THE IMPORTANCE OF PROJECT CULTURE IN ACHIEVING QUALITY OUTCOMES IN CONSTRUCTION

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ABSTRACT

This paper presents a review of developments that have led to current construction quality management philosophies. The primary factors responsible for the relatively poor quality outcomes currently achieved by the sector are reviewed and the influences of bureaucratic and hierarchical management systems are considered.

It is posited that, in general, the typical approach to procurement by the principal and head contractor is motivated more by risk shedding than by a desire to improve the control of the process. Furthermore, arguments are drawn from the literature to show that a productive culture and teamwork within the supply chain are essential for the achievement of planned quality outcomes.

A study of the relationship between project cultures as assessed by Quinn's Competing Values Framework and the quality of outcomes on thirteen construction sites is presented. *Clan* type cultures were found to correlate with improved quality outcomes, whereas *market* cultures, more common on construction projects, were found to correlate with weaker quality outcomes.

KEYWORDS

Quality management, project culture, teamwork

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INTRODUCTION—QUALITY MANAGEMENT IN CONSTRUCTION

In the days of the master builder, teams of artisans in full-time employment generally moved from one project to the next using technologies that were well understood. Because they were using mature technologies (higher levels of skill and fewer technical options) and because of the continuity that existed within the construction team, the maintenance of cultural cohesion was considerably easier than the challenge it presents today. Transactional interaction based on lowest cost means that changes in team composition have become the norm and not the exception on new projects. As a result, cultural fragmentation has become common within project organisations and profitability is sought through a sub-contracted competitive model. Relationships are often tense and untrusting as a result of the contracts upon which they are based. As project teams need to create a new set of relationships each time a project is formed, the demand for social management skills has increased, but this need often remains unfulfilled.

While the direct employment of labour by the master builder may have had financial drawbacks, these would have been balanced by positive benefits. Product quality, a consequence of much more than just management systems and procedures, would have greatly benefited from the cultural cohesion within these organisations. Fragmentation and specialisation within the supply chain has created a myopic focus on cost and short-term goal attainment. This has replaced openness, trust, respect and the development of long-term relationships, all of which are essential for strong cultures that are able to provide the broad range of quality outcomes that are required of a successful project.

BUREAUCRATIC ORIGINS OF QUALITY MANAGEMENT

Taylor's *scientific management* and Weber's *bureaucracy* laid the foundations for the development of Western approaches to the management of work and organisations (Cameron and Quinn 1999). Originating from the Industrial Revolution and developing as a result of challenges confronting manufacturers in an increasingly complex society, they were designed to produce goods and services in what was considered to be the most efficient manner. Taylor's scientific management essentially categorised work into tasks and separated work planning and management from work execution. Weber's bureaucracy imposed formal structures on organisations within which rules and procedures were designed to co-ordinate and direct employees actions towards organisational goals. Managers and workers alike operated within functional hierarchies and responsibilities were divided according to specialist competencies (Mitchell 1998).

Until the 1960s, the underlying principles of these theories were almost unquestionably accepted as being the most reliable, predictable and cost efficient method of control. To this day, they have remained major influences on Western approaches to management (Cameron and Quinn 1999) and are evident in most contemporary construction project organisations.

However, early researchers in organisation development (Mayo, Argyris, McGregor and Likert) argued that these models of organisation are inevitably hostile to the growth needs of individuals (Ouchi and Price 1992). They argued that within hierarchies, power differences tend to stifle the development of the less powerful in the team by creating psychological dependence and by limiting experience through specialisation. Furthermore, they argued that

the narrow, economic performance measurement of the more powerful members led to interpersonal difficulties and, often, to frustration (ibid).

The rational, hierarchical approach to organisational control has filtered through to all disciplines of management-including quality management. Consequently, in construction most quality control systems are inherently bureaucratic. Hierarchical organisations with a single point of responsibility can be construed as an attempt by those in authority, to retain power and control. In such organisations empowerment is a foreign concept-power and politics are the dominant forms of the *modus operandi* and many detrimental consequences arise because of this form of organising. (Bounds et al. 1994).

Navarre (1993) noted that construction management is inherently bureaucratic and dependent upon a mechanistic rationality, founded on rules and procedures. This characterisation may also be made about construction quality management. Most contemporary quality management systems are largely concerned with rules and procedures and hence are consequently more likely to provide consistency rather than quality.

THE QUALITY MOVEMENT POST-1950

Experience has shown that the pressures of international competition have motivated the development of strong, quality based management cultures. In post-World War II Japan, quality improvement was an essential ingredient in making Japanese products more internationally competitive. They were so successful that by the '80s, American industry realised that it too had to embrace quality improvement—as the only basis to compete with Japanese manufacturers (Cole 2000).

