DISCOVERING THE PRINCIPLES OF PROJECT MANAGEMENT: AN INTERIM REPORT ON THE FIRST FIVE YEARS OF AN INVESTIGATION INTO THE PRACTICES OF PROJECT MANAGEMENT IN LARGE PROJECTIZED PRIVATE-SECTOR COMPANIES

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ABSTRACT

Large companies in many industries are partially or largely "projectised", and the success or failure of the projects that they undertake has significant social and economic implications. Observation suggests that improvement initiatives are frequently undertaken by the management of these corporations on the basis of anecdotal evidence and incomplete data, and with unclear objectives or success criteria. It follows that the impact of any particular initiative is difficult to assess.

In the light of these observations, the author established a research program at the end of 1993 which initially posed six questions:

1. What aspects of project management are common to different industries?

2. Which aspects of project management (such as practices or processes) are sufficiently important to project-based organisations that they are felt to be worthy of measurement across industries?

3. What useful cross-industry "metrics" can be developed to measure the relative performance of these practices or processes, and what constitutes the "benchmark" for them?

4. What evidence is there from actual project outcomes that the "benchmark" practices translate into actual project performance?

5. In the light of project performance, which practices and/or processes can be demonstrated to have a determinative influence on project performance?

6. How can metrics that are relevant to determinative practices or processes be incorporated into useful predictive models?

An appropriate "mixed methodology" was established, with the collaboration of the companies taking part in the research. The approach was pragmatic, empirical and iterative. A network of 15 large companies was assembled. The network had a combined annual project spend in excess of £15,000 million in 1995. After the first five years of work, the number of companies taking part has grown to more than 30. Partial answers have been found to the first five questions and tentative answers are emerging to the sixth. Taken together, the answers are beginning to suggest some "principles of project management".

Perhaps as interesting as the answers to the original research questions is the understanding of research methodology that has emerged from the program. Neither the positivist (or post-positivist) paradigm on the one hand, nor the constructivist paradigm on the other has been found to provide research instruments or methods that are rich enough on their own to capture the full extent of the complexity inherent in such a complex reality-structure as a "project", let alone a "projectised company".

The "mixed methodology" action research that has evolved during the past five years will be described, and evidence will be provided that it can enhance the research capability of traditional "single paradigm" methods. Research instruments developed using the methodology will be described, including:

- an instrument for assessing the capability of an enterprise to define, initiate, plan, execute, control, support and close-out a project, and

- an instrument for assessing the correlation between particular project management practices and processes and project results,

BACKGROUND

In January 1994, fifteen large companies started to work together as a "project management benchmarking network". Some 30 organisations had been invited to form the network by the author of this paper, and fifteen accepted the invitation.

Behind the commercial objectives that the members committed to, and with the consent of the members, the author also undertook to conduct the investigation as a research study seeking to answer the following six questions:

1. What aspects of project management are common to different industries?

2. Which aspects of project management (such as practices or processes) are sufficiently important to project-based organisations that they are felt to be worthy of measurement across industries?

3. What useful cross-industry "metrics" can be developed to measure the relative performance of these practices or processes, and what constitutes the "benchmark" for them?

4. What evidence is there from actual project outcomes that the "benchmark" practices translate into actual project performance?

5. In the light of project performance, which practices and/or processes can be demonstrated to have a determinative influence on project performance?

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RESEARCH ISSUES AND APPROACHES

The title of this paper is "Discovering the Principles of Project Management". Behind this choice of words is a construct that itself needs to be explored – the assertion that there are some principles available to us to be discovered. But are there? The activity of setting out to discover something assumes that the "something" has an objective existence of its own, and is lurking in some sort of "undiscovered" state waiting for the explorer to come across it. A good example might be a fundamental law of science, such as the second law of thermodynamics.

Laws as social constructs

Laws, like principles, exist in language. They are "social constructs" that obtain their "reality" from the fact that numerous human beings agree to their truth and validity. Clusters of constructs form "paradigms", that in turn influence the way people who adhere to those paradigms view the world. Thomas Kuhn's seminal work (Kuhn 1996) illustrates the effect this has and has had on "science".

