

De-Engineering Project Management.

Regarding projects as examples of “complex responsive processes of relating”, rather than as “business processes” in need of re-engineering.

1 Abstract

There is a need to improve the effectiveness of research into the management of projects so as to provide support both for project management practitioners, and also for organizations in public, private and voluntary sectors that seek to accomplish beneficial change through projects.

Although the assumptions that underpin much implicit project management theory are rarely made explicit they are derived from systems thinking and control theory. This paradigm has contributed to the development of a “praxis” that delivers disappointing results, and that emphasises management process and universally applicable rules at the expense of contingency, indeterminacy and the acquisition of human expertise in specific contexts.

Its failure is not due to faulty application of the theory, but to the inevitable consequence of failing adequately to unmask the underlying paradigm and to recognise its inherent limitations as a basis to both effective research into projects and also to improved project management praxis.

So what underlying theory and epistemology of projects might guide research efforts to identify significant improvements to praxis?

The “complexity sciences” that are currently being developed in the physical-, life- and social-sciences provide a promising perspective from which to approach the development of such a theoretical framework. This paper identifies one strand that appears to hold out particular promise – complex responsive processes of relating. Research that is based on this theory could remove many of the shortcomings of the present paradigm, and there is some evidence from existing research to endorse its possible relevance.

2 The need to improve the effectiveness of project management research.

2.1 Paradox in the world of project management.

These are strange times in the world of project management!

On the one hand the profession continues to grow rapidly all over the world, and organizations continue to structure more of their work as projects. University courses in project management are on the increase, particularly post-graduate qualifications. Governments are exerting great pressure to persuade both departments and non-government organizations to increase their project management capability. The number of project managers seeking accreditation from professional associations is increasing dramatically, and new and revised standards for the management of projects are being sold in ever-increasing numbers.

And yet, on the other hand, seriously successful project management departments are being downsized, outsourced, broken up or dispersed into business units. The

communications gulf between the Boardroom and the project management community remains as wide as ever – and as difficult to bridge.

2.2 The failure to improve project results.

And yet such research-based assessment of project success as there is indicates that results not only continue to disappoint expectations, but that there is little, if any, sign of the situation improving (O'Connor and Reinsborough, 1992; Standish Group, 1994). A recent thorough review of “Megaprojects” states that, “Cost overruns in major transport infrastructure projects are widespread. The difference between actual and estimated investment cost is often 50-100 per cent, and for many projects cost overruns end up threatening project viability.” (Flyvbjerg, Brunelius, and Rothengatter, 2003)

It would appear that belief in the efficacy of project management remains a profession of faith (Turner, 2000) that is not backed up by convincing data!

In spite of this, most project management research is “applied research”, undertaken expressly to assist with the development of “better” project management practice (Kloppenborg and Opfer, 2000). Underlying theory is rarely articulated, although as Melgrati and Damiani have demonstrated (2002) the under-pinning assumptions are strongly influential.

Perhaps this shouldn't be surprising since project management is quintessentially a practical and pragmatic subject (Cooke-Davies, 2001). It has arisen to allow practical people to manage certain kinds of tasks and activities more effectively. Would that it were doing so!

2.3 The challenge to project management research.

How can project management research best provide support to project management practitioners, to the organizations that educate and employ them, and to the people who provide the money and societal assent to allow the projects to proceed?

Good research is built on the foundation of explicit theory, and panel conversations at the PMI Research Conferences in Paris (2000) and Seattle (2002) have both indicated the need for a more serious and in-depth review of the theoretical basis to project management research.

2.4 The need for a coherent "theory"

“The purpose of any . . . theory is to explain as wide a range of phenomena as possible.” (Einstein and Infeld, 1988) Indeed, the more successful a theory is, the greater the number of observed phenomena that can be explained simply and economically. A theory that stands the test of time, such as Darwin's Theory of Evolution, not only provides the basis for the generation of many different hypotheses that can then be tested either by experiment or by observation, but it is also robust enough to allow modification to its component elements (such as the later discovery of genetic mutation). It may even, like Newton's Theory of Gravity ultimately become embedded into an overarching theory such as Einstein's Theory of Relativity.

Although it is comparatively rare to find the underlying theory articulated in published accounts of project management research, the dominant theory is frequently some version of control theory, operations research or systems theory. Melgrati and Damiani (Melgrati and Damiani, 2002) cite a small selection of the

many studies that are prescriptive and systemic in their tone, and that use dominant metaphors (“system”, “whole”) borrowed from general systems theory.

These roots in control are understandable in view of the fact that as a discipline, modern project management emerged after the second world war in the engineering industries, as a means of controlling complex and uncertain projects (Morris, 1994). As a consequence, many academic departments concerning themselves with project management are housed within Engineering departments in Universities (Cooke-Davies and Wolstenholme, 1998), and adopt the prevalent paradigms..

