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From the Hard paradigms towards Multimethodology in Project Management

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Abstract

Traditional project management techniques rely on detailed models of a component of a project with the main object of providing tactical and operational advice. However, the interrelationships between the project's components are more complex than that suggested by traditional methods. Project management is now being applied to non-traditional areas where change may be common, only broad goals may be scheduled and defined, and the negotiation of these goals may be as important to success as efficiency of project delivery. In this context, a major role for new approaches is suggested, particularly at the front-end of projects, where project managers need to use softer tools within a 'hard' framework of decision point milestones. Multimethodology can be seen as a possible means to facilitate this rapid problem structuring. In this paper, different methodological paradigms are distinguished and utilized as a framework to map a number of management science methodologies. It is the aim of this paper to help project managers to take a systemic view of the project, identifying a suitable combination of methodologies that provides a means to manage the project successfully

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1. Introduction

The appropriateness of some of the basic assumptions on which traditional tools and techniques are based is coming into question in many project contexts. Traditional assumptions of project management are suited to specific contexts, those where efficiency and control are paramount, and where goals are predetermined, uncontested, and are expected to remain the way[1]. However, these assumptions are starting to be questioned in terms of their ability to address complex problems[2]. A focus on control and reductionist approaches has been found to restrict project management to manage simple projects in relatively stable environments or be inadequate for addressing systemic effects[3,4].

Traditional techniques, which can be very effective in situations typified by common situational logic but less useful in "messy" situations, rely on detailed models of a component of a project with the main object of providing tactical and operational advice about the scheduling, control and monitor of projects[1]. For projects that are complex, uncertain, and time-limited, conventional methods might be inappropriate and aspects of newer methodologies in which the project "emerges" rather than being fully preplanned might be more appropriate[5]. These kinds of criticisms have been raised in relation to some of the techniques most commonly associated with traditional project management such as breakdown structures[4,6]; network analysis in general[7], PERT[4,8], and critical path analysis[9]. The limitations of the assumptions on which traditional project management tools and techniques are based can be taken as indicating a movement away from the traditional way these tools and techniques are applied.

Project management is now being applied to non-traditional areas such as organizational change and information systems development, where change may be common, only broad goals may be scheduled and defined, and the negotiation of these goals may be as important to success as efficiency of project delivery[1]. In this context, a major role for new approaches is suggested, particularly at the front-end of projects, where objectives are often unclear and where different actors have conflicting aims[10,11,12]. It is assumed that behind the decision to initiate a project there is supposed to be a well-thought strategy, against which the outcome of the project can be objectively evaluated. However, in practice, projects can be initiated for unclear reasons, undertaken with the process in mind rather than outcomes, and pursued despite environmental changes which leave the project objectives obsolete or even undesirable[13]. At the front-end of projects, the problems of real-world situations do not present themselves to project managers as well-formed structures, indeed they tend not to present themselves as problems, but as messy, undetermined situations[14].

The field of project management may actually be in the process, not of a paradigm change, but an expansion of paradigms that are acceptable and applied within the field[1]. Yeo[15] suggested that it was time to reunite the field of project management with the extended body of knowledge and systems methodologies such as Soft Systems Thinking. According to Morris[16] the theory of project management remained stuck in a 1960s time warp. Multimethodology can challenge the dominance of the single method orthodoxy. By combining the multidimensionality of a project and the different types of interventions, project managers must be able to take a systemic view of the project, identifying a suitable combination of methodologies that provides a means to manage the project successfully. This paper begins by presenting four distinctive paradigms: functionalist; interpretative; critical; and post-modern. Section 3 is dedicated to the concept of Multimethodology and in Section 4 a tentative mapping for a number of well-known 'soft' and 'hard' Operations Research methodologies is shown and used to help linking them together. Finally, there is a conclusion section with the main findings of the paper.

2. Management Science Paradigms

In this section, four distinctive paradigms: the optimization/normative paradigm; the interpretative/learning paradigm; the critical paradigm and the post-modern paradigm, are introduced in order to be utilized as a framework to map different management science methodologies and methods usually utilized by project managers[17].