And yet it seems nonsensical to claim that it was the act of "discovering" the second law of thermodynamics that brought the phenomenon of entropy into existence. The "truth" that the law is seeking to describe is a property of the physical universe – as it were "woven into the fabric" of physicality itself. Both the universe and its properties existed before the law was created in language to describe it. The law didn't exist before it was "discovered"– the "reality" did.

Another way to put this is that science, as a discipline, is based on a "realist" attitude to the physical universe, but scientists acknowledge the necessary existence of social constructs. Indeed, it is one of the characteristics of the scientific method that all such "laws" are typically held to be true "provisionally", pending the emergence of experimental evidence that causes the construct to be modified or, indeed, abandoned.

This is highly relevant to research into project management or the management of projects.

The philosophical basis to project management

Few published works on project management make explicit the philosophical approach on which they are based. Most writers seem to imply that some form of empirical realism is possible. Some describe project management as a science or suggest that it uses "scientific" techniques, as for example Kharbanda, Stallworthy and Williams (1980). They define cost engineering as "that area of engineering principles where engineering judgement and experience are utilised in the application of scientific principles and techniques to problems of cost estimation, cost control, business planning and management science."

Morris (1994) states:

> "there is not yet an adequate conceptual basis to the discipline [of project management]",

and concludes:

> "the current formal view of, and indeed practices of, project management are often inadequate to the task of managing projects successfully; and that we would do better to enlarge the subject to the broader one of the '*management of projects*'"

by including topics such as:

> "design and technology management, the management of political forces (governmental and non-governmental, and 'political with a small p' - business, labour and community), cost-benefit management and the raising and management of the project's finance, the management of the timing or phasing of the project (something quite different, incidentally, from the theory and practice of project scheduling), and even contract strategy and administration."

The author agrees with Morris, but believes he doesn't go far enough.

Most project management literature assumes and justifies a particular world-view (that of the project management professional). Consequently, the challenge facing any research program such as this one is to determine the appropriate research method to adopt. Even, in fact, to questioning the appropriateness of the world-view itself.

Project management clearly is a social construct involving a particular way of thinking and talking about a particular enterprise undertaken by a particular group of people. As such, it belongs firmly in the domain of social science rather than of science. On the other hand, many of the products produced by projects employ either the hard sciences (e.g. in the construction of a space probe) or technologies directly derived from the hard sciences (e.g. in the construction of a new building). This means that the realm of project management encompasses both social science and science, and the investigation of an appropriate research methodology must be broad enough to hold a debate simultaneously with both of these domains.

This paper will address the debate by starting with such fundamental questions as: "What is going on when people gain 'knowledge'?", "Does a physical reality exist, and how can people have access to it?", and "What role does language play in giving people access to knowledge about reality?" . Only after obtaining answers to these questions is it appropriate to ask, "What is an appropriate research paradigm to give people access to knowledge about project management?"

WHAT IS GOING ON WHEN PEOPLE GAIN "KNOWLEDGE?"

In popular language today, a sharp distinction is drawn between "subjective" opinions and "objective" knowledge. Phrases such as "just give me the facts" give voice to the prevalent idea that somehow "objective" knowledge is of a higher value than the mere "subjective". Ever since the Copernican revolution, science has been seeking to remove "subjectivity" from knowledge, and thus to remove any distortions from man's understanding of the true nature of physical reality.

The classic dichotomy – Realism versus Constructivism

In the realm of philosophy, the logical positivists such as Russell and Ayer have taken this worship of "objectivity" to such an extent that the positivist school admits as real only such statements as can be demonstrated beyond all doubt. As Russell explains, "The pioneers of modern science proceeded from the observation of particular facts to the establishment of exact quantitative laws, by means of which future facts could be predicted." (Russell 1937) As Drusilla Scott illustrates this. "You see from your office window many umbrellas in the street below (fact). You suppose it is raining (induction to hypothesis). If so, the street will be wet and shiny (deduction). You stand up and look (test). It is. Your hypothesis is confirmed." (Scott 1996).

An alternative approach has been adopted by Sir Karl Popper, who, recognising that there was something more to the process of scientific discovery than the cold logic espoused by Russell, chose rather to relegate the subjective and creative elements of the process to the realm of psychology.