By the 1980s, the Japanese manufacturers had produced better quality products, with less waste and shorter time-to-market cycles, at costs that were well below those of their international competitors. American and European firms and economies were paying dearly for this (Cole 2000).

At first, US industry could only see that their language, culture and practices differed from those of their Japanese counterparts. While *quality management* might work for the Japanese, how could it possibly work in the US, where there were different values and methods of operation? In fact, for a while, US managers allowed these differences to be an impediment to the transfer of ideas. However, by the mid-1980s, US manufacturers had synthesised the lessons from Japan and had once again become competitive in terms of the cost and quality of their products and processes (ibid).

Today, the construction industry is faced with a myopia not dissimilar to that first experienced by US manufacturers. While construction professionals see that the *quality movement* has worked wonders for many manufacturing enterprises, they cannot see how to leverage the ideas to benefit construction. Construction industry practices, culture and organisations are so entirely different from manufacturing that practitioners cannot see how to adapt these ideas and make them create value for their customers.

Construction has been largely sheltered from international competition, though it does have an indirect effect on the economic efficiency of a country through its impact on infrastructure costs. In the absence of direct international competitive pressures, the motivation for quality improvement in construction has come from two sources: client

dissatisfaction and government action by mandating quality system compliance under ISO9000, aimed at maintaining overall international competitiveness.

Quality management is perhaps one of the most undervalued and misunderstood strategic concepts within the building and construction sector worldwide. In a recent international survey undertaken in Australia, Hong Kong and Singapore, only in Singapore was quality management seen by building contractors as being of fundamental strategic importance and necessary for business survival (Karim et al. 2000). In Australia it was seen essentially as a marketing tool.

Construction comes to the issue of quality management with a number of significant difficulties:

- Construction procurement is usually through an extremely fragmented supply chain, which is driven by cost minimisation rather than value maximisation. This creates tensions within the supply chain, cohesion is essential for efficiency and innovation-this requires shared values and strategies.

- Historically, the sector has had an almost exclusive *product quality* focus. Most people still conceptualise quality in product (and not customer) terms as *fitness* for *purpose* and as *meeting* the *specification*. The modern conceptualisation of quality is in terms of customer satisfaction.

- ISO 9000 has had an overwhelming focus on quality management systems and has not linked *system* quality to *product* quality (Karim et al. 1999).

- The fact that ISO compliance was mandated by government clients led to a perception among many in construction that quality is a marketing issue (ibid).

The fragmentation of the supply chain means that the many supplier-customer relationships within the industry mask the over-arching relationship and obligation that exist between the entire supply chain, the end customer and the other stakeholders (ibid). Each organisation tends to view quality from its parochial perspective. In contrast, owners and occupants judge the overall quality of a building and not the quality of the parts. Further their perspective often ranges over the whole life of the asset, not merely the construction phase.

Recent, formal, bureaucratic approaches to managing quality in the construction industry, generally based on ISO9000, have had very varied success. This has led to a worldwide debate about the value of these systems. These methods of management are generally abstract and only loosely reflect work processes and are usually more concerned with the management system than with the control of the process. (Shammas-Toma et al. 1994).

ERAS OF QUALITY CONTROL

Cameron and Barnett (2000) characterise the development of quality management into three distinct phases: *error detection,* starting in the 19th century and ending in about 1960; *error prevention,* only lasting to the 1980s and *continuous creative quality,* starting in the late 1980s/early 1990s. The timing of these phases is based on trends in quality management practice in the USA; they differ from country to country and industry to industry.

The limitation of the first era was that quality was inherently *reactive, defensive and protective* (ibid). Quality management was seen as an end in itself, a necessary action to

rectify mistakes. Quality control was a specialist activity and this was the era of statistical control. In this paradigm, quality management did not *add* value; it *corrected* mistakes and *cost* money (= waste).

The second era, *error prevention,* emerged in the early 1980s in response to a perception among leading manufacturing companies in the US and Europe that their costs were too high and that through error prevention-quality improvement-Japanese manufacturers had gained a competitive advantage (ibid). Quality became the responsibility of everyone in the production line. The vision of quality broadened to encompass all aspects of the organisation, leading to the emergence of TQM. The aim was zero defects and the goal was to satisfy customers rather than to fix problems. It is interesting that lead contractors are only now entering the *error prevention* era-some 40 years behind lead manufacturers.

The third era, *continuous creative quality,* led to a convergence of the business and the quality strategies of an enterprise (ibid). The focus moved to creating new, unexpected benefits for customers and the creation of brand loyalty.

Construction quality management is just now beginning to move from the first to the second of these eras-*error detection* to *error prevention*. This paper first reviews current practice, which is still rooted in the *error detection* paradigm. A model representing the method of quality 'control' commonly encountered within the Australian construction sector is presented in figure 1.