The optimization/normative paradigm (problem solving methods, 1940-1960) has been associated with the development of the so-called "classical Operations Research" and the belief that organizations can be seen as objective worlds. This paradigm relied on the assumption that the decision maker acts in full possession of rationality or bounded rationality[18] and the ability to choose between alternatives generated in full knowledge of what the problem is and when she/he wants to be. Project management has developed as an essentially purposeful, functionalist activity aligned with the hard paradigm in terms of tendencies, towards positivist and realist philosophies and a focus on objectivity

and reductionist[1]. Objectivity and the assumption of a stable and equally accessible reality are considered as indicative of a realist philosophical underpinning. Reductionist, or to accept that goals and the required work can be decomposed and thus explained by simpler, more fundamental things[7,19] and a strong emphasis on centralized control instead of participation or learning[3,20,21] are also indicative of the hard paradigm.

The interpretative/learning paradigm (improving-situation methodologies) emerged during the 1960s and 1970s. During this period a number of Soft Systems Thinking methodologies appeared in the UK, amongst the more influential were Checkland's Soft Systems Methodology[22] and cognitive mapping[23]. Ackof[24] called this paradigm the "design approach" because these methods attempts to dissolve systems of problems or messes as opposed to the "research approach" that aims to tackle the context (environment) where the messes take place. This paradigm, usually taken as the one representing the "soft" Operations Research, is probably the most well-known and populated in terms of the number of methodologies adhered to it, methodologies such as: soft systems methodology; interactive planning; strategic assumption surfacing and testing; systems intervention strategy; strategic choice approach; social system design; cognitive mapping, strategic options development analysis; and team syntegrity. The soft paradigm is commonly associated with an interpretative epistemology, inductive reasoning, and exploratory, qualitative techniques, which emphasize contextual relevance rather than objectivity. Practice based on the soft paradigm emphasizes learning, participation, the facilitated exploration of projects, and typically demonstrates an interest in underlying social process[1].

The critical paradigm (intervention-empowering emancipatory systems methodologies emerged during the 1980s and 1990s). Critical systems thinking[25-27] appeared in the UK systems movement when total systems intervention embraced the critical systems thinking commitments in systems practice[25]. Its philosophy is based on the belief that social systems are oppressive and unequal. The critical systems thinking provides the philosophical underpinning for the methodologies in this group, working in a coercive context in which the social and organizational world are oppressive and unequal. Two main approaches, critical systems heuristics[28,29] and total systems intervention[25] were applied under the banner of critical systems thinking in the UK.

The post-modern Management Science/Systems Thinking approach emerged in the early 2000s questioning the dominating and totalizing discourses[30]. Championed mainly by Tacket and White[31-33], it is based on a narrative that attacks the rationality embedded in the pretensions of modernism in grand narratives, proclaiming instead the ever presence of indeterminacy and chaos. The needs of the individual and the focus on power knowledge that will resort to a variety of tools and techniques are very much in the agenda of any post-modernism systemic interventions[34].

3. Multimethodology

While multimethodology is not yet in position to challenge the dominance of the single method orthodoxy, it is, nevertheless, becoming increasingly popular. Bennett[35] and Bennet and Cropper[36] combine conflict analysis, strategic options development analysis and strategic choice to demonstrate the value of employing different methodologies at various stages in the intervention process. Gains and Rosenhead[37] combine cognitive mapping with Soft Systems Methodology in medical quality assurance and Lane and Oliva[38] illustrate how strategic options development analysis can help in the problem formulation stage of systems dynamics modelling. Ackerman and Belton[39] combine strategic options development analysis and multiple criteria analysis to acquire, organize and make use of corporate knowledge. Stowell[40] uses Soft Systems Methodology in a similar way in information systems development. Mingers and Brocklesly[41] outline some of the philosophical, cultural and cognitive feasibility issues that multimethodology raises.