> "The work of the scientist consists in putting forward and testing theories. The initial stage, the act of conceiving or inventing a theory, seems to me neither to call for logical analysis nor to be susceptible of it. The question how it happens that a new idea occurs to a man – whether it is a musical theme or a dramatic conflict or a scientific theory – may be of great interest to the empirical psychologist but it is irrelevant to the logical analysis of scientific knowledge. This latter is concerned with questions of validity . . . Can a statement be justified? . . . In order that a statement may be logically examined in this way, it must already have been presented to us." (Popper 1959).

In other words, logical positivism denies the reality of anything that cannot be subjected to a standard of proof accomplished only in Mathematics, while those who accept Popper's theory of science restrict the realm of what can be known by excluding all the messy areas that involve "subjective" elements.

In sharp contrast to the confidence of science and positivism, the second half of the twentieth century has seen the emergence of a view that is in total contrast to it – a view that is often characterised as constructivism, but that leads to the outlook known as "postmodern". In this view, all confidence in man's ability to know anything about reality is replaced by a deep-seated suspicion that anything that is spoken says more about the speaker than it says about the object which is spoken about. For example, "Roland Barthes (1915 – 1980) exposes the manipulative power-interests which often underlie the 'mythologies' of the second half of the twentieth century. In his *Mythologies* (French 1957, English 1972) he unmasks what we too often perceive as 'natural' or 'given' as socially contrived. Many manipulative devices appear to be natural 'truths'."(Thiselton 1995)

An alternative epistemology

Michael Polanyi proposed a radical alternative both to positivism and to constructivism. Polanyi saw great danger in the separation of personal judgement and involvement from scientific method, and asserted that "the devaluing of personal judgement is a self-fulfilling principle, since any faculty that is unused tends to decay. Many people have in any case less opportunity for using their personal judgement than men had in the past, and when they are consistently told it is unreliable and irrelevant, they use it even less, and it becomes unreliable and irrelevant. We wait for 'science' to pronounce." (Scott 1996)

As Polanyi put it:

> "Backed by a science which sternly professes that ultimately all things in the world – including all the achievements of man from the Homeric poems to the *Critique of Pure Reason* – will somehow be explained in terms of physics and chemistry, these theories assume that the path to reality lies invariably in representing higher things in terms of their baser particulars. This is indeed almost universally regarded today as the supremely critical method, which resists the flattering illusions cherished by men in their nobler faculties." (Polanyi 1959)

A glance at any modern broadsheet reveals the extent to which the general public is willing to give credence to any survey or research that can lay claim to being "scientific".

And yet behind this façade of "objectivity" lurks personal and subjective commitment. "From a psychological point of view I am inclined to think that scientific discovery is impossible without faith in ideas which are of a

purely speculative kind and sometimes quite hazy; a faith which is quite unwarranted from the scientific point of view." (Popper 1959) It is this movement from "faith" to evidence to grounded theory that lies behind the methodology adopted in the research program being described here.

A NEW RESEARCH METHODOLOGY

A lack of rigour about these epistemological considerations is one factor that has limited the contribution made so far to the global project management "body of knowledge" by research. This has led the author to the development of an explicit research model – one that may possess the capability of "breaking free" of the constraints of existing paradigms while retaining epistemological consistency.

In essence, the method consists of an iterative cycle of four steps, each one of which makes an important contribution to the overall method (see Exhibit 1). Applied consistently and with continuity, the method comprises a rigorous enquiry into both the elements and also the limits of the world-view under investigation.

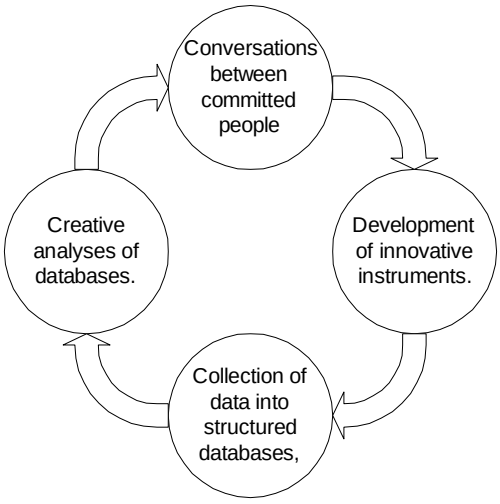

Exhibit 1: An explicit research model

The research is undertaken by a network of research partners (large organisations to which project management is a commercially important function) who both fund the research, and also bind themselves by agreement with each other and with the network facilitators to provide suitably qualified people for the workshops and working parties, to provide timely and accurate data for research, and to safeguard the commercial sensitivity of the research outputs. The network is facilitated by a research organisation that exists solely to serve the research network, is independent of any member of the network, and that binds itself to the research network in the agreements that have just been described.

