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Reconceptualising project management methodologies for a post-postmodern era

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Abstract

As populations grow, technology advances, and socioeconomic complexity rises, organisations are required to recurrently adapt to their particular environments in order to survive. Project management methodologies are one relatively recent adaptation to the organisations' faculty for means of production. A literature review provides a framework to trace the evolution of modern project management methodologies through time and illustrates how they have been shaped by the various and particular pressures and constraints of their environments. The analysis reveals how modern project management methodologies are inherently 'old technology' and how a reconceptualization of their function and structure is required if they are to enable organisations to recurrently gain the competitive edge in an increasingly complex and demanding world. Conclusions are drawn about the convergent evolutionary nature of the various forms of methodologies and reasoned speculations are made about their future function, design, and significance as a strategic organisational device.

Keywords: Socioeconomic Complexity, Project Management Methodology, Post-postmodernism

Introduction

It is recognised that there is a deep divide between the doctrines of the various project management (PM) methodologies and how project management is actually practiced [1], i.e. what the project manager does to manage the project. Why this is so is a valid line of research enquiry.

This paper contributes to this line of enquiry by examining the evolution of various project

management ideas, concepts, tools and methodologies. It considers how these various aspects of PM co-evolve with their social, cultural, and corporate environment which in turn exerts significant pressure upon them to adapt and therefore survive in such a way that they may be prevalent enough to be regarded as PM landmarks.

In the literature review we draw attention to previous scholarship that has considered the changing characteristics of various aspects of project management, and conclude by emphasizing the lack of literature that considers the evolution of features of project management in any holistic sense.

The body of the paper is structured around a discourse which is captured in a diagram (see Figure 10) that we have called 'the phylomemetic tree of project management'. This diagram is our attempt, and an early one at that, to depict the inferred evolutionary relationships among various tools and methodologies pertaining to project management, and to illustrate how they have adapted in response to various environmental pressures.

A key point derived from this enquiry is that the evolutionary paths of project management practices and methodologies are loosely coupled, and there is *prima facie* evidence that the various features of project management tools and methodologies are being selected for reasons other than that their application and implementation lead to increasing productivity.

The paper closes with a discussion on the future of project management methodologies and the role they could play derailing the political aims of the project management institutions whilst simultaneously revolutionising project management practice.

We think that it is worth foreshadowing our concluding remarks at this point. The process of

creating the project management phylomemetic tree has been like undertaking an archaeological dig back through recent project management time. Foucault [2] famously used the same methodology with regard to the medical profession, though with more rigor that would go well beyond a conference paper. As our phylomemetic tree has taken shape, we have spent much time deliberating its various meanings. That is to say that it prompts us to answer the question; what is this tree saying to us? One answer we have found compelling is that it illustrates a story of both individuals and groups competing for access to scarce resources (the basics for survival etc.) through the medium of individual and collective work. The Western worker of the 1960's would find themselves in a social environment that had begun to value individualism, yet the organisation they worked for was still structured in the inflexible way of the 1930's factory. The worker could not survive based on their individual trades as they might have done in the 1700's, but rather they needed to work collectively and to divide the labour to compete with other collectives (organisations). The organisational survival philosophy of the day was efficiency and all efforts were driven towards these ends as efficiency leads to a competitive advantage, and the advantage leads to the survival of the organisation and therefore the workforce.

We hope that the reader will notice how, as the worker moves through time, the societal values change, the nature of commodities change, the demands on productivity necessarily change, and the organisation and its workers must adapt their tools and methods to survive the competition with others in the market place.

Literature review

The search for a historical perspective on project management has engaged researchers for a considerable period of time. Accounts have been set down which essentially provide a chronological view of human endeavours which are characterised as "projects" and the ways in which these endeavours were accomplished are deemed to be "project management" [3-6].

In the main, such histories provide a chronological re-telling of events to which the notion of a project or project management is retrospectively ascribed. This research regularly acknowledges the contexts in which such work was undertaken, and the societal conditions which exerted influence upon the work and those undertaking it [7].

In some instances, the macro-socioeconomic events are addressed to provide context for the recounting of events. For example, the influence of F.W. Taylor's scientific management enters the discussion [5, 6]. Accounts also consider events such as military campaigns, from the 14th century [4] to Desert Storm [3] as being part of project management's evolution.

Bredillet [8] presents nine "schools of project management thought", summarising and categorising preceding research to trace the evolution of project management research, thereby drawing upon more general theories of management and organisational management. The value of this approach is that it might provide a basis for exploring the evolution (what preceded what) and natural selection (the basis for survival and propagation) of project management. Of particular interest are the optimisation school of the 1940's – 1950's, which is very Taylorian in its approach, the process school under which project management provides a roadmap, through to the contingency school, which "recognizes the difference between different types of projects and project organizations" [9]. Each seems to represent a step-change in the thinking concerning project management, evolving from rigid prescription, through guidelines, to recognising the situated variations in the application of project management.

Other research has focussed upon specific societal influences which shaped what we now, by convention, consider to be project management [10].

The evolution of projects management *per se* has occurred in more subtle ways other than a historical context suggests. Maylor, Brady, Cooke-Davies and Hodgson [11] stand at the end of a line of research that has examined the projectification of work and how the term 'project' has supplanted the term 'work' [12]. Furthermore, how projectification has led to programmification, where organisational strategies are displaced by programs that comprise projects [11], and this influences the power and political structures within the organisation and sets new norms of behaviour and practice of the workforce and the professional institutions [13]. Whitty [14] has taken an evolutionary approach to the evolution of project management. This theme of research considers all aspects that pertain to project management, such as practices and artefacts, and examines them against the framework of evolution by natural, social, and memetic selection. Aspects of project management therefore manifest not merely because of their management efficacy but

rather because they create competitive advantages for those who use or purport to use them [15]. It is to this latter evolutionary theme of research that this paper is more closely aligned.

