950s in the US Air Force (Morris, 1994). The advent of the Korean War created a sharp increase in production orders for B47 bombers and 'joint production offices' were established to improve coordination between engineering and production (Morris, 1994). Most researchers agree that "*much of modern project management was defined in the 1950s, on the major cold war defence programs*", Verzuh (1999), and an important new phase was being reached with the sudden high demand for ICBMs as a result of the perceived Soviet threat. The Von Neumann Committee (Strategic Missile Evaluation Committee) was set up to research the production capabilities for Atlas ICBMs, and reported in 1954 that only the creation of a new development group, with full responsibility for the entire project, could achieve objectives. This group "*should be of calibre and strength…, created by a drafting operation by the highest level government executives in university, industry and government organisations"* (Beard, 1976*).* Systems Management was being born.

Systems Engineering meant that "*the complete weapon system - missile, its components, supporting equipment and preparation for its implementation as a weapon - were planned, scheduled, and controlled, from design through to testing, as an operating entity*." (Baccarini, 2001). However the practice of systems management soon became bureaucratised, and came to mean managing *others* and/or procedures. In effect, systems management was 'assembly line management'. It brought to the managerial level what the assembly line had brought to the factory floor.

The US Navy's Polaris programme brought to project management 2 new outstanding tools, still very much in use today: PERT and CPM, but more importantly, because of the level of authority and autonomy the project had enjoyed, it set the standard for that level of authority, cutting across functional lines in what came to be known as *matrix* organisations. PERT developed from a need to evaluate project progress, and predict progress rates. A special taskforce was set up by Admiral Raborn in 1956 to develop a method for doing this. Within 4 weeks the first PERT concepts were developed, and by 1957 PERT was running on project managers' computers (Morris, 1994). Other tools, still currently in use, were conceived and developed subsequently, such as earned values (C/SCSC) and precedence diagramming.

Outside the military arena, systems management was being adopted by major industrial players such as Chrysler, General Motors, DuPont (who developed CPM), "*from the mid-1960s the construction industry began to use modern project management techniques in its attempt to cope with the explosion in the number of large complex projects"* (Baccarini, 2001). It was also then that the concept of the individual project manager began to emerge. After a decade of adapting to systems integration, the 1960s saw an explosion in its use, however some writers have claimed that during that time project management suffered an over-emphasis on planning and control systems (Baccarini, 2001). Finally, Paul Gaddis' (1959) article "The Project Manager", in the Harvard Business Review helped to broaden the focus of project management. "*He highlighted several organisational issues that, perhaps for the first time, introduced general managers to the growing new discipline of project management*." (Baccarini, 2001). It was the first article published on *modern project management.*

6. Modern Project Management

By the 1960s the industrial/consumer requirements of western countries had caused huge advances in technology and manufacture. The US had developed systems engineering in its aerospace/defence industry, as well as engineering management in the process engineering industries (Davidson, 1987). Substantial developments occurred in modern management theory, especially in organisation design and team building. All these factors contributed to the emergence of *modern project management* (Morris, 1994). Later the computer arrived on the scene, ushering in a brave new world in which project management's planning and control systems are now operated.

6.1. Project Management associations

In the mid 1960s project management professional associations began to emerge. In 1965 the Denmark-based International Project Management Association (IPMA) was formed. It now spans 21 countries with a membership of 9,500 (Cleland, 1998). In the United States, the Project Management Institute (PMI) was founded in 1969, but initially many industries

were reluctant to embrace the new methodologies that modern project management presented. One theorist (Thamhain, 1996) conducted a study of the best practices for controlling technology-based projects and supports the position that modern project management tools and techniques can significantly enhance overall project performance. His conclusions recommend managerial actions for minimizing barriers to the introduction of new controls, and methods for fostering a work environment conducive to organisational learning. Thamhain refers extensively to the research conducted by Randolph & Posner (1988), Cespedes (1994), Clark & Wheelwright (1992) and Raz (1993), on tools, techniques and management processes needed to run projects successfully.

In the UK the Association of Project Management (APM) was founded in 1972 to promote modern project management, and today counts 4000 members and 140 corporate members (Cook & Pritchard, 1998).

6.2. Work Breakdown Structures

An intellectual and academic interest in project management, in parallel to its industrial and defence applications, began to emerge in universities and industry, leading to new research and an analysis of its basic concepts and methods. This led to a push to apply general management theories to project management, particularly in terms of the "systems approach" and organisational factors such as differentiation, integration and interdependence (Baccarini, 2001). A shift was being made from a focus upon organisational and scheduling aspects to more comprehensive texts on project management (e.g., Cleland & King, 1968).

The combined endeavours of academic research and defence and industry requirements resulted in the creation of another great icon of modern project management: the Work Breakdown Structure (WBS) by the end of the decade. This was first adopted by NASA, and is seen by some theorists as the direct descendent of the Andersen Committee's approach to USAF systems acquisition (Morris, 1994). Essentially this management tool begins at the highest level of the program by identifying the project's deliverables (hardware, services, facilities, etc.) and subdividing these into component parts to successively lower levels, reducing the cost and complexity of the units at each level. Each unit thus becomes more manageable and controllable (Archibald, 1976).