1 Conversations between committed people

The first element in the method consists of structured conversations (workshops) between people who are both knowledgeable and committed; knowledgeable about the existing project management "world-view" and committed to identifying those areas where the current world-view's limitations lead to project failure, with its high concomitant social and economic cost. The conversations are structured using a wide range of group dynamic techniques and are led by skilled facilitators who are themselves both knowledgeable and committed in the same way as the participants, but whose sole function during the workshop is to lead the group process.

This enables those participating in the conversations to arrive at a common structure for the knowledge to which they have common access, and to identify questions to which they have no answers, or recurrent problems with which they are confronted. Input to the conversations is made in the form of both quantitative data (analysis of research data provided by the participants – see step 4 below) and qualitative data (case study presentations by members).

The conversations are facilitated in a highly nuanced manner, so as to explore the subtleties of the world-view in a way that is simultaneously critical and constructive. This means that the workshops themselves provide

refinements to participants' understanding of the current world-view (new insights), as well as questions arising from the world-view to which answers may well prove valuable (research questions).

The use of analytic techniques for choosing between the alternatives thus generated, such as the Analytic Hierarchy Process (Saaty 1990), enables consensus to be achieved as to which questions are the most important for immediate research, or which are suitable topics for future workshops.

2 Development of innovative instruments

These questions are themselves the object of the second element in the research method. A subset of those people who are involved in the conversations including both facilitators and participants is commissioned by the whole group to develop a research instrument that might shed light on the research question, using whatever research methods seem appropriate to it. The preferred method is to establish a working party, which creates the appropriate instrument using project management methods from within the world-view to manage the production of an instrument that meets the requirements generated by the workshop that originated it.

The working party agrees terms of reference with the research network at a subsequent workshop and maintains informal contact with members of the research network to assure the quality of the instrument. The instruments thus developed are themselves presented to the research network in a workshop.

3 Collection of data into structured databases

Research instruments, once generated, are used by the members of the research network to provide data into a central data repository held on behalf of the research network. The data includes numerical performance measures (such as the actual costs and durations of specific projects), qualitative descriptions of specific practices, decisions or policies and judgements about the specific practices scored against explicit scales. The confidentiality of commercially sensitive data is assured through agreements signed between each member and the network facilitators. Only the originators of the data and employees of the network facilitator see raw data.

Audit methods agreed by the working party that originates the instrument allow the accuracy of numerical data to be assured, and the network facilitators work with chosen representatives to assure the application of common standards to items on questionnaires that call for the respondent to exercise judgement.

4 Creative analysis of the databases

Unlike many research programs that employ a single paradigm, analysis of the data that are collected using this method is carried out in stages using a variety of research methods to "wrest knowledge" from the databases. Textual answers to qualitative questions are analysed using qualitative methods supported by such software tools as QSR.NUD.IST. Quantitative data is analysed using a wide range of statistical techniques supported by software tools such as SPSS or Answer Tree. Techniques such as grounded theory or system dynamics are employed to allow a nuanced interplay of qualitative and quantitative methods.

The results of the analysis are fed back into the research network in the form of input to workshops, at which the hypotheses and conclusions are assimilated by participants and their existing world-view is either enriched or challenged. Since the investigation is iterative and endless, all research results are tentative and stand ready to be challenged on some future occasion. As fresh questions arise during workshops, further analysis is performed on the database. Questions produce tentative answers, and the answers in turn raise further questions. And so the enquiry continues.

EXAMPLES OF TWO "INSTRUMENTS" DEVELOPED DURING THE RESEARCH

Corporate practice questionnaire

This was the original instrument developed by the author, his team and members of the first network. A list of "topics" was generated that represented areas of project management interest for the members. No attempt was made to provide an overarching structure. The ten topics chosen for study were:

1. Integrating project working into the organisation.

2. Managing human factors in projects.
3. Defining project "anatomy".
4. Defining and executing projects.
5. Estimating cost, time and resource requirements.
6. Analysing and managing risk.
7. Managing quality.
8. Monitoring and controlling progress.
9. Closing projects.
10. Measuring project performance.