A genealogical methodology

Whilst phylogeny and its relationship to genealogy (in a Darwinian sense) has been studied and modelled [16], a phylomemetic analysis needs to acknowledge the nature of project management as continual evolution of ideas, concepts, and practices ('memes') under changing socioeconomic conditions.

Consequently, an alternative approach is sought that is more accommodating. The approach adopted in this paper is to determine the paths, or branches, by which seemingly disparate influences or external pressures came to bear upon the practice of project management, and illustrate how project management tools and methodologies responded to these pressures.

An attempt is made to trace these influences, and any cross-pollination between them, thereby perhaps ending up with inter-twining branches in the project management phylomemetic tree.

Although the concept of genealogy has been dismissed as "amateurish" [17], it features "three different, but interwoven aspects" [18] which are pertinent considerations for this method of analysis:

- Genealogy should be understood as a mode of writing history, necessitating interpretation of past events: whilst facts (e.g. chronological information) may be drawn upon, it is also inevitably subjective. Genealogy is a "different and radicalized historicism of the self" [18]. Translating the notion to the project management historian, it might be taken as acknowledgement that there are disparate views, or biases, in examining the origins of the discipline. We must also acknowledge that when we look back we do so through the lens of hindsight, and we can interpret the past in a predestined manner, such that all previous steps were intentional in the direction of future steps. Previous forms are therefore incorrectly treated as primitive forms and current forms as the ultimate goal.
- Genealogy as a mode of critique: the Greek origin of "critique" as "to distinguish, separate or divide" leads it into a role as "a way of problematising something" [19]. This role of genealogical analysis makes a contribution to "the development of an understanding of the

historical constitution of the discourse" [13]. This objective guides the approach of the current paper to critically analyse forces shaping project management over time. However, a genealogy or line of descent must not be viewed in any discontinuous sense, as a Harmonogram (taking the present topic as an example) does not at some point stop and become a Gantt chart. But rather the features of an artefact (say the Harmonogram) change in response to particular constraints. And when enough change has occurred to distinguish it from the original, the new form (the Gantt chart) is named.

- Genealogy as a style specific to a genre: any given genealogy account is "constitutively directed towards an audience...The reader is supposed to understand him- or herself as the subject and object of those very processes of subjectivation that are being recounted" [18]. In the context of this paper, the reader will, we hope, become aware of their role in the evolution of project management.

Thus, as we embark upon an exploration of project management's genealogical roots, it is necessary to keep in mind that both the analysis contained in previous recounting of project management may have been subject to such self-historicism (a search for self-recognition of project management or other discipline within the discourse); and indeed that the analysis presented herein also needs to be self-conscious of subjective interpretations, particularly when viewed from a memetic standpoint.

The phylomemetic tree of project management

Phylogenetics is concerned with the evolutionary development and history of a species or higher taxonomic grouping of organism [20]. However, the term has been utilised in the fields of social sciences such as the anthropological study of language [21].

An alternative term, "phylomemetic", which we use in this paper, has been coined specifically to describe the phylogenetic analysis-based approach to reproduction of non-genetic elements [22]. This term has been applied to such diverse studies such as the development of Indonesian batik motifs [23] and the evolution of innovation [24].

Underpinning phylomemetic analysis is an inquiry based upon Dawkin's [25] notion of a "meme" as a carrier of ideas from one person to another. A memetic approach to projects and project management has already been postulated [14, 26] and provides a "lens" through which project

management and other disciplines can be examined [27].

Phylogenetic analysis is usually represented through a “phylogenetic tree” which (depending upon its type) adheres to specific format and annotation [28].

However, it is not proposed (at this stage) to put forward a representation which follows such a mathematical or formulaic approach applied to how the branches and roots are linked. Rather, the intent is to provide a means to communicate the established or more often than not inferred evolutionary relationships across the influences which have shaped the tools and methodologies of project management.

We now turn our attention to establishing specific relationships between the various modes of project management, and the constraints and influences to which they have been subjected,

We will attempt to trace the history of project management as a series of interrelated pasts and histories to seek and discuss their intertwining over time.

In crafting the “tree” as an outcome of the following research, it is important to acknowledge some salient considerations which influenced the tree in its current form (Figure 9).

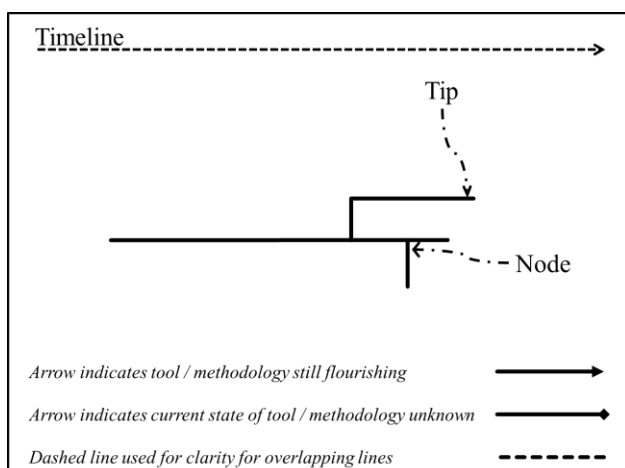


Figure 9 Elements of the PM Phylomemetic Tree

Nominating a single root for project management would be purely speculative. In the case of phylogenetic tree analysis, the inference of roots are possible through identification of an “outgroup”, in which species which are considered outside the group of interest (the “ingroup”) are ignored; the branch which joins the “outgroup” to the “ingroup” is the inferred root [29].

