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'Systems' and Project Management

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INTRODUCTION

Some writers have asserted that project management actually derived from 'systems', and these are exemplified. A brief summary of the nature of 'systems' is given, and the substantial contributions 'systems' have made to project management tools and techniques are summarized. However, some project management approaches developed earlier than, and independent from, 'systems', particularly in the construction industry, and these are briefly discussed.

ASSERTIONS THAT PROJECT MANAGEMENT DERIVED FROM 'SYSTEMS'

Several prominent writers say that project management derived from 'systems'. For example, Yeo 1993;111 says

The practice of project management has its origin in systems analysis and systems engineering. Systems analysis requires the setting of clear and credible objectives and the formulation of viable alternatives. Systems engineering is goal-seeking, and emphasises communication and feedback control.

Kerzner 1979;13 said much the same thing, in asserting that

... project management is an outgrowth of systems management.

Cleland & King 1968;viii expressed similar ideas a little differently.

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

A somewhat similar connection is made by Checkland 1981;130 who equates engineering project management with systems engineering, as follows.

This picture of systems engineering as the total task of conceiving, designing, evaluating, and implementing a system to meet some defined need – the carrying out, in other words, of an engineering project – is the one which persists throughout accounts of this activity; and from the 1950s on, many engineers and project managers in large organizations were consciously formulating the procedures needed to make such projects successful,

including the necessary sequencing of activities as well as approaches to coordinating the efforts of numerous specialists.

If project management developments had been confined to the US military, the first three statements above could perhaps be justifiably defended. But developments in project management had also been proceeding in the process and construction industries, and these appear to owe little, if anything, to 'systems'. However, before discussing these developments further, we look briefly at the nature of 'systems', and their contributions to project management.

THE NATURE OF 'SYSTEMS'

'Systems' can mean different things to different people, so that it is not easy to summarise 'systems' in a short paper. The seminal work on 'systems' is probably Checkland 1981, whose treatment of the subject is comprehensive and complex. This complexity will not be reflected in the following summarisations, which mainly derive from writers in the project management domain.

Several writers have specifically identified 'the system approach' with problem-solving processes, including Mukhi et al 1988:50-51, and Kerzner 1979:33, who says:

The systems approach may be defined as a logical and disciplined process of problem solving. The word process indicates an active on-going system that is fed by input from its parts.

'The systems approach' is often associated with systems analysis and systems engineering, notably in the context of 'hard' problems, in which clear and definite objectives can be defined early in the problem-solving stage, and alternative means of achieving the objecting can be found, and evaluated.

Systems analysis

Systems analysis derived from wartime Operations Research (OR) studies, and its development is mainly associated with the RAND Corporation, which was established in 1948 as a non-profit-making corporation in the advice-giving business. As Checkland 1981;135-6 describes it,

During the 1950s the pattern of RAND-style 'systems analysis' became clearer. The work done consisted of broad economic appraisal of all the costs and consequences of various alternative means of meeting a defined end.

Cleland & King 1968;38 describe systems analysis as

a methodology for analysing and solving decision problems through a systematic examination and comparison of alternatives on the basis of the resource cost and benefit associated with each.

Systems analysis techniques are essentially decision theory and operations research techniques, which are covered in many publications, for example Miller & Starr 1960. Some of these are also discussed by Cleland & King 1968 in the first chapters of their book.

Systems engineering

In contrast with a reasonably high level of agreement in the literature about the nature of systems analysis, there appears, at first, to be little unanimity about the place of systems engineering. However, on balance, I believe that many would agree with Yeo 1993;111, who defines systems analysis as a systematic approach that deals with the problems of the identification and selection of alternative proposals, and then defines systems engineering as:

[taking] the decision on the best alternative [from the systems analysis] as given, and concentrates on the implementation of such a proposal.

The list of systems engineering techniques developed during the 1950s and 1960s in the US defence and space programs in the systems engineering/project management domain is very large. Morris 1994: 38-9 records over a dozen examples, while Yeo 1993 says that the Systems Engineering approach developed in the US military in the 1950s and 1960s has provided the conceptual basis for the development of the many modern project-management concepts, procedures and techniques that are familiar today. Examples of such modern project management concepts and techniques are

- the work breakdown structure
- the organization breakdown structure
- responsibility assignment matrix as a structured basis for project planning and organization
- earned-value methods for project measurement
- variance analysis and control
- engineering change control, and
- configuration management

Whilst the contributions to project management from 'systems' have been very substantial indeed, not all of the above concepts and techniques originated in 'systems', but in earlier developments of project management which were independent of 'systems', as now discussed.