This is also the dominant but unspoken basis to the overwhelming majority of management practice in commercial and public organizations, whether derived from scientific management, or from the human relations perspective (Stacey, Griffin, and Shaw, 2000).

Where project management research papers have dealt with underlying theory, they have often adopted a “metaphorical” approach (e.g. Richardson et al., 2000; Thomas and Tjåder, 2000). Metaphors drawn from complexity theory, for example, have started to occur in both the literature on management and on project management. (Reynolds, 1987; Hout, 1999; Bonabeau and Meyer, 2001)

The picture that emerges is less of one that is based on a coherent theory, than on an unarticulated “paradigm”, and as the following section will show, applying metaphors within such an environment is unlikely to provide the necessary rigour to allow research to build up a coherent picture when it is done in different places by different researchers on different subjects.

2.5 The need to be explicit about the basis to the theory.

The difficulty that is encountered whenever discoveries in one academic discipline are used to inform conversations or research in another is one of epistemology (the theory of knowledge) or of ontology (the study of what exists). Every theory is built upon an implicit or explicit “worldview” of the nature of reality and the extent to which it is knowable.

Unfortunately, when the epistemology is not made explicit, it is possible to “smuggle in” unwarranted and implicit implications, along with the metaphors and overt theories that are guiding discussion.

Two such “smuggled in” assumptions that pervade the current management (and project management) discourse are (1) that an organization is a system that is designed to accomplish rational goals, and that exercises a form of control over its individual components in order to accomplish these goals, and (2) that the “organization” is an entity that exists over and against the individuals that comprise it (Stacey, 2001)

When insights from complexity science are used simply as metaphors then these covert assumptions are never examined. This is currently happening in examples such as the use of “edge of chaos” language to justify a degree of self-organization in project teams operating in highly uncertain environments, or the use of agent-based modelling to design portfolio- based reward systems.

The metaphors, however, may be totally inappropriate to their use in the context of human organizations. A project team is not a weather system, a thin film of liquid between two sheets of glass being used for convection experiments, or a flock of

birds. The metaphors only stand if one adopts a “relativist/constructivist” worldview in which reality is constructed by the project team.

Since the prevalent management paradigm of systems thinking/control theory is based on a “realist” worldview, there is an immediate conflict between the way theory from complexity science is applied to project management, and the underlying implicit theory on which project management is based.

It has been argued elsewhere that lack of clarity of this sort greatly diminishes the value of project management research, and that a “critical realist” viewpoint is the most appropriate basis for project management theory (Cooke-Davies, 2000); (Cooke-Davies, 2001).

Without rehearsing the same arguments in favour of critical realism once more, it is perhaps sufficient to observe that such a worldview acknowledges both the “real” existence of objects in the physical world, and the need for “constructed” ideas and theories to account for observed phenomena.

Physics is surely as dominated by the “realist” worldview as any in the academy, and yet Albert Einstein writes as follows:

“Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world. In our endeavour to understand reality we are somewhat like a man trying to understand the mechanism of a closed watch. He sees the face and the moving hands, even hears its ticking, but he has no way of opening the case. If he is ingenious he may form some picture of a mechanism which could be responsible for all the things he observes, but he may never be quite sure his picture is the only one which could explain his observations. He will never be able to compare his picture with the real mechanism and he cannot even imagine the possibility or the meaning of such a comparison. But he certainly believes that, as his knowledge increases, his picture of reality will become simpler and simpler and will explain a wider and wider range of his sensuous impressions.” (Einstein and Infeld, 1988)

2.6 Problems with epistemology in social science

In an article in the 17th April 2004 edition of “The Economist” entitled “Might the proper study of management be man?”, the author writes, “The ‘science’ of management is largely derivative: a mix of military strategy, the economics of the firm and the engineering of processes.”

That particular article is mainly concerned with psychology and, in particular, the work of Harvard psychologist Howard Gardner. But its titular question is of far wider import. The majority of works on epistemology are concerned with questions such as “What can we know?”, or “Under what conditions can we know that we know?”, but by asking a different question, “How do people acquire knowledge and skills?” Flyvbjerg (Flyvbjerg, 2001) is able to argue powerfully that theory in social science is necessarily of a different kind from theory in science or technology.

In doing so, Flyvbjerg draws on the Dreyfus model of how people acquire knowledge and skills (Dreyfus and Dreyfus, 1986) and follows Michel Foucault and Pierre Bourdieu in creating a kind of theory that he names *phronetic* social science, after Aristotle’s distinction of *phronesis* (practical wisdom) from both *episteme* (theoretical knowledge) and *techne* (productive knowledge).