In the case at hand the uncertain character of project management’s origins, and the interlacing of influences throughout its history, prevents identification of an “outgroup”. Consequently, whilst we can capture evidenced or inferred relationships between branches, we are left with a tree whose root lacks a firm identity. (In this regard, then, we are left with what might be an “unrooted tree” - from which we cannot infer a root - or one whose roots are yet to be identified. However, we are not alone in facing such confusion: the “tree of life” itself is not immune to this problem [30]).

Other elements of the tree follow, conceptually, a phylogenetic tree. “Tips” can be seen as points at which a set of influences have converged to a point of manifestation in a model or other project management entity. In our tree, “nodes” can be considered as points in which two (or more) influences converge, resulting in new “branches” or tip(s).

We have, however, departed from convention in qualifying our branches and tips (see Figure 9). Critiquing the evolution of project management thought and practice as a genealogical exercise necessitates making judgement as to what constitutes a branch. The criteria for determining this is based upon the identification of a fundamental environmental influence (not just in the context of project management) which effectively, served to impact the DNA of how work was expected to be performed (methods) or actually performed (practiced).

As we discuss later, tools and methods which are ancestors of others do not necessarily cease to be when those descendants emerge: they may in fact continue to exist alongside – or even outlast – the tools and methods to which they contribute. To this end, we have added to the notation to make such distinctions. This should also aid the readability of the phylomemetic tree found in Figure 10.

The social-cultural environment

As mentioned previously, the evolutionary changes in project management must be considered as responses to environmental pressures to change. That is to say that individuals or organisations require the tools and methodologies to meet specific needs which are not necessarily linked to productivity. Those that are able to be adapted to meet the need are adopted, and those that either are not or cannot remain used in their particular niche until they are eventual driven to extinction. The networking methods of Activity-On-Node vs.

Activity-On-Arrow (or Arc) is one example where the former is widely adopted in popular project management software and lends itself well to the 'post-it note' network diagram, whereas the latter is now only mentioned in passing in most project management textbooks.

A macro view of the history of what we today call project management could be said to have evolved through the eras of modernism (beginning late 18th Century) then post-modernism, (beginning mid-20th Century), through to what can be described as the post-postmodern era (beginning start 21st Century).

These eras are best understood in terms of how the latter in many ways rejects the ideas of the former. Having said that, we must also remember that the ideals and values of each era are not simply abandoned and driven to extinction, but rather they can exist simultaneously. For example, whilst we are in a post-postmodern era, the values and ideals of modernism can still exist in a project management methodology such as PRINCE2 that has its roots in a post-modern age.

The modern period of history (1650-1950's) has a mental outlook that is different from medieval times [31]. Of significance are the diminished authority of the Church and the increasing authority of science. States replaced the governmental authority of the church, and this shaped a liberal culture associated with commerce. Therefore modernism is associated with the rise of capitalism throughout Western Europe and North America. Essentially it is a way of approaching or acting toward the world which can be characterised by the statement of rationalist philosopher René Descartes - *cogito ergo sum* (I think, therefore I am). Practically this translated into a scientific mind-set that could be expressed as – if we are going to progress and improve our way of living, then we can only rely on facts and what we can see and prove to 'enlighten' us. This approach selects for so called enlightenment cultural values that are rationalistic, scientific, and logical. Modernism encapsulates the industrial revolution with rapid advances in technology. World discoveries were made at this time through the advent of mapping, and the history of science and thought was inculcated in educational systems. It was a period that saw immense growth of 'the organisation' and 'the institution' and paved the way for a systematic then scientific approach to management and production methods. Our phylomemetic tree has its roots planted in this era which begins with the shift from a craft (individual skilled worker) means of production to the

mechanised and semi-automated (group semiskilled and unskilled worker) workflow and assembly line means of production characterized by Taylorism and the optimisation of the factory. Lean methods are a response to the quest for optimisation and this underpins the era of Fordism, where mass production and mass consumption are combined, and where products are manufactured and sold to those who made them. Whitty [10] has attempted to trace the development of the project management mind-set through this period and points out, as do others [32], that the dominant project management mind-set today is still modernist, and therefore somewhat significantly lags behind the times. And there are reasons why it has been deliberately kept this way as we shall see.

Post-modernism (1950's to 2000's) can be viewed as the collapse, rejection, exhaustion, even boredom of modernism [33]. Whilst the ideals of modernism could be stated as 'everything can be known through experiment and evidence', the ideals of post-modernism could be stated as 'scientific thinking is not the only way to living'. The turn from modernist to post-modernist ideas has been attributed to the atrocities of both World Wars, and the lack of trust of the authorities and rational thinkers that led to those events. Others suggest it was the