A series of questions were generated for each topic, and referred to the membership for comment. Members were asked to score themselves on a scale of 0 to 5 for each question, with scoring guidelines being provided by the research team. The scoring guidelines attempted to establish both ends of a spectrum for the 0 and 5 scores, and to provide some indication of appropriate intermediate points along the scale. Members were asked to provide integer scores for both "approach" and "deployment" – as used in the European Quality Award self-assessment instrument. They were also asked to cite evidence for why they had scored the questions as they did. To provide some indication of the scorer's perception of their organisations' success, three general questions probed the perceptions of success from the viewpoint of the customer, the sponsoring organisation and the members of the project team.

Data collection methods varied in different organisations, with no single method being mandated. In some, for example, a knowledgeable individual provided the answers from his or her own knowledge of the organisation. In others, facilitated workshops were held with representatives from the whole project management community discussing each question and agreeing on both the scores and the evidence. The only check that different organisations were interpreting the scoring guidelines in ways that were comparable came from a review of the evidence. Where it was apparent to the author and his colleagues that the interpretation of the scoring scale was at variance with that intended, the member organisation was contacted by telephone and a conversation ensued to ensure that agreed guidelines were followed.

There are clearly weaknesses with this method. Different methods of scoring the questionnaire (e.g. by an individual versus at a workshop) may have led to different organisations giving different scores for broadly similar practices; people may have understood the question and its scoring guidelines in a different sense than was intended by the authors of the questionnaire; the views of those providing the score may have been unrepresentative of either what happens, or of what happens throughout the organisation they were representing.

On the other hand, the purposes of this survey were modest, and the inherent variability was adjudged by the participants as providing an acceptable margin of error for what was, in essence, a "ranging shot" in the overall methodology.

Since the initial survey in 1994, four improvements have been made to the instrument, and one to the manner in which data is collected.

1. In the second survey of 24 organisations carried out during 1996 and 1997, two further topics were added at the suggestion of members: managing the customer, and implementing process improvements.

2. In a third survey carried out during 1999 on an increasing number of organisations (at the time of writing 41 sets of data have been received, and 40 of them processed) a more consistent attempt was provided to structure the data according to a systems view of the way projects are integrated into the enterprise. The questionnaire was expanded to include a total of 142 questions.

3. Also in the third survey, questions were added in the light of research carried out using the Data Collection Instrument – a different research instrument that will be described below.

4. After the third survey instrument had been completed and 32 sets of data had been processed, a new network was formed consisting solely of major pharmaceutical organisations involved in the development of new pharmaceutical compounds. At the time of writing, this new network has thirteen members, including six of the industry's top ten R&D spenders. A working party of members of this network took the 142 questions of the third survey to extract from it those questions that were thought to be especially relevant to drug development projects. Very few questions were excluded, although members felt that it was important to restrict questions to a maximum of 100 for practical reasons of

data collection. The final questionnaire used by the network (the Pharmaceutical Industry Knowledge Network).

5. The change to data collection methods has yet to be applied consistently, but it has been tested in practice and found to be viable. In this method, a small group of trained facilitators are familiarised with the questions and the scoring scales for each. A group of project managers from throughout the organisation that is submitting the data is assembled for a one-day workshop. This group is then led through a facilitated program to describe in detail the practices and processes by which projects are managed in their organisation, using a standard glossary to ensure that terms are used in the same way (in this case, the glossary provided by PMI's Guide to the Project Management Body of Knowledge). The facilitation team record the output, and enter into dialogue with the participants after the workshop to ensure that what was captured was a fair description of what the participants believe to be the case.

   The trained facilitators, who submit their answers to the workshop participants, allowing them to question any scores that they believe to be inappropriate, then answer the questionnaire. Once comments have been received and incorporated, the data is submitted for inclusion. This is still a basically "subjective" record, but it removes significant elements of variability from the data collection.