2.7 The ineffectiveness of much current project research.

This section of the paper has advanced six arguments for the ineffectiveness of much current research, namely that:-

- Current research is convincing for “converted” project managers, while leaving their employers cold;
- Current research has failed to demonstrate its ability to effect significant improvements in project results;
- The project management research community is calling for an in-depth review of the theoretical basis to project management.
- Project management lacks a coherent and explicit underlying theory;
- The current worldview (systems/control/realist) has visible flaws when unmasked; and
- Since the management of projects is itself a branch of social science, it suffers from epistemic difficulties along with other branches of social science.

It can be argued that none of these is, in and of itself, a compelling case for seeking a new basis of theory to project management but taken together they are hard to ignore. The following section will propose that the current paradigm for much of the practitioner-focused English-language-based research is incapable of providing the necessary improvement in effectiveness. This will pave the way for offering, in section 4, an alternative paradigm from the perspective of "complex responsive processes" of relating.

3 The present paradigm is incapable of accomplishing the desired "step change".

Section 2.5 above started the process of “unmasking” the current systems/control/realist paradigm, by drawing attention to two important and unexamined assumptions that are generally “smuggled in” with the implicit epistemology.

Although this paper is arguing very strongly against a “realist” position underpinning project management theory, project management must take account *inter alia* of the material world so that any underlying theory must take account of the “three worlds” of the management of projects that are illustrated in Figure 1. [See Cooke-Davies (2001, p99—110) for a more complete account of this argument.]

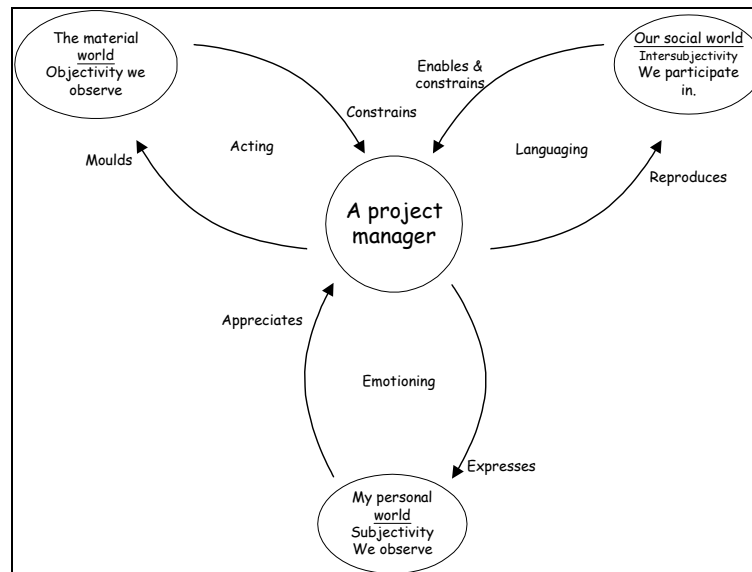


Figure 1: A framework based on Habermas' three worlds. Adopted from Mingers and Gill, 1997

However, this section will continue the unmasking process, by revealing some of the consequences of failing to allow explicitly for the “social science” elements inherent in the social and personal worlds within which project managers ply their trade, along with other people involved in the management of projects.

3.1 Failure to distinguish different kinds of "social construction"

In “The Social Construction of What?”, Hacking (2000) makes a raises three philosophical issues, each of which is directly relevant to the three worlds of the management of projects. The issues have to do with the nature of different types of words, three “sticking points” about social construction as it applies to the natural sciences, and what he calls “different kinds” (principles of classification)

Each of these will be reviewed in turn, and used to cast a light on aspects of project management theory that are frequently kept hidden.

3.1.1 *Objects, ideas and “elevator words”.*

Hacking seeks semantic clarity when discussing issues of “social construction” by distinguishing between three different types of word.

The first he calls *objects*, and includes in the list such varied words as people (children), states (childhood), conditions (health, childhood autism), practices (child abuse, hiking), actions (throwing a ball, rape), behaviour (generous, fidgety), classes (middle), experiences (of falling in love, of being disabled), relations (gender), material objects (rocks), substances (sulphur, dolomite), unobservables (genes) or fundamental particles (quarks). (Hacking, 2000, p21&22). Hacking lumps them together, because they all exist in the world, regardless of whether the concept has been agreed between human beings and their social institutions or not.

The second type he calls *ideas*, by which he means conceptions, concepts, beliefs, attitudes to, and theories about. They can be private or public, clear or woolly but in any case they are discussed, accepted, worked out, shared or contested. Hacking would distinguish between, for example, the “idea” of the “project planning process”

and the “objects” such as the “behaviour” of the “people” engaged in the “planning activity” and the “artefacts” that they produce through this behaviour.