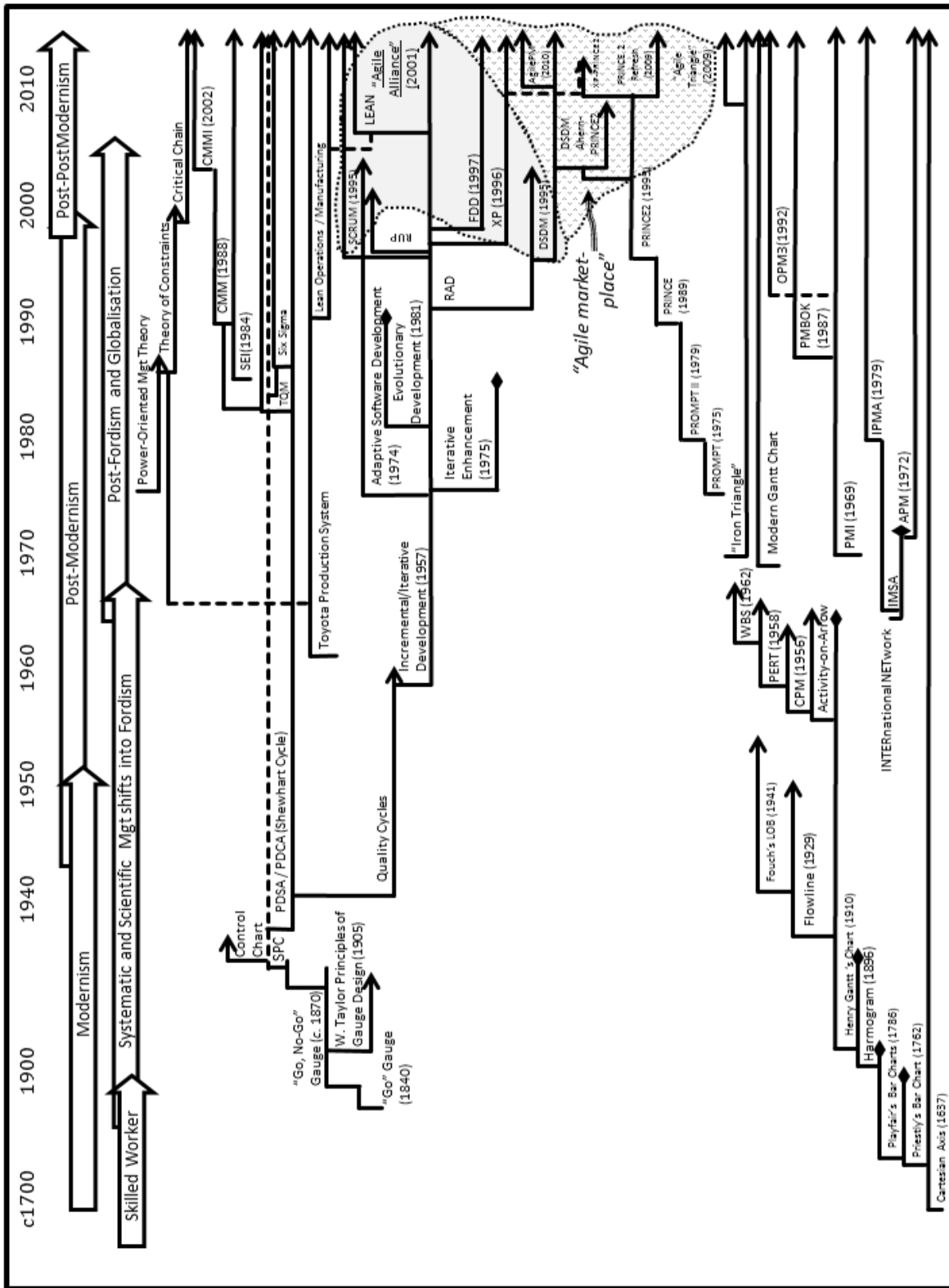


Figure 10 The Project Management Phylomemetic Tree

disappointment in the claims of science that brought the atomic bomb instead of a cure of all diseases. Advances in technology have led to better transportation of goods and services and the worker is no longer constrained to buying the products they manufacture.

This leads to downfall of Fordism, and the Post-Fordism era is coupled with the opening up of the market place and the era of globalisation. Post-modernism is therefore characterised by individual perception, choice, and mechanisms that enable choice in an ever increasing, self-perpetuating, competitive marketplace.

In sum, the modernist culture is prescriptive. It argues that there are essential truths that can be discovered. We therefore have prescriptive treatments of disease, and prescribe 'best ways' to solve productivity or management issues and our efforts are driven towards discovering these prescriptions and best ways. Alternatively the post-modernist culture values heterogeneity, fragmentation, and difference, and questions the possibility of impartiality, objectivity, or authoritative knowledge [33]. The modernist follows doctrines and believes in universals, whereas the post-modernist asks questions and is suspicious of grand 'all explaining' narratives and dismisses any universality [34].

Figure 10 concludes with an era beyond postmodernism, so called post-postmodernism. This is a view that the uncertainty and open-endedness of postmodernism is a step too far and that some certainty, some variety, and some return to modernism is the right balance. A post-postmodern era may describe the world in terms of pluralities where there are no universals or individuals, but rather the world is comprised of cohorts, sets or kinds. There is often a shallowness of participation ascribed to post-postmodernism bases on our ability, through technology, to move instantaneously between socio-cultural groups [35].

The Analysis

To follow is an analysis of how project management has evolved and responded to

various trends and socio-economic pressures. It is loosely framed to historical periods and management eras, but it is also necessary to sometimes follow an evolutionary branch and focus on features such as the rise of the professional project manager and the commodification of project management. Figure 10 provides an illustration of the analysis.

On the 18th C. roots of project management

The term 'Project Management' has only relatively recently emerged to characterise a way of organising and managing work in the last sixty years or so [7]. Wider acceptance, understanding, and normalisation of the term occurred in the period from c.1955 - late 1960's [36], during which Gaddis' [37] seminal article on *The Project Manager* appeared.