PRE-WAR AND EARLY POST-WAR ANTECEDENTS OF PROJECT MANAGEMENT

In his book 'The Management of Projects', Morris 1994 deals extensively with the historical development of project management and relevant antecedents. He discusses several pre-war and early post-war forerunners of project management.

- Proctor & Gamble's development of *product management* (under the term 'brand management') in the mid-to-late 1929s.

Like project management, product management stresses the integration of those functions influencing the successful outcome of a venture. (pp 7-8)

- A *Project Engineer function* was developed by Exxon and other process engineering companies during the 1930s to follow a project through functional departments. (p 8)
- A paper by Gulick in 1937 proposed that a coordinator might be appointed to pull together the administration of a task involving several functional areas. (p 8).
- A *project office* function was progressively developed by the US Air Corps Materiel Division during the 1930s, to monitor the development and progress of aircraft. (p 8)
- Joint project offices, to improve coordination between engineering and production, had become common practice in the USAF by early 1952.

These pre-war and early post-war initiatives had the common denominator of being progressive steps towards developing a project management-like integrating role. Although these initiatives exhibit the hallmarks of the 'systems' approach of viewing a system as a whole, they had nothing to do with 'systems' as such, which had not yet been developed in the form that emerged later. In this sense, the coordinative/integrative functions of project management were evolving well before 'systems'.

DEVELOPMENT OF PROJECT MANAGEMENT IN THE CONSTRUCTION INDUSTRY

Assigning single responsibility for integrating activities throughout the project

The earliest specific move to project management in the construction industry that I know of was in North America in the early 1950s, as recorded by Bechtel 1989.

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

In the Australian building and construction industry, the first instance of the use of the project approach I know of was that developed by Civil & Civic Pty Limited from the mid-1950s, as discussed briefly in an "*Interview with Alan Stretton*" in *PM World Today*, May 2009. With both Bechtel and Civil & Civic, the initiation of project management

approaches was evidently prompted by efficiency/effectiveness considerations, notably in assigning undivided responsibility to a project manager to integrate all activities from project initiation to completion. It is unarguable that these initiatives were undertaken without any knowledge or consideration of 'systems'.

Independent development of some techniques

I can personally testify from direct experience that the work breakdown structure (WBS), variance analysis and control, and engineering change control, were all in place (some with different names) in the construction industry before I ever heard of 'systems', and of the contributions by the US military.

Advances in project management in the construction industry in the early 1960s were greatly influenced by the emergence of network planning and scheduling techniques. Three sets of network planning and scheduling techniques were developed in the late 1950s, with one extending into the early 1960s.

The Special Projects Office of the US Navy developed PERT, the Program Evaluation Review Technique, for the Polaris project in 1957-58. PERT could be seen as a 'systems' development. Reports indicate that this technique was not wholly successful, but it was widely used in the military for some time. However it appears to have been only rarely used outside the military area, and rarely if ever in construction

By far the more important development in this period for construction projects was CPM (Critical Path Method) in Du Pont from 1957-1959. This owed nothing to the 'systems' movement in the military or elsewhere, although there may have been a partially shared common ancestry in Operations Research.

Overlapping with CPM was the development by Fondahl (1958-1961) of what (rather later) came to be called the Precedence Diagramming method (PDM), which became the de facto standard (replacing CPM) by the 1980s. This key development also owed nothing to the 'systems' movement.

So strongly were the developments of CPM and PDM to effect project management in the construction and allied sectors, that during most of the 1960s, and in some cases well into the 1970s, these network scheduling and control techniques were seen as virtually synonymous with project management in many circles. This tended to be an advantage for the project management cause, as the hype surrounding these techniques helped 'sell' project management to some of the more conservative stakeholders in the construction industry.

But these developments are further refutations of implications or assertions that project management derived only from work in 'systems'.

CONCLUDING

This note has acknowledged the great contribution that 'systems' have made to project management tools and techniques, but has refuted implications/assertions that project management specifically developed from 'systems' concepts.

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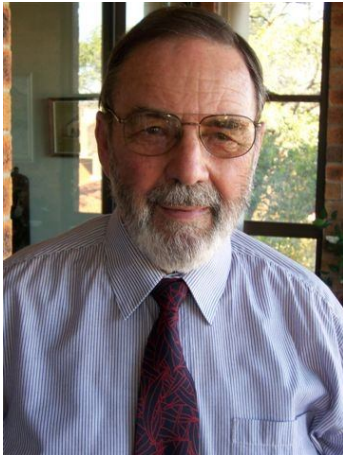
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