The third type of word contains those words that people use when discussing ideas or objects – words such as facts, truth, reality or knowledge. “These are not objects in the world, like periods of time, little children, fidgety behaviour or loving-kindness.” (Hacking, 2000, p22) Even though they are used to say something about the world, and there may be some correspondence between certain propositions and the objects or characteristics of the world that are being described, they are not in the world in the same way that project managers, bridges or cost over-runs are in the world. Hacking calls them *elevator words*, because they are often made to work at a different level from words for ideas or words for objects.

In the management of projects, there is a tendency in practitioner literature to reify processes, and in literature derived from organizational theory to reify social groupings and organizational units. This results in a blurring between objects and ideas, and a lack of methodological integrity to much quantitative research.

3.1.2 Three sticking points

In applying the concept of “social construction” to the natural sciences, as was described briefly in section 2.5 above, Hacking unmasks what he calls three “sticking points” that each represent a spectrum of possible epistemological positions that may be adopted. He refers to these as contingency, nominalism and external explanations of stability.

- **Contingency**

The sticking point on contingency defines where a researcher stands on a spectrum of belief about the extent to which the results of scientific investigation are contingent upon the specific theories, experiments and apparatus that were used to deduce the scientific laws. Kuhn (1996), for example, distinguishes between the great leaps of personal intuition that represent “paradigm shifts” and the day-to-day problem solving that represents “normal science”.

It is hard to resist reading Kuhn in such a way that he believes science to be highly contingent upon the particular people, ideas and circumstances that accompany a “paradigm shift”.

- **Nominalism**

Hacking (2000, p83f) distinguishes between a standpoint that the structure of the world in and of itself actually conforms approximately to the ways in which we describe it and, on the other hand, a standpoint that the world remains so hidden from us that all the structure we conceive lies within our representations.

It is a problem that has been around for as long as philosophy has been discussing the relationship between thought and the world – certainly as long as the differing views of Aristotle and Plato.

- **External explanations of stability**

The third of Hacking’s three “sticking points” concerns the stability of the scientific knowledge that we possess about the world. The Second Law of Thermodynamics, for example, has withstood more than a century of debate between competing theories of physics, and still survives unscathed.

It isn’t that scientists are infallible – but it does raise the question of how much

of science is “here to stay”. The Second Law, sounding oddly old-fashioned in using the industrial-age term “work”, states that “heat cannot be transferred from a cold to a warm body without performing work.”

The sticking point concerns whether the stability of the Second Law (and other similar laws in the natural sciences) arises entirely from factors that are *internal* to the content of the science, or whether it is not due, in part at least, to factors which are external to the *content*, such as the history, culture or sociology of the science that “discovered” the law.

Researchers can take a different position for each of these sticking points along a spectrum that reaches from the extreme “constructivist” end to its opposite, and that will inevitably colour the research being carried out. If this is not consciously examined, the propensity for concepts to be “smuggled in” to the research becomes that much greater.

3.1.3 Different "kinds"

Referring to the American philosopher Nelson Goodman (1906—1988), Hacking suggests that a proper study of mankind is relevant kinds (2000, p128ff). After reflecting on how the world we inhabit is highly influenced by the different ways that it is classified, on what a rich, varied and confusing mass of material lies under that agreeable euphemism, “the selection of relevant kinds”, Hacking distinguishes between two overarching categories of kinds: indifferent kinds and interactive kinds.

- **Indifferent kinds** are those kinds of classifications where the objects being classified are unaffected by (indifferent to) the fact that they are being so classified. Microbes, for example, are unaware that they are classified as microbes, and their behaviour in the world is not affected in any way by the classifications that are applied to them. This is not to say that there is no interactions between microbes and human beings – simply that the classification of them as microbes does not directly cause them to behave as they do.
- **Interactive kinds**, on the other hand, are those kinds of classifications where the objects or ideas being classified are those that interact directly with people and their behaviour. New kinds create new possibilities for choice and for action, and even events in the past, when viewed in the light of a new kind, can assume different significance, and thus become accessible to experience in a different way.

A failure to make appropriate distinctions between these different kinds can lead to “looping effects” as the subjects of a particular study respond differently in the light of the classifications that are being applied to the research. Indeed, this is one of the characteristics of all research carried out into the human or social sciences, and it will be examined in more detail in section 3.2 below.

Before moving on, however, we can summarize by suggesting that each of these three philosophical issues raised by Hacking carries with it a particular trap for the unwary researcher in the field of project management:

- Failure to distinguish between different types of words is likely to lead to a muddled methodology;

- Failure to recognise consciously where one lies along the spectrum associated with each of the three “sticking points” is likely to lead to unwarranted and hidden assumptions; and
- Failure to recognise the extent to which the categories associated with project management are “interactive kinds” is likely to lead to self-fulfilling prophecies, or to biased research.