In searching for evidence in terms of artefacts, cultural strategies, and literature [4], it is possible to uncover endeavours which would typically be classified in modern times as "projects".

What is common to these ancestries of modern project management are their fields of application, originating in construction, but latterly finding ready adaptation in military systems development [38]. The tangible nature of such industries' undertakings suggests a logical basis for such a cross-over of disciplines. However, project management is now used in many diverse undertakings such as software development [39, 40] and change management [41-43] which do not readily offer links to the historical fields of application.

This analysis is therefore framed within ontological and epistemological interpretations of project management. This approach is adopted to uncover how project management has on the one hand adapted to new environments and therefore applications, whilst also demonstrating resilience. It illustrates when the doctrines of the various project management methodologies became commodities in themselves and branched away from practice. It also illustrates how PM concepts co-opted features during

various socioeconomic circumstances which are characterised by vastly different pressures and constraints and this is still the case in contemporary and future society.

Given the expanse of time which this represents, uncovering project management's lineage requires more than reliance upon broad statements of ancestry, it is possible to identify events and achievements of mankind which directly or indirectly are encapsulated in modern project management.

Mechanisms for scheduling work provide a useful starting point for focussing upon the cross-fertilisation of ideas which have come to be incorporated into project management. Whilst the use of scheduling techniques can be inferred from human achievements in construction over the ages, formal recognisable processes and tools can be traced to the 18th century [44]. Two examples which show clear visual links to later representations are found in Priestley's "Chart of Biography" which used a horizontal timeline to plot lifetimes, and William Playfair's bar-charts and line graphs [45], which further resonate with subsequent representations of project work.

Under Scientific and Operations Management

Late 1800's to 1950's

The Gantt chart is an icon of project management [46, 47] and provides an anchor-point for discussing both the lineage of project management and the evolving conceptualisation of project management itself.

Its central place in project management has its function elevated beyond a "means of displaying simple activities or events plotted against time or dollars" [48] to one of the "most commonly employed methodologies" for scheduling [49]. Further, it is recognised in both the *Guide to the Project Management Body of Knowledge* [50] and the Association of Project Management's *Body of Knowledge* [51] as a key method for graphically representing project schedules

The first recorded use of the Gantt chart was in 1917 [52]. However, its historical significance is tied to Henry Gantt who was a disciple of F.W. Taylor, the father of Scientific Management [53], who espoused in modernist tones that a "one best way" existed for organising work [54]. Gantt invented various types of charts for recording work, both planned and complete [55]; the one of interest is his "layout chart", although there are earlier claims to its origin [44].

Scientific Management's influence upon project management practices is widely acknowledged throughout the literature [6, 10], despite being intuitively at odds with the notion of projects, given their uniqueness in terms of product or service being produced and/or organisational construct used [53, 56].

Thus, by virtue of it being both as part of the 'bodies of knowledge' and imbedded in commonly-used PM tools that are central to the project managers' day-to-day work, the Gantt chart provides us with a direct ideological link to scientific management and modernist thinking.

The Gantt chart features in the family history of other wide-spread project management techniques. With the rise of computing power and system theory the 1950's witnessed the emergence of the Critical Path method (CPM) [57], and almost concurrently the Performance Evaluation and Review Technique (PERT). PERT was used for the Polaris submarine project in 1958 [58], as a "statistical technique for measuring and forecasting progress in research and development programs" [59], whilst CPM emerged in 1956 from the DuPont corporation for use in the construction industry in which it has been "widely embraced" [60]. Arising from the initiative that give rise to PERT, was a forerunner to the Work Breakdown Structure (WBS) [61], though "WBS" only entered the project management lexicon *circa* 1962 [62].

Both CPM and PERT are network scheduling techniques. They are schematic representations of the "logical relationships of project activities" [63]. PERT and CPM share in common a focus upon a critical path of project activities, using the Arrow-on-

Arrow technique [64], but the former uses (in its purest form) probabilistic estimating of activity durations, whereas the latter is based upon a deterministic approach. However they are commonly discussed in conjunction with each other.

The lineage of PERT and CPM is, despite their separate (if almost simultaneous) emergence, closely shared. The success of both arose from the ability to apply computer algorithms, and are being reported as sharing a lineage as “direct extensions” of the Gantt chart [65].

An important difference with Gantt charts is that they were not network diagrams, and did not represent linkages between activities as would PERT and CPM [66]. In fact, the variant of Gantt chart which features in modern project scheduling techniques is the “layout chart” which originated as a production scheduling tool [55].

However, other roots have been identified for this capability. Adamiecki’s Harmonogram, devised in 1896 and which was published in English in 1931 featured the concept of activity networks and, along with Sewell Wright’s work on path analysis [67], is credited as a “precursor” of network techniques used in PERT and CPM [5].

Thus, the Gantt chart’s roots in production scheduling point to a lineage in project management arising from Operations Management (OM). OM itself claims roots in Scientific Management, through the Galbriths [68], and the work of Charles Babbage, described as a “pioneer” of OM [69]. Further, entwinement with Scientific Management is suggested through the work of Georgius Agricola c. 1556 in distributing work to miners, comparable to the approaches implemented by Taylor some four-and-a-half centuries later [70].

Whilst the influences between Scientific Management and OM may be historically interwoven, examination of OM provides further branches of the project management phylogenetic tree.