Data Collection Instrument (DCI)

The second major research instrument employed by all members of the benchmarking networks is an instrument that collects both "subjective" and "objective" data about the conduct of a specific project. It was originally referred to as the "Data Collection Instrument" (DCI), but is now more popularly known as the "Project Health Check Tool".

The purpose of the DCI is to relate specific project management practices that are employed on a specific project to the tangible and intangible results achieved by the project. The DCI itself is a Microsoft Access application that is run on multiple computers by a member of the network, so that data can be entered by many project managers. Data can be consolidated at a central site for internal analysis, and the data on any number of projects can be exported by the company to the research team for research or for "benchmarking".

This structure represents the second version of the instrument, developed jointly with member organisations after the first version yielded promising data, but was found to take more effort in providing the data (approximately six days of work-effort) than members were willing to invest. The first version was developed using System Dynamics principles (SD) to build a generic model of the dynamic interplay of planning and management practices, and their effect on resourcing and productivity.

The second version used GQM (Goal/Question/Metrics) principles (Rombach and Basili 1987) to develop an instrument that would accomplish many of the objectives of the first version, but would allow data to be provided for less than one hour's effort. This was accomplished by a working party using project management techniques.

The instrument contains a number of assumptions and constructs that were made explicit during the development process. These can be articulated as follows:

1. Different projects in different industries follow different life cycle models, but each project will pass through a set of specific "transition points" from one state to another. It was possible to define a series of 19 such transition points (known as "key project events") that were recognised as relevant and significant by each of the member organisations, regardless of industry or type of project.

2. Questions about project management practices can be divided into questions about "products" (i.e. artefacts that represent the outputs of a process) and "processes". In each case, the person providing the data (usually the project manager) is asked to asses the "adequacy" of the product or process in terms of its suitability to be utilised "as implemented" to manage the entire project. In the case of processes, a secondary question asks for a judgement about the "maturity" of the process within the organisation.

3. An appropriate scale for "adequacy" extends from (N)ot at all adequate, through (P)artially adequate and (L)argely adequate to (F)ully adequate.

4. An appropriate scale for "maturity" extends from (C)ommitted, through (A)ctively applying, (P)erforming with trained and knowledgeable people and (M)easuring the extent to which it is being applied to (V)erifying the extent to which the process is applied.

5. By collecting specific project results in terms of cost escalation, scope creep and schedule delay it will be possible to correlate not only the perceived adequacy of project management products and processes and the perceived maturity of project management processes with project results, but also to assess the impact of the timing of these practices. This will be done by comparing the final project results with the adequacy of different products and processes at different stages of the project (using the key project event data).

6. Assuming an adequate sample of projects (allowing for different industries, project types and so on), it will be possible to identify the effect of different practices on project results, and thus to derive some fundamental principles of project management.

INDICATIVE FINDINGS OF THE RESEARCH TO DATE

The research program is very much in progress. Indeed, at the time of writing 56 organisations are members of the networks undertaking the research, with new networks in formation in North America, Europe, Latin America and South America.

Using the CPQ, the author has access at the time of writing to 40 sets of data, 8 of which are using the reduced Pharmaceutical industry questionnaire. Only 15 organisations currently have access to the DCI, and they have so far provided data on some 120 projects. This will soon increase dramatically.

This paper is about research methodology, rather than research results, but one or two of the findings that have been obtained using the methodology might be of interest. Three have been chosen to illustrate the kind of findings that are emerging.

1. Few organisations are satisfied with their performance at transferring "lessons learned" from one project to another. A working party produced a generic process map which has four high-level steps: Data Capture, storage, communication and application to new projects. A questionnaire was developed to support the map, and a dramatic fall-off was observed between the third stage (55%) and the fourth (25%).

   Taking two questions from the CPQ that are representative of stage 1 and stage 4, it is interesting to note how many organisations score highly for the stage 1 question and poorly for the stage 4 question (See Exhibit 2 below). This suggests that there may be a principle to be discovered about how lessons may be transferred from one project to another.