3.2 Failure to distinguish between human beings and other kinds of agents

Just as Hacking points out the dangers of failing to pay attention to the precise nature of social construction in the development of theory and research, so Flyvbjerg, in “Making Social Science Matter” (2001) draws attention to four philosophical issues that relate to social science because of the nature of human beings. They are the role of intuition and reason in how humans learn; the hermeneutic problems of conducting research into the behaviour of “meaning-making” people; the immense sensitivity of human experience to context; and the importance of conflict and power in social science.

Each of these four issues sheds further light on the challenges to project management research.

3.2.1 Rationality, body and intuition in human learning.

Drawing on the work of Dreyfus and Dreyfus (1986), Flyvbjerg observes that the way humans acquire knowledge and skill (including competency at project management or social science research) passes through five stages:

- “Novices act on the basis of context-independent elements and rules.
- Advanced beginners also use situational elements, which they have learned to identify and interpret on the basis of their own experience from similar situations.
- Competent performers are characterized by the involved choice of goals and plans as a basis for their actions. Goals and plans are used to structure and store masses of both context-dependent and context-independent information.
- Proficient performers identify problems, goals and plans intuitively from their own experientially based perspective. Intuitive choice is checked by analytical interpretation prior to action.
- Finally, experts’ behaviour is intuitive, holistic and synchronic, understood in a way that a given situation releases a picture of problem, goal, plan, decision and action in one instant and with no division into phases. This is the level of true human expertise. Experts are characterized by a flowing, effortless performance, unhindered by analytical deliberations.” (Dreyfus and Dreyfus, quoted in Flyvbjerg, 2001, p20f)

From this, Flyvbjerg concludes that conventional rationality is not the ultimate outcome of the human learning process, and so the proper study of human experience cannot be underpinned by a purely “rational” epistemology.

Similar points have been made elsewhere in connection with the philosophy of Polanyi (Cooke-Davies, 2001) and in incorporating situation theory into project management praxis (Cooke-Davies, 2002). It raises the ever present danger that what

can be studied in project management research can never deal adequately with the invisible and unconscious skills of the most expert practitioners.

3.2.2 Is "theory" possible in social science?

As if that were not sufficiently challenging, the same point casts doubts on the ability of social science researchers to produce genuinely new knowledge.

Starting from the basis of his analysis of the Dreyfus model, and calling on the work of Michel Foucault, Flyvbjerg argues that "the study of social phenomena is not, never has been, and probably never can be scientific in the conventional meaning of the word 'science'; that is in its epistemic meaning." (Flyvbjerg, 2001, p25)

He argues that the Drefus model is completely at variance with the contention of ethnomethodologists that, because researchers' background skills are internal in relation to their activity (i.e. they are themselves often expert practioners), they must explicitly account for their procedures in producing knowledge. This presents a fundamental hermeneutical conundrum: to be able to understand their field of research well enough to conduct research, social science researchers must possess expert knowledge of their field, but on the other hand, this very expert knowledge invalidates the acquisition of new knowledge from their research.

Similarly, Foucault observes that the study of individuals and society understands human beings in a dual manner, as both constituting what counts as facts in the human sciences and at the same time as an object for theoretical and empirical research. Since, for him, no science can objectivize the phenomenon that makes it possible, stability cannot be achieved when human activity is both subject and object of science.

Like Narcissus, all project managers are seeing when they gaze into the waters of project management for research purposes, is their own reflection!

3.2.3 The power of context.

The term "theory" can be used in two very different ways; predictive (e.g. the Second Law of Thermodynamics) and non-predictive (e.g. organization theory). These two meanings are so different, that any discourse failing to distinguish between them is liable to lapse into confusion.

Flyvbjerg argues that it is in "predictive theory" that the social sciences are most clearly distinguished from the natural sciences, owing to the relative importance of special preconditions.

Theories such as the Second Law explain and predict phenomena in terms of context-independent elements that can be abstracted from the everyday world, so if the study of society (such as project management, for example) seeks to follow natural science, then it must also abstract such elements from the context-dependent activities of human beings in order to subsequently explain and predict those activities in terms of formal relations (rules or laws) between the abstracted elements.

Notwithstanding the attempts by Noam Chomsky in linguistics, or Claude Lévi-Strauss in sociology, Flyvbjerg shows how both Dreyfus and Pierre Bourdieu argue convincingly that in the study of human behaviour and interaction excluding the context within which an action takes place robs the action of that which determines its meaning, its purpose, and even its relevance to the content of that which is being studied!

This creates very real methodological questions for the relevance of any quantitative methods used for research into projects and their management.

3.2.4 Conflict and power in social science.

If social science can never be modelled on the natural sciences, argues Flyvbjerg, then it requires an alternative basis. For this, he returns to Aristotle's "Nicomachean Ethics", and offer *phronesis* (practical wisdom) as a preferable alternative basis for the social sciences to both *episteme* (theoretical knowledge) and *techne* (productive knowledge).