Fouch’s Line-of-Balance (LOB) was conceived in 1941 [71] for production

scheduling but has found application in large construction project work [72] and notably has been combined with CPM to overcome limitations in representing complex and concurrent tasks [73]. A variant to LOB, Location-Based Scheduling (LBS) has also been developed as a ‘flow line’ scheduling technique [74].

Another project management approach, Critical Chain Project Management (CCPM) is based upon the Theory Of Constraints [75]. The Theory Of Constraints itself draws heavily from concepts associated with the Toyota Production System [76]. Although CCPM also derives thinking from the field of System Dynamics [77], it has an intellectual foundation essentially based upon Operations Management [78].

Under Fordism

1940’s to 1960’s

The environmental pressure during this period came from mass production and mass consumption where competition in the market was low, but on the rise. Our analysis shows that methods such as Agile have their roots in this period.

Today we associate Agile methods largely with software development and they have been characterised as such since the turn of the 21st century [79, 80]. However, such domain specificity (i.e. software development) has not precluded either its investigation by other domains (e.g. construction [81, 82], or claims of suitability for use of project management approaches which are otherwise grounded, such as PRINCE2 [83], and PMBOK Process Areas [84].

Agile methods descend from a lineage of practices involving iterative and incremental development, rooted in the work of Walter Shewhart, and which is evident as far back as the X-15 hypersonic jet development in 1957 [85]. Notably, Shewhart greatly influenced the work of W. Edwards Deming [86, 87], pointing to an additional branching of the

influence of Operations Management upon project management through the Total Quality Management movement and lean manufacturing.

The lineage of iterative and incremental approaches, specifically in software development and approaches to its management, continued in various guises through the 1970's to current times. The literature reports practices such as "Iterative Enhancement" [88], "adaptive" software development [89] and "Evolutionary Development"[90], the latter being recognised as an influence upon more recent agile methods such as "XP" and "SCRUM" [91].

Shewhart is referred to as the "father of statistical quality control" [92, 93] and invented the control chart in 1924 [94] as part of statistical process control (SPC) [95]. SPC built upon measurement of "limits" or tolerances in the dimensions of interchangeable parts and introduction of the "go" and "no go" gauges in 1840 and 1870, respectively [95, 96]. William Taylor established formal "principles" for such gauges in 1905 [97].

Deming's work, as noted, built upon Shewhart's [86], and is closely associated with the Total Quality Management movement. However Deming's work is "firmly grounded...in proven management principles that trace their roots to Frederick Taylor" [98]. Further, despite the differences between Deming and Taylor, they have been described as "extensions of scientific management principles rather than radical departures from them" [99]. This relationship between the respective management philosophies remains a matter of debate [100]. Indeed, taking one side or other of this debate may be an example of "historicism of the self" [18] but has enough veracity to be included in our project management phylogenetic tree.

Under Post-Fordism and Globalisation

1960's to 2000's

The environmental pressure during this period came from advances in transportation, information technology, and a liberalisation of the market. The response was just-in-time manufacturing and production methods.

Deming in particular had a well-documented influence upon the manufacturing [101, 102] and product development processes at Toyota, where the Plan-Do-Check-Act (PDCA) cycle (the "Shewhart Cycle" in Deming's terms[86]) is an integral part of the product design process [103].

We can trace another lineage to Agile from Toyota. The Toyota Production System (TPS) is viewed as being established circa 1948, though it was not documented as such until 1965 [104]. The TPS originated as an adoption of Western production systems of the time (including Deming's methods [101]), but deviated significantly from them in featuring a requirement for lower inventory levels (giving rise to "Just-in-Time") and the flexibility of greater product flexibility through innovative product-line techniques. The influence of the TPS extended to the major U.S. auto manufacturers from the 1980's through Japanese firms US operations and as a result of the U.S. firms conscious learning from the Japanese firms [102].

As a representative of "agile" project management of software development, "Lean Software Development" specifically acknowledges concepts such as Lean Production, the TPS, Just-in-Time manufacturing and Toyota Product Development System for providing its intellectual underpinnings [105]. Indeed their principles influence agile project management in general [106].

The 'iron triangle' offers another *vignette* into the shape-shifting of project management

under the influence of agile. As such it first appeared *circa* 1969 [6], and has become a near-ubiquitous representation of “the project”, holding strong emotional symbolism for project managers and a memetic quality to propagate itself [46].

The ‘modern’ Gantt chart emerged during this era as a combination of its original intent (the identification of tasks to be undertaken and the associated duration) and the specification of hierarchies of work (i.e. a WBS), combined with the ability to establish sequencing and relationships between tasks (based on PERT) and the ability to determine their critical path (using CPM). Effectively, we see the Gantt chart evolving from its (with hindsight) simple form, to a somewhat more sophisticated tool which is used in project management software such as MS-Project.

PRINCE2 (standing for PROjects IN Controlled Environments, release 2) is a project management “method” [107] which is owned by the United Kingdom (UK) Office of Government Commerce (OGC).

Its ancestry is traced to another method, PROMPTII (standing for Project, Resource, Organisation, Management and Planning Technique), which was adapted in 1979 by the UK Government’s Central Computing and Telecommunications Agency, which subsequently became part of the OGC, “as the standard to be used for all government information systems projects” [108].

PROMPT had been created by Simpact Systems Ltd. in 1975, as “a response to an outcry that computer projects were overrunning on time estimated for completion and original budgets as set out in feasibility studies” [109]. PROMPTII comprised six “event oriented-stages” to guide the management of computer projects, and was designed “to introduce an element of painless standardisation across projects” [110].