Multimethodology can be seen as a possible means to facilitate rapid problem structuring, the analysis of alternative process design and then, the specification through to systems solutions[42]. The essence of Multimethodology is dependent on the idea that techniques can be detached from one methodology and used in another[41]. In this sense, techniques can be complementary to each other in that several may occur, or they may be substitutes, any one being potentially satisfactory. Thus, in moving a technique from one methodology to another, the technique can conserve the original function or the context makes different paradigm assumption. Theoretically, the development and use of multimethodology often relates to the problem of jumping between hard and soft interpretivist paradigms. Whereas academics consider these to be in distinct philosophical contradiction, practitioners can perceive and experience these problems far more pragmatically. There are three main arguments in support of multimethodology[41,42]: Firstly, real-world problem situations are multidimensional. Since each paradigm only reveals certain aspects of a problem

situation, when adopting only one paradigm, project managers are inevitably gaining only a limited view of the project situation but they are completely blind to others. According to Habermas[43] each real-world situation of human activity will include three worlds: (*i*) the material world which is outside and independent of human being and objective in the sense that is independent of the observer; (*ii*) the personal world which is the world of our own individual thoughts, emotions, experiences and beliefs. It is subjective in that it is generated by, and only accessible to the individual subject; and (*iii*) the social world which is one of intersubjectivity once it is, on the one hand, a human construction, and yet, on the other, it goes beyond and preexists any particular individual. Another argument for multimethodology is that by combining methodologies project managers can construct a more effective combination that deals comprehensively with a particular intervention. An intervention is not usually a discrete event but proceeds through a number of phases that pose different tasks. Thus, in the selection of a multimethodology there are the following stages: (*i*) appreciation of the problem situation as experienced by the agents involved and their access to the situation; (*ii*) analysis of the underlying structure/constraints generating the situation as experienced. Why the situation is as it appears; (*iii*) assessment of the ways in which the situation can be other than it is, of the extent to which the constraints could be altered with the general limitations of the intervention; and (*iv*) action to bring about desirable or agreed changes. The last argument in favour of combining methodologies is that multimethodology can be seen as an appropriate response to postmodern beliefs and values, and as the definitive form of postmodern management science practice.

4. A framework to map Management Science methodologies and methods

Projects are made up of complex relationships between the personal, material and social worlds and depend, not only on companies and organizations for the material and personal resources, but also on the social context that exists within these companies and organizations. Thus, project managers must be able to "take a systemic view" of the project, incorporating elements of the three worlds and then to identify a suitable combination of methodologies that provides a means to manage the project successfully. By combining the multidimensionality of a project and the different types of interventions that need to be undertaken, the framework shown in Table 1 is produced. This framework can then be used to map the characteristics of different methodologies to help in linking them together. Since a fully intervention needs to be concerned with the three different worlds (material, personal, and social), and the four different phases (appreciation, assessment, analysis and action), each box in the framework generates questions about particular aspects of the project that need to be addressed. Looking at particular methodologies to see to what extent they address these questions, it is possible to appraise their relative strengths or weaknesses in each box[41].

Table 1. Project dimension and types of intervention in a project

	Project dimension		
Intervention	Social	Personal	Material
Appreciation of	Cultural, social, and political environment; social practices; power relations; relations with others	Individual beliefs, meanings; emotions; needs; self-esteems; abilities; solidarity; leadership	Physical and technical circumstances
Analysis of	Distortions; conflicts; interests	Differing perceptions and personal rationality; problem solving ability	Underlying causal structures
Assessment of	Ways of altering existing structures	Alternative conceptualizations and constructions	Alternative physical and structural arrangements
Action to	Generate empowerment and enlightenment	Generate accommodations and consensus; solving conflicts	Mobilizing resources, select and implement best alternatives

Source: adapted from Mingers and Brocklesly[41]

Table 2 and Table 3 show a tentative mapping for a number of well-known "soft" and "hard" Operations Research methodologies. The soft methodologies used in the appreciation phase are Soft Systems Methodology and Critical Systems Heuristics whereas the methodologies used in the analysis and assessment phases are Cognitive Mapping and Visual Systems Methods. Finally, a Strategic Choice type commitment can be used to facilitate agreement and implementation. Soft Systems Methodology is particularly strong for analysis and assessment of the personal

dimension and can also be used for appreciation of the social and material worlds. Critical Systems Heuristics is aimed at the appreciation of the social world whereas Strategic Choice is strongest for assessment and action of the personal dimension but it not aimed so much at generating and exploring a diversity of individual viewpoints, more at generating commitment to a particular viewpoint. Viable Systems Method is essentially related to the material and social worlds, providing a model of viable organization structure based on an analysis of biological organisms, and thus it has the power to analyze weaknesses and suggest effective alternatives. Cognitive Mapping has strengths in appreciating and analyzing individual's pattern belief, it has gained commitment to action, but is weak in assessing possible alternatives.