However, rather than simply adopt Aristotle's view uncritically, Flyvbjerg quotes Bertrand Russell as saying "The fundamental concept in social science is Power, in the same sense in which Energy is the fundamental concept in Physics." (Russell, quoted by Flyvbjerg, 2001, p88). But power, and its bedfellow conflict, is missing from Aristotle's *phronesis*.

Demonstrating the shortcomings of Habermas' essentially modern concept of "communicative rationality" as the theoretical basis to democracy, Flyvbjerg suggests that social and political theories that ignore or marginalize conflict are potentially oppressive. He therefore draws further on the thinking of Foucault with his focus on conflict, power and partisanship to develop the recognition that theory, in social science, can never be free of values, and is thus always liable to become the basis for partisan, pragmatic, opportunistic objectives.

For these reasons, he argues that non-predictive theories, and conceptualization in general must be constantly confronted with praxis, including the praxis of the individual scholar in order to put them to the test and modify them. According to both Aristotle and Foucault, claims Flyvbjerg, "practice and freedom are not derived epistemologically or by theoretical work. Freedom *is* a practice, not a result of a state of affairs. And *phronesis* is the intellectual virtue most relevant to the project of freedom." (Flyvbjerg, 2001, p128: emphasis in original)

4 CRP - an alternative paradigm.

So if the present paradigm that underpins both project management praxis and much project management research is not only failing to deliver results, but is unlikely to do so due to inherent deficiencies, than where can hard pressed project managers and the organizations that employ them look for help?

Well, one possibility (named *phronetic* social science by Flyvbjerg) has already been touched on in 3.2.4 above, and has produced promising results in the area of pre-project processes for large infrastructure projects (Flyvbjerg, Brunelius, and Rothengatter, 2003).

This paper, however, is advancing an alternative candidate – one from the complexity sciences; a theory referred to by its originators as "complex responsive processes of relating". This section will seek to locate this theory within the whole field of the complexity sciences, and describe its salient points, before moving on, in Section 5, to considering its possible benefits and implications for project management research.

4.1 Different aspects of "complexity" theory.

There is as yet no single science of complexity, although a number of different strands are developing in different sections of the academy comprising what might be called the complexity sciences. People writing about complexity in human

organizations often draw on one or more of three of these strands: chaos theory, dissipative structure theory, and the theory of complex adaptive systems (Stacey, Griffin, and Shaw, 2000).

Chaos theory (Gleick, 1988) provides an explanation of the behaviour of a system in terms of deterministic non-linear equations in which the output of one calculation is used as the input to the next. As such, it embodies a model of a system that is identical to that embraced by system dynamics (Senge, 1990; Rodrigues and Bowers, 1996). Chaos theory shows how the behaviour of a system over time has the potential to move towards one of a different number of attractors, depending on a number of control parameters that are determined outside of the limits of the system itself. The weather and stock markets are often used as an illustrative example of systems governed by so-called “strange” attractors – which are paradoxically regular and irregular, stable and unstable at the same time.

This paradoxical dynamic between stability and instability, however, is not simply a characteristic of chaos theory. The same phenomenon occurs in the theory of dissipative structures (Prigogine, 1997), which also points to the potential that deterministic nonlinear systems have for producing unpredictable behaviour. The example most frequently cited is that of convection. This particular example has the advantage that it can be demonstrated through a laboratory experiment that under certain conditions, a liquid will demonstrate a pattern of behaviour in which some convection “rolls” will move in one direction, while others move in the opposite, in a manner that is unpredictable and cannot be determined by the experimenter. In effect, to use Prigogine’s language, there comes a point of “bifurcation” at which some rolls spontaneously “choose” one direction and others spontaneously “choose” another. The relevance of this to project management theory shows up in the central question posed by Prigogine in the work quoted – “Is the future given, or is it under perpetual construction?”

The third strand which is increasingly frequently quoted in management literature (e.g. Hout, 1999; Bonabeau and Meyer, 2001) is the area known as complex adaptive systems. Complex adaptive systems consist of large numbers of agents, each of which behaves according to its own principles of local interaction. These systems, like the ones discussed under chaos and dissipative structures, show distinctive behaviours that include stable equilibrium, random chaos and an emerging order “at the edge of chaos” – a term employed for example in a number of project management presentations at the Drug Information Agency Annual Meeting in San Antonio in July 2003. Complex adaptive systems can exhibit extremely complex and apparently intelligent behaviour if each agent follows the same small number of simple rules. For example, three simple rules are sufficient to simulate the flocking behaviour of birds (Reynolds, 1987).

Interestingly enough there is within the emerging field of complexity science one strand of theory that is grounded in “reality” (the evolved and biological characteristics of the human being) and that suggests fresh avenues for project management research – the strand of theory known as “complex responsive processes” (Stacey, 2001).