PRINCE was subsequently launched in 1989, as an evolution of PROMPTII, originally

“developed by the UK Government as a standard approach for its IT projects” [108]. Recognising this specific genesis, PRINCE2 was launched in 1996 as a more generic project management method is applied in both public and private sectors across many countries world-wide, including being used extensively in the Australian Federal Government [111]. In addition, claims have been made for PRINCE2’s usability or alignment with other seemingly disparate project management approaches:

- Alignment to the Project Management Institute’s Project Management Body of Knowledge (PMBok) is characterised as PRINCE2 acting as a ‘recipe guide’ (prescriptive) to the PMBoK’s role as a ‘cooking guide’ (non-prescriptive) [112];
- Use as a project management method in conjunction with DSDM Atern [83, 113].

On the rise of the Project Manager

Claims for the “project manager” to be considered a distinct role be traced back in the late 1950’s [37] and has developed to be considered a distinct “discipline” [38] and a “profession” [114], though the text-book definition of the latter in respect of project management has been queried [115].

It took another decade or so for what are now considered to be representative bodies of project managers to emerge. The International Project Management Association (IPMA) arose from a meeting to discuss CPM in managing large projects, in 1964 [116]. The resulting group, initially adopted the name INTERnational NETwork, or INTERNET, but changed to International Management Systems Association in 1965 before a further change in 1979 to its current identity.

The Project Management Institute (PMI) was also formed in the late 1960’s, as was the Association for Project Management (APM) in the UK. Notably, the APM arose from the same INTERNET origins as the IPMA [117].

The profile of these organisations grew rapidly during the 1990’s. In the case of the

APM, from 2,000 in 1987 to 10,000 by 1998 [117]. The PMI experienced growth approximately 8,500 members in 1990, to current membership in excess of 300,000. This growth has been attributed to the adoption of a “projectised approach to work” by organisations throughout the 1990’s, spurred on by the popular management writings of the likes of Rosabeth Moss Kanter and Tom Peters [118].

The move to the “project oriented company provides an explanation as to the motivations of individuals to engage in a cohort of like-minded practitioners: participation in organisations such as the PMI or the IPMA plays a role in the career development of project managers [119]. Nonetheless, project management has struggled to be more than a “pseudo-profession” [120], although project managers continue to advocate for greater recognition of competency standards as part of their attempts to legitimise their profession [121].

The evolution of the Project Management Office (PMO) or similarly-named organisational structure can be traced back to the 1950’s [122], however it experienced significant growth in popularity during the 1990’s [123], appearing to coincide with the popularisation of this projectised approach to work. The PMO plays a significant role in the “professional development” of project managers [124]. PMOs invariably also have a role in determining standards and methodologies for project management [124] and in providing a “home” for project management personnel [119].

On the Commodification of Project Management

The issue of standards and their basis for being is relevant to our analysis. Both the APM and PMI have their respective “Bodies of Knowledge”, or BoKs [51, 63] and these form the basis of their respective certification programmes. There are vast numbers of project managers who pursue such certifications (in the case of PMI, in excess of 450,000 holders of various certifications), and the underlying BoKs are perceived as “building blocks of a profession” [125]. Such certifications and accreditations also generate

a significant income for the organisations who hold intellectually property rights to them.

The PMI’s BoK, or PMBoK [63] has a strong memetic quality [10]. Many commercial offerings for project management tools and methodologies claim ‘compliance’ or ‘alignment’ with the PMBoK as a means of reinforcing legitimacy of a project management commodity within the minds of practitioners, or perhaps more so in the minds of decision-makers regarding their procurement. All this takes place despite misgivings about the rigour of the theoretical foundations of PM commodities [115], and of the ‘attitudes and behaviours’ derived from such BoKs [125]. This is also reflected in a concern as to its very legitimacy as the basis for project management ‘standards’ [126].

Whilst Carnegie Mellon University’s Software Engineering Institute (SEI) is not an organisation representing project management, it is worthy of inclusion in our analysis as it does own a commodity that has had a significant influence on the project management environment to date, and we believe will continue to do so. In 1988 the SEI launched the Capability Maturity Model (CMM) to provide “guidelines for improving the software process” [127]. It is significant to our analysis because many organisations undertaking software projects are expected to attain CMM accreditation, and the structure of the five-level CMM provides the intellectual framework for many Project Management Maturity Models [128, 129]. CMM set out to be “an application of the process management concepts of Total Quality Management (TQM) to software...” [127] which included project management. This claim provides an explicit link to a lineage of operations management influences as discussed previously.

Under Post-Postmodernism

2000’s to 2012

The environmental pressure in the age beyond postmodernism is that of embracing change, but not too much of it. Some stability is required, but not too much of that

either. There are obvious contradictions here, which in a sense sum up post-postmodernism.

Throughout this age, the traditional project management tools, methodologies, and commodities such as professional certification and training have faced an environment which is largely hostile to their survival, and they have had to adapt in order to persist, and somewhat along different evolutionary paths.

‘Agile’ has sought to distinguish its representation of measuring project performance from the traditional iron triangle, such as through specifying “Value, Quality, and Constraints” [130]. The constraints here include the traditional iron triangle measures of cost, schedule and scope, with value being described as the extrinsic quality being delivered. Whether this is merely a matter of definition, rather than a departure from the iron triangle measures has been debated [131].

The ‘modern’ Gantt chart, the “one step approach to planning” [132], is also fighting for survival as Agile methodologies have largely rejected its use, and have in the large part turned to the “burn down chart” to represent the work commitments and progress [133].