Table 2. Soft methodologies applied in the appreciation, analysis, assessment and action of the three different worlds

	Appreciation of	Analysis of	Assessment of	Action to
Critical Systems Heuristics	Social			
Soft Systems Methodology	Social, Personal and Material	Personal	Personal and Material	
Cognitive mapping		Personal		
Viable Systems method			Material	
Strategic choice				Personal

Source: adapted from Mingers and Brocklesly[41]

Table 3 shows the "hard" Operations Research methods and methodologies based on the three philosophical dimensions described above (ontology, epistemology and axiology). The first column addresses the ontological assumptions, that is, what the methodology does, the second column deals with the epistemological assumptions of the method, that is, the form that the model takes. For example mathematical programming uses a set of simultaneous equalities together with an objective function and an optimization model while dynamic programming uses a combination of states, stages and recursions. The final column deals with the axiological assumptions describing the use of the method.

Table 3. Classification of main Management Science methods

	A system to	By modelling	In order to
Network models	Represent the component activities of a project and the precedence relationships among them.	Activities' attributes, resources, constraints.	To analyze the schedule information and explain the sequencing need for project activities.
Multi-objective decision-making	Model the relation between the measurable attributes of entities and processes and to optimize the value of an objective(s) function using linear and nonlinear equations	Linear and nonlinear variables, constraints.	Evaluate many different options and decisions thereby optimizing an objective
Multi-criteria decision-making	Make decision in the presence of multiple and often conflicting criteria	Activities' attributes (time, cost, safety, quality, etc.)	To evaluate, rank and select the best option from a group of alternatives
Game theory	Model the evolution of a conflict or competitive situations involving different players and interacting decisions and strategies using a variety of game-theory-based modelling tools	Activities' attributes (time, cost, etc.)	To explain the behavior of two or more players, i.e., owners, constractors, and explore different solutions among them.
Dynamic programming	Model situations where decisions are made at stages and to determine a strategy which is optimal in a multi-stage decision problem.	Activities' resources	To explore the operation of complex real-world project situations to aid understanding and control.
Forecasting models	To forecast the future value of measurable attributes of entities and processes as a function of past data.	Activities' attributes (time, cost, etc.)	To predict the behavior of real-world systems and obtain reliable warnings so that this behavior can be changed or anticipated.

Simulation models	Simulate the behavior of a project with stable patterns of statistical behavior and the activities their undergo	Activities' attributes (time, cost, etc.)	To explore the operation of complex real-world interactions between discrete entities to increase understanding of their behaviour in the project.
Markov model	To model stochastic or random processes in which transitions between states as well as the time the system spends in each state are random.	Probabilities, time	To address stochastic scheduling problems and risk evaluation.
Data Envelopment Analyses (DEA)	To calculates the relative efficiency of multiple projects on the basis of observed inputs and outputs	Inputs: resources; Outputs: time, cost	To evaluate and select projects in a multi-project environment

5. Conclusions

Project management is now being applied to non-traditional areas, such as organizational change and information systems development, where change may be common, only broad goals may be scheduled and defined, and the negotiation of these goals may be as important to success as efficiency of project delivery. In this context, a major role for new approaches is suggested, particularly at the front-end stage where the combination of methodologies or parts is being desired. Project managers need to use softer tools within a "hard" framework of decision point milestones, integration with corporate plans, requirement capture modelling, benchmarking and more value optimization. The choice of methodologies to combine will depend on the skills, knowledge, experience, competences and personal style of the project manager at a particular point in time of the project. Multimethodology can be seen as a possible means to facilitate this rapid problem structuring and the analysis of alternative process design. In this paper, a tentative mapping for a number of well-known 'soft' and 'hard' Operations Research methodologies is shown. This framework is then used to map the characteristics of the different methodologies generating questions about particular aspects of a project that need to be addressed. This paper shows how looking at particular methodologies from different paradigms to see to what extent they address these questions, project managers can take a systemic view of the project, identifying a suitable combination of methodologies that provides a means to manage the project successfully.

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