6.3. Why modern project management?

The principal cause for the emergence of modern project management was simply the huge growth in the number of projects initiated (Baccarini, 2001). This in turn has been identified by researchers as being attributable primarily to 3 factors: First, organisations were under intense pressure to implement *change* in order to compete. Information technology's adoption necessitated even more changes, many of which had to be implemented using projects. Secondly, time and time-management; competition was urging managers to shrink project completion times, and to view project management "*as an organisational time saver*" (Cook & Pritchard, 1998). And thirdly, the growing complexity of tasks, and the need for specialisation meant that many functional boundaries in organisations needed crossing, and an increasing number of multi-disciplinary inputs were required (Baccarini, 2001). "*Increases in technological complexity along with the need for a multi-disciplinary approach to the development of new products have given rise*

to the need for a goal-orientated management technique to cut across organisational lines." (Obradovitch and Stepanou, 1990).

In addition to claims that project management practices save time, money and organisational efficiencies, it is rapidly "*being recognised as a value-added profession from the customer perspective*" (Cook & Pritchard, 1998). Customers want, and are prepared to pay for, project-managed outcomes.

In an industrial environment increasingly obsessed with saving money ("*cutting costs*"), modern project management started to be seen as a viable methodology across the board, from defence to the motor industry, because it was able to save money in a number of areas: planning, resource deployment, tracking, use of reserves, and project close-out (handover) (Cook & Pritchard, 1998). It demonstrably optimises organisational efficiency through its ability to corral organisational resources from a *task-oriented* (rather than a *function oriented*) perspective (Gaddis, 1959). It evolved out of the need to draw upon the resources and insights of the entire organisation (Cleland, 1998), and integration became the new buzzword.

Although the above are the principal reasons why project management came to the fore, a wide range of minor factors has also contributed to its widespread adoption. These include team development, employee growth, customer satisfaction and loyalty, and public acceptance of project management.

7. Expansion of project management

The 1970s saw the universal adoption of project management and a consequent explosion in its use. This decade saw an expansion in project-based management in most industries, defence programs, civil engineering and roadwork, architecture and the beginnings of software development. New issues arose as a result of this huge expansion which had not been problematic before. Because of the expansion into such diverse industries as banking, law, pharmaceuticals, and advertising (Kerzner 1979) *external* factors began to have an effect on the development of projects which were unrelated to project management procedures and methodologies (Baccarini, 2001). These included ecological considerations, the national economy, government actions, community acceptance, etc. Many projects failed as a result of community resistance or ecological impact, notwithstanding effective application of project management methods (e.g. nuclear power stations). Baccarini (2001) argues that the economic failure of the Concorde project was primarily a result of external factors (unexpected high fuel costs, and the inability to obtain permission to fly supersonically over land).

As more material was being researched and published on project management methods, experience was beginning to replace theory. Results were starting to reinforce concepts (Snyder, 1987). Researchers were recommending that project managers address these external factors that impacted on project outcomes. "*Those responsible for…such projects should strive to influence the project's chances of success along these 'external' environmental dimensions,"* wrote Morris (1994), "*as well as ensuring that the internal project management functions are being carried out effectively"*.

Project management was maturing. Universities started to offer degrees in project management; more people were writing about it and researching its theoretical bases. A proliferation of publications on project management added to the maturing process. The most significant attempt at producing a project management body of knowledge was the PMI's (Project Management Institute, USA) publication of The Project Management Body of Knowledge (PMBOK), which today is the industry standard, and has recently been renamed to *A Guide to the Project Management Body of Knowledg*e to reflect the PMI's new emphasis on 'generally accepted' project management practices (available: http://www.pmi.org/publictn/pmboktoc.htm.) Wirth & Tryloff (1995) have identified 6 major documents, including PMBOK, which are the repositories of this body of knowledge. While it has been argued that some of these bear so little resemblance to each other that they "*cast a degree of doubt on the very existence of a common PMBOK*" (Wirth & Tryloff 1995), research has facilitated the recognition of one common PMBOK with multiple interpretations (Wirth & Tryloff, 1995).

The 1980s brought a continuation of the expansion of project management methods to ever-increasing areas of activity, which in turn encouraged the development of new tools and concepts, such as configuration management, simultaneous engineering, total quality management, risk analysis and partnering (Baccarini, 2001).

8. Future trends

Today the trend is for project management to develop as a stand-alone discipline in its own right rather than as a subsidiary of hierarchical management, and some observers have commented that it might be the key to "*surviving the turbulent times of the 1990s*" (Peters, 1992). This trend is likely to increase in the next decade (Baccarini, 2001). A strong emphasis on adapting to external factors will continue to influence the development of projects and, *ipso facto*, of project management methodologies.