In a sense ‘Agile’ is a post-modern state of project management tools and methodologies as it rejects the traditional modernist tools and methodologies such as the Gantt and PRINCE2. Agile positions itself as self-sufficient with an established relationship between the organisation and management of work (Figure 11).

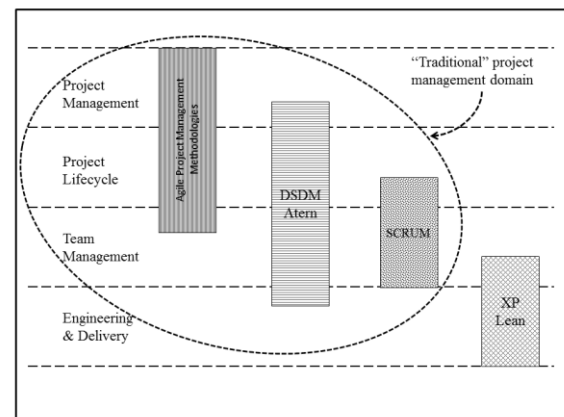


Figure 11 Project Management in the Agile World - adapted from [134].

PRINCE2 is attempting to conjoin with agile approaches such as DSDM [83, 113] and XP (Extreme Programming), despite a view amongst software practitioners that “the two may look contradicting” [135].

One could say that PRINCE2 is adapting to survive in the agile world. However, competition is fierce. Despite its earlier involvement with PRINCE2, the DSDM Consortium launched its “AgilePM” methodology in 2010 [136]. Further, AgilePM is positioned as a “framework” for application to SCRUM [137] whereas SCRUM is positioned as a means for managing project lifecycles where the work is being undertaken using XP or Lean Development [134].

This raises fundamental questions around the longer-term survival of modernist methodologies such as PRINCE2, and their attempts to propagate into the agile world. Whilst they distantly share roots, they have evolved along a different path, and now they compete for the attention of the project manager and the project organisation.

The PMI’s PMBoK also faces a new and potentially hostile environment. Whilst it contains references to such approaches as “progressive elaboration” and “spiral” lifecycles [63] that are conceptually akin to incremental / iterative development, it represents a different underlying approach to the management of projects. It appears to be somehow ‘outside of’ or overlaid upon project activity, whereas agile methodologies

appear to have a closer coupling to the conduct of work and its management.

The PMI seems to be attempting to gain entry into, and legitimising itself within, the agile project management world. Having already established certifications in many areas of project management (such as risk management and schedule management), the PMI launched an “Agile Certified Practitioner” (PMI-ACP) certification in 2011. It draws largely upon the methodologies associated with the Agile Manifesto, though makes claims of a link back to the PMBOK and PMI Standards [138]. However, as with PRINCE2, it faces an environment in which the agile methodologies include an approach to project management which has evolved specifically to the requirements of that environment.

A similar fate may await the SEI initiatives. The CMM was superseded in 2002 by the Capability Maturity Model Integration (CMMI). In this adapted model the key process area of Quantitative Project Management is introduced [139]. Although it does not prescribe specific techniques (though a relationship with Six Sigma is noted), its legacy of quantitative-based quality management begs a similar question as it does of other traditional project management approaches when faced with an environment in which the emphasis is upon personal commitment and team empowerment [134].

Under post-postmodern conditions we see at various points the evolutionary paths of the traditional and agile project management tools and methodologies converge, merge, and diverge. This illustrates how pressures and constraints have created a turbulent response, with the result, although not conclusive, pointing to very different fates in terms of the ability to survive.

Concluding Remarks

On the basis of this analysis it is possible to offer a few observations regarding the implications for project management in general and the project manager in particular.

The change in project management tools and methodologies appear to lag behind the

changing eras as experienced by the rest of society. Modernism has dominated project management and this has been influenced by the rise of the role of project manager and the commodification on project management products and services, each of which has needed to control and stabilise their environments (markets) to survive. Various tools were used to achieve control and stability, such as the project management professional institutes, the bodies of knowledge, and certification and accreditation programs. The professional institutes have been, in a way, factories for producing project managers, and in turn created their own market. This embodies the modernist ideals of Fordism in that they sell their products and services to their membership. This behaviour, we suggest, is a central cause of the divide between the doctrines of the various project management methodologies and how project management is actually practiced.

It is interesting to note that the shift from modernist to post-modernist ideas in project management did not come from within project management *per se*. It is the software developers who had long suffered the constraints of modernist tools and methods who led the protestation. We argue that the Agile Alliance could be considered an artefact that symbolises the moment that sparked the post-modern project management era. This era creates a real ‘market place’ for the practitioner, as Agile methods compete for their attention and use. All of the traditional tools and methodologies will have to adapt, by way of rejecting some of their modernist features, in order to survive. This will have significant business implications for those who own intellectual property in PM commodities. Modernism sees practitioners compete against each other with the means of competition (membership, certification etc.) supplied by the professional institutions. Postmodernism sees the tool and methodologies compete for the attention of the practitioner and the PM organisation.

Of particular interest is that our analysis suggests that we are just beginning to see the dawn of the post-postmodern era for project

management. One example of this is how Agile is drawing on Kanban techniques, which have their roots in modernist Lean and Just-In-Time production, to create a mixture of Agile and production line processes [140]. We argue that for a post-postmodernism era to be somewhat realised in project management the bodies of knowledge would need to become open-source, where communities of practitioners build PM knowledge around kinds or types of projects which express themselves differently in different domains of work [141].

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