In fact, this model does not represent an actual method of control but, rather, only a means of retrospectively monitoring the output of the production process. Quality deviations are identified after the event and, subsequently, rework ensues— waste is inherent and unavoidable. In process terms, a third party usually assesses quality (architect or management), a rationale more congruent with the error detection paradigm (1800-1960) than the newer paradigm (1960-1980) that embodies quality prevention and error minimisation philosophies through lean management practices.

The system is bureaucratic and costly to administer. Architects and 'higher-tier' management (akin to quality inspectors) perform inspections with information being fed-back through an unnecessarily complicated and long chain of project participants. Typically these include the architect,
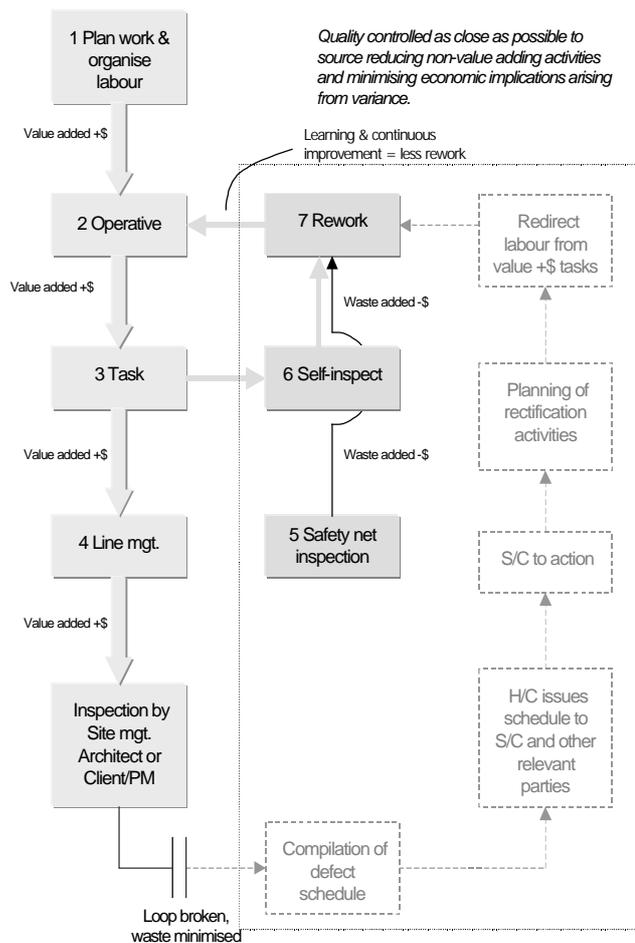

Figure 1: Value Stream Process Map - Rework waste loop in old management paradigm.

the head contractor's project management team, the sub-contractor's project management team, the sub-contractor's production supervisors and finally the sub-contractor's labour**.** Due to the number of actors involved in the rework loop the flow of information is slow and the speed of the decision making process reflects this. In addition, decision making is remote from the production face. Quality is not controlled at the source and, hence, the financial implications of defective work are increased**.**

When deviations are identified and rectified, subsequent checks are still needed to ensure that required quality levels are achieved. This results in the creation of *'right-second-time'* culture, or, even worse, *'third'* or *'fourth time'*. The implicit messages conveyed by the application of this type of system have far-reaching implications for project cultures. Take for example McGregor's Theory X (1960), which argues that our beliefs and attitudes can inadvertently affect the behaviour of others (whether these be desirable or not). The creation of a self-fulfilling prophecy as described in figures 2 and 3.

Implementing a system that allows quality to be appraised by a third party to the process conveys a number of implicit messages to the workers: they cannot be *trusted;* they cannot be given *any* or *even a little* responsibility and they are not *held accountable for their actions*. This blocks the process of creating an effective team with empowered workers. The system *reinforces* hierarchical management functions by segregating managers from workers and clearly defining boundaries between members of the team. It would be hard to create an environment less conducive to employee empowerment and mutual teamwork.

Pattern within a culture

Reinforces manager's beliefs
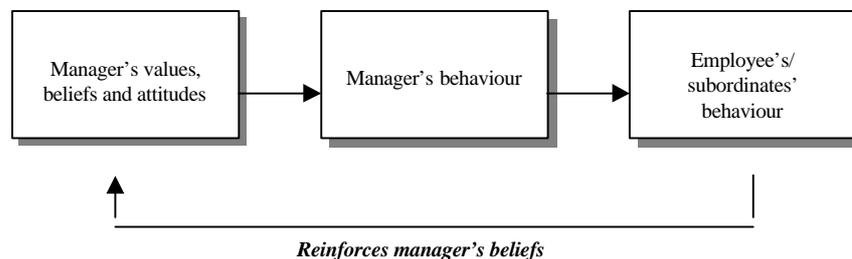
Figure 2: Adler (1997) Managerial attitudes and employee's behaviour: a self-fulfilling prophecy