As project management is transformed from a technical activity to a strategic management practice, it will become a vital part of organisations' response to strategic planning needs, especially as corporate strategies try to adapt to a rapidly changing environment, and project management will be applied to target strategic needs "*rather than merely accomplish specific, isolated projects*" (Dinsmore, 1999).

The PMI's publication: *The Future of Project Management* (PMI, 1999), identifies a number of possible trajectories in the future evolution of project management. In particular it emphasizes that project management will continue to evolve into an independent profession, accompanied by the corresponding educational and training programs (degrees, certification, diplomas, etc.). It also points to the importance of people skills, team cooperation and leadership qualities. Other theorists concur, some indicating that the trend is towards management systems that foster "*greater participation and ownership by the project team-members*" (Johns, 1995).

Most writers agree that project management will continue to expand, gaining an important role in all future business and industrial activity, however one area where it will play a pivotal role is in the development of interactive multimedia products (Mc Daniel & Liu, 1996).

9. Project management for multimedia development

The advent of computer technology opened the doors to the development of a plethora of new tools. Not only has computer technology enabled the rapid development and deployment of project management tools and instruments (e.g. MSProject and similar software, electronic GANTT charts and PERT charts, etc.), but the explosion in demand for multimedia products for education and *infotainment* markets, coupled with a need for more effective information processing in business, resulted in a correspondingly large development of multimedia management methods and technologies. Project management techniques for developing multimedia began to proliferate. (Mc Daniel & Liu, 1996).

Virtual teams of developers can now collaborate without the need for physical proximity because of the very nature of their working environment, and the emergence of new technologies will facilitate even more this development. Distance is no longer "*a significant barrier in managing and controlling a project"* (Ashrafi, et al, 1998).

The project management methodologies specific to the development of multimedia products are already developing, and project management as a science has come a long way since the building of the Pyramids and the Acropolis.

10. References

Anon., 1887. In *Customs in Common.* Thompson, E. P. (1993). (pp.352-403). London: Penguin

Ashrafi, R., Wideman, M, & Hartman, F. (1998) "*Current and future challenges and their impact on project management".* PMI Annual Seminars & Symposium, Long beach, Calif. 9-15 October

Archibald, R.D. (1992). *Managing High-Technology Programs and Projects.* John Wiley: New York

Avots, I,. (1969). Why does Project Management Fail*? California Management Review.* 12, 77-82

Baccarini, D,. (2001). *Project Management.* (Paper 4). Unpublished paper.

Brooks, F,. (1982). *The Mythical Man-Month.* Addison-Wesley: Philippines.

Cleland, D.I. (1990). *Project Management: Strategic Design and Implementation*. McGraw-Hill, New York

Cook, C.R. & Pritchard, C.L. (1998). "Why Project Management?" in Cleland, D.I. (ed.) *Field Guide to Project Management*. Van Nostrand Reinhold, New York.

Davidson, J,. (1987). Managing Projects in Organisations. San Francisco: Josey Bass

Franklin, B,. (1748). Advise to a Young Tradesman.

Gaddis, P.O. (1959). "The Project Manager". *Harvard Business Review,* May-June, pp.89-97.Groves, 1962

Johns, T,. (1995). Managing the behaviour of people working in teams. *International Journal of Project Management* Vol 13, No.1, pp 33-38

Kerzner, H. (1996) ""The Growth and Maturity of Modern Project Management" *PMI 27th Annual Seminar/Symposium,* Boston, Mass. 7-9 October. Pp. 1-7

McDaniel, K. and Liu, M. (1996). A study of project management techniques for developing interactive multimedia programs: a practitioner's perspective. *Journal of Research on Computing in Education,* 29(1): 29-48.

Morris, P.W.G. (1994). *The Management of Projects*. Thomas Telford, London. Obradovitch, M.M. & Stephanou, S.E. (1990). *Project Management: Risks and Productivity*. Daniel Spencer, Bend, Oregon

Munns, A.K. and Bjeirmi, B.F. (1996). The role of project management in achieving project success. *International Journal of Project Management,* 14(2): 81-87.

Snyder, J.R. (1987). "*Modern Project Management: How did we get here - Where do we Go*?" Project Management Journal. Vol. XVIII, No. 1, March, pp. 28-29.

Taylor, F,. (1911). *The Principles of Scientific Management*.

Thamhain, H.J. (1996). Best practices for controlling technology-based projects. *Project Management Journal,* 27(4): 37-48.

Thompson, E. P. (1993). Time, work-discipline and industrial capitalism. In his *Customs in Common* (pp.352-403). London: Penguin

Thomas, P & Pinto, J. (1999). Project Leadership: a question of timing. *Project Management Journal.* 30(1): 19-26.

Verzuh, E. (1999). The Fast Forward MBA in Project Management. J. Wiley, New York.

Wirth, I, & Tryloff, D,. (1995). Preliminary comparison of six efforts to document the project management body of knowledge. *International Journal of Project Management,* Vol 13. No.2. pp109-118

Zuboff, S. (1988). *In the age of the smart machine: The future of work and power.* New York: Basic Books.