Under this theory, “organization” is an emergent property of many individual human beings interacting together through their complex responsive processes centred around the use of language simultaneously for conversation and to negotiate social status and power relationships. Communication by means of evolved

language is a defining characteristic of human beings, distinguishing them from all other species of animal (Kauffman, 1993). It is a key determinant in the evolutionary success of human beings, and accounts for both the creation of diversity and thus of selection through competition and extinction of societies and organizations. It is entirely consistent with the latest findings of fossil evidence concerning the last significant increase in the size of the human neo-cortex from 400,000 years ago until some 100,000 years ago, when it reached roughly the size that it is today. (Zimmer, 2003)

4.2 Complex Responsive Processes of relating – a rigorous application of complexity theory

Central to the theory is the recognition that communication is a complex process involving both the words that are spoken and the response that they elicit – indeed the chain of responses that provide the context for an individual conversation or an element of it. Gone is the distinction between “the individual” and “the group” – one is left with individuals relating to each other through the complex processes of vocalised and non-vocalised communication. And out of this web of complex responsive processes arise BOTH the emergent properties of “organization” and “self-identity”

It is important to understand just what a “radically social understanding of individuals” (Stacey, 2003) is implied by this.

The theory allows for an alternative account of the emergence of innovation (Fonseca, 2002) and of leadership and ethics (Griffin, 2002). It provides a coherent explanation of the paradox of control (Streatfield, 2001) and of the nature of organizational change (Shaw, 2002).

Furthermore, as a theory that is consistent with other aspects of complexity science, it allows for an inter-disciplinary research approach that is shared with the physical sciences, the biological sciences and social sciences (Auyang 1999) while avoiding the pitfalls identified in section 3 above.

4.3 CRP “in a nutshell”.

So what, precisely, is the theory to “complex responsive processes of relating”? According to Stacey, Griffin and Shaw it represents a move “away from the notion that human action or interaction is a system, or can usefully be thought of as a system, when it comes to thinking of change of the transformational kind.” (Stacey, Griffin and Shaw, 2000, p186).

While not rejecting the usefulness of the notion of human organisation as a system for the purpose of understanding or designing interactions of a repetitive kind in a predictable environment, its inherent “theory of causality does not allow for the emergence of true novelty.” (ibid, p187).

CRP understands “human intentions, choices, and actions as essential to, as operating within, the dynamic of daily interactions between people.” It argues that “organizing is human experience as the living present, that is, continual interactions between humans who are all forming intentions, choosing and acting in relation to each other as they go about their daily work together.” (ibid p187)

“No one steps outside [the system] to arrange it, operate on it or use it, for there is no simply objectified ‘it’. There is only the responsive process of relating itself.

Instead of understanding ‘the organization’ as a tool humans design and use, [it is understood as] organizing, that is, experience as the living present. Instead of understanding human action as Rationalist Teleology split off from a tool structured by Formative, or even Transformative, Teleology [it is explored in terms of] how the detail of human choice and action itself operates as the process of organizing.” (ibid, p187)

What this means is that from this perspective “the relational processes of communication, within which people accomplish joint action, are actively constructing the future as the living present and that future is unknowable in advance. Throughout, the process is characterized by the paradox of the known-unknown and in it emerges the aims people formulate, the goals they set, the intentions the form and the choices they make. What is being expressed here is individual and collective identity at the same time.” (ibid., p188f)

There is thus no distinction of kind, or of logical level, between the individual and the social. The phenomenon being studied is human relating, and the individual is the singular element of this, while the social is the plural.

The creators of the theory publish an interesting list of characteristics of these complex processes of relating, which are as follows:

- “They are processes of action and interaction, through which people in organizations act jointly, transforming their environment and their identities.
- They are acts of relating.
- These actions of relating are bodily actions of communicating, both directly in the medium of feelings and in the form of language.
- They are therefore processes of power-relating, that is, processes that both enable and constrain action.
- They are actions of communication and power reflective of human freedom.
- They are actions of communication and power-relating open to the detail of varying interpretations.
- They are actions of communicating taking the form of bodily gestures and responses, including the vocal ones of language, which call forth responses in others.” (ibid., p190)

5 So What?

Section 4 offered a coherent theoretical basis to project management research and praxis, but this offer begs three questions: how research into the management of projects would benefit from the adoption of complex responsive processes of relating as the underlying theory; the extent to which published research might provide substantiating evidence, when viewed through the “complex responsive processes” lens; and the implications for project management practice and research.