67. How does a project actually start?	82. Do all projects hold post-project reviews to capture any relevant project information?	
	Low (3 or less)	High (4 or 5)
High (4 or 5)	19 organisations	1 organisation
Low (3 or less)	18 organisations	1 organisation

Exhibit2: Project Start-up and Project Close-out

2. There is a loose connection between cost escalation and schedule delay, but the correlation is not as tight as might be expected (See Exhibit 3). This might be because a CHAID analysis of the most significant correlations indicates that the adequacy of different practices correlates to cost performance than to schedule performance. Schedule performance, for example, most strongly correlates to:
   - Clear responsibilities
   - Risks identified and quantified and
   - Practical steps to influence the team's performance

   Whereas cost performance correlates to:
   - Tight scope change control
   - Effective performance measurement and
   - Mechanisms for reinforcing prior success.

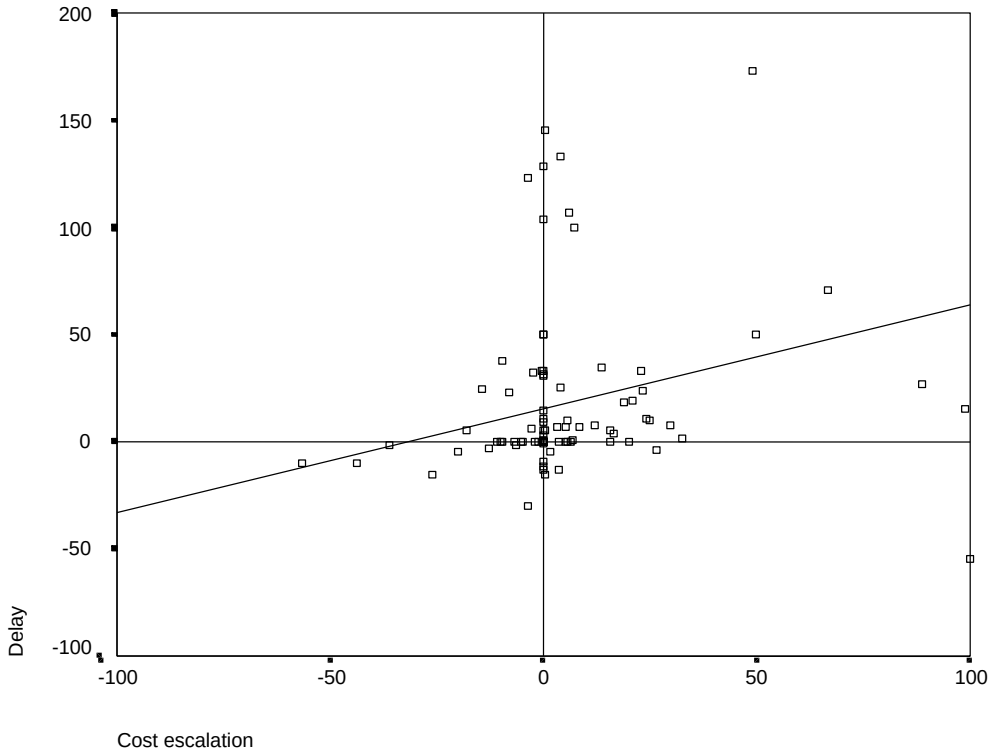

Exhibit 3: Relationship between cost escalation and schedule delay

3. One element of taxonomy that appears to differentiate practices is what is termed "perspective". This term is used to describe the predominant loci of clients and of resources relative to the organisation actually undertaking the project. On a two by two matrix, both clients and resources can either be part of the same organisation as the group undertaking the project or they can belong to an unrelated organisation. This yields the four "perspectives" of in-house, procurer, supplier or prime contractor.

   Comparison of scores from the CPQ shows differences between these perspectives. For example, procurers score more highly for defining and executing projects and for measuring project performance. Suppliers (including prime contractors because of sample size) score more highly on managing quality and (marginally) on managing risk, but lower than others on project planning and closing projects. In-house organisations score highly relative to other groups on no specific groups of questions, but score noticeably lower on estimating and managing quality.

CONCLUSION

One of the most interesting features of the explicit methodology developed in this research is the manner in which practice and theory are woven together. The members of the networks are essentially practical, but the research aims extend beyond the identification of "good" project management practices to the development of sound "project management theory". The fact that the two are held together successfully is evidenced by the growing number of organisations that are joining the networks. There are reasons to hope that the epistemological basis to the method will lead, ultimately, to a theory about the roots of success and failure in projectised companies that will be capable of verification and/or modification through repeated observations.

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