5.1 Benefits of adopting a CRP perspective.

It was argued in section 2 that there is an urgent need to improve the effectiveness of much current research into the management of projects, and in section 3 that the current realist/systems/control paradigm cannot provide the desired improvement. On the other hand, the perspective described in section 4 does not suffer from the

same shortcomings. In particular the CRP perspective offers four specific benefits in comparison with the current paradigm:

- 1 It places PM research firmly in the realm of social science - not technology or "pseudo-science" – by directing attention to all aspects of the complex processes of interaction that take place between specific individual people.
- 2 It recognizes the reality of both "power" and "communication" in relationships between people, and so allows for the adoption of a *phronetic* approach that accounts for the reality of power and conflict in any human situation.
- 3 It recognizes the importance of context, since every reaction in all three of Habermas' worlds is located in a specific history and culture.
- 4 It can be applied by researchers from across the "Realist – Constructivist" spectrum, and can draw on powerful insights from the natural sciences of complexity.

It is tempting to believe that if similarly rigorous research were carried out from this perspective into the "praxis" of clearly recognized expert practitioners in the management of projects to that which was carried out on expert practitioners in the field of psychotherapy by Richard Bandler and John Grinder (Bandler and Grinder, 1975; Grinder and Bandler, 1976), then it might transform the praxis of managing projects just as the field of Neuro-Linguistic Programming that emerged from Bandler and Grinder's work has transformed the praxis of psychotherapy.

5.2 Corroborative evidence from published research.

The first task in formulating a coherent theory of projects based on the complex responsive processes (CRP) perspective is painstakingly to assemble evidence from all published research. This would involve something along the lines of re-visiting the Kloppenborg and Opfer research (2000) and extracting from each item potentially relevant data and/or conclusions that might have a bearing from a CRP perspective.

An important aspect of collecting this data is an appropriate "organizing system" (or system of categorization) to allow the material to be viewed in a manner that allows patterns to be identified.

On the basis of a "critical realist" stance it will be reasonable to regard these as separate "windows" into the "reality" of specific examples of those complex responsive processes that are to be examined under the category of "projects" rather than independent and unrelated phenomena.

In spite of the theoretical thrust to this paper, it is possible to see that published research does indeed provide some encouragement that complex responsive processes could form a useful theoretical basis for fresh research into project management.

If chains of conversations and their concomitant behavioural responses are the most significant factors in the functioning of a human organization, then one would expect to see evidence that human interactions exert a greater influence on project results than any other factors that form the body of accepted project management knowledge. Indeed, such evidence does exist.

Gadeken's investigations of the competence of outstanding project directors in aerospace (Gadeken, 1994) suggests that those competencies to do with the effective management of human interactions correlate more strongly to success than technical competencies. Also, his work on the impact of project team effectiveness (Gadeken, 1996) gives rise to similar conclusions.

Lechler's paper to IRNOP III (Lechler, 1998) for example, suggests that the people interactions are the most important contributors to success.

Work by the Construction Industry Institute suggests that there is a direct link between trust and cost performance (1993), and Hartman (2002) has argued that a multiplicity of separate pieces of research, each using different theoretical and epistemological approaches, has contributed to an overall mosaic indicating that trust might be woven into the very "DNA of better project, program and corporate management."

Unpublished research within the pharmaceutical industry carried out by Human Systems Limited and CMR International suggests that time to market on new drug development is influenced by the degree of empowerment and appropriate authority of the project team, while a separate survey conducted by Human Systems in November 2003 (and also as yet unpublished) has demonstrated a statistically significant correlation between project team capability and project management success.

None of these is conclusive, of course, and even taken together they fall far short of providing the basis for a "theory of projects".

Taken together, however, they do suggest that there is a "prima facie" case for investing effort in both a fresh review of published research, and also for carrying out fresh research from the perspective of the proposed paradigm.

5.3 What would this mean for project management ?

So perhaps it might be appropriate to speculate how project management research and practice might change, when viewed through the lens of such a theory?

In research, placing people, their conversations, their power struggles and their interactions at the "heart" of project management, as it were, would suggest an increase in ethnography, and in research based on language, discourse and constructs – perhaps along the lines of the current work being done at Cranfield University. There might be a reduction in the number of quantitative or pseudo-quantitative research studies.

There would certainly be a move away from the position of the researcher as "detached and objective" observer, standing outside of the "system" (whether a project or an organization) towards the researcher and practitioners each being participative inquirers.

For project management practice, if people are moved into centre-stage and processes and systems are moved to the periphery, there will perhaps be a changing emphasis on the relationship between learning and control with implications for governance, for self-organising teams, and for the selection of key personnel.

And perhaps "bodies of knowledge" would be seen as shaping conversations and assisting with the establishment of power relationships that are appropriate to the projects' ends, rather than as prescriptive guides..

Who knows, perhaps project management might even become fully de-engineered, and accepted into the mainstream of management studies within the academy, rather than consigned to a minor role in engineering and construction departments?

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