(based on Douglas McGregor (1960), *The Human Side of Enterprise*, McGraw-Hill, New York).
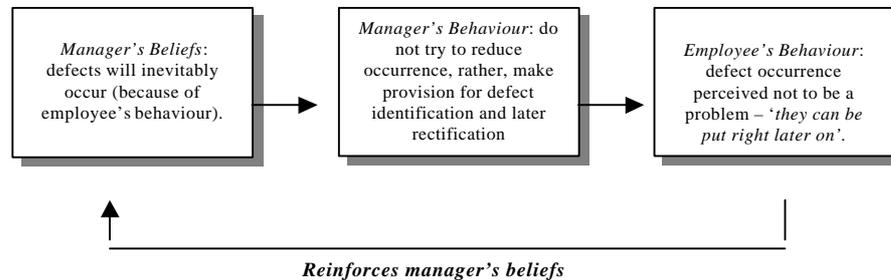
Example with regard to defect occurrence

Reinforces manager's beliefs

Figure 3: Modification of McGregor's model describing a defect acceptance loop.

Many of the above consequences are implicit-resulting from the dynamics of the system and the contextual framework imposed on those operating within it.

In the early 1990s, Australian governments mandated ISO9000 compliant quality management systems in an attempt to move the Australian industry in into the *error prevention* paradigm. While that attempt largely failed, the realisation that poor quality is costing money and upsetting customers is finally galvanising lead contractors to focus on the *error prevention* paradigm.

REFLECTIONS ON CURRENT QUALITY MANAGEMENT PRACTICE IN CONSTRUCTION

Shammas-Toma et al. (1994) reflect on the failure of traditional bureaucratic systems, noting that the crucial issues of worker motivation and supervisor/worker relationships are generally disregarded:

> *[the emphasis of traditional quality control systems] is on the formal mechanisms of control, from whichever origin they favour, with little attention given to the propensity, or otherwise, of those who actually do the work, to become subject to them. Thus, crucially, operative motivation and the impact that supervisory attitudes and the quality of the way quality management systems are implemented are ignored.*

The principles of *control* that Shammas-Toma et al. refer to in these quality systems are the natural corollary of management practices and philosophies belonging to the old paradigm intrinsically preoccupied with structure, control, bureaucracy, and, perhaps subconsciously, self-preservation.

These attitudes, values and beliefs are, according to Bennett (2000), the root cause of many of the problems associated with the '*old management paradigm*'. Bennett refers to the new paradigm as '*The Third Way*' (Lean Construction). He leaves little doubt as to what he believes to be the cause of problems associated with construction management practices in the UK. As construction on site is not an automated process it logically follows that people rather than machines and technology are critical in influencing project outcomes. Bounds et

al. (1999) argue that in the new paradigm product technologies are becoming less significant and *softer* management functions and process technologies are recognised as being critical.

Traditional construction quality management systems are often unrepresentative of events at the workface, and, as previously suggested, are usually preoccupied with the instrument of control and its administration rather than the outputs that are important to the customer. Management endeavours to improve these systems by attempting to document every conceivable course of action to make the system foolproof, often, result in even more rules and procedures (McCabe et al. 1998, Gray and Flanagan 1989). Hughes et al. (1999) reported that the more comprehensive a quality system (represented by more paperwork and bureaucratic processes), the less motivated managers were to use them. The overall result being that increased effort put into bureaucratic systems development is almost completely futile and simply compound the problems of their application.

It has been reported that many quality improvement initiatives do not yield desired results (Repenning and Sterman 2000). Improvement, at times, being temporary and, at other times, achieving only a fraction of intended success. This paradox is insufficiently understood, however, it is accepted that success relies on the concurrent implementation of the social and technical aspects of organisation and process design (ibid). There is a need for a multidisciplinary theory to better understand the ingredients necessary for successful implementation.

In the face of such obstacles, Winter (2000) provides an optimistic outlook by analysing the potential for change.

> *These three propositions—that process problems are predominately attributable to system flaws; that the experts on the work are the people that do it; and that people are fundamentally motivated to do a good job— altogether imply a need for major recasting of managerial roles in the interests of organisational effectiveness.*

LEAN PRODUCTION AND QUALITY

Though the Americans, Deming and Juran had influenced Japanese practice and thinking in the 1940s and 50s, the quality centred organisations and culture that emerged in Japan were essentially a Japanese innovation (Rowen 1993). Their models of organisation were fundamentally different from Western practice. There have been three attempts to characterise the achievements of Japanese management practices epitomised by the Toyota Production System (TPS).

The first attempt to characterise the achievements of the Japanese production miracle was in terms of Total Quality Management. This carried the message that the Western focus on product quality was far too narrow to be useful, rather the focus needs to be, not only on the immediate production process but, on the entire organisation. TQM embraces all aspects of an enterprise's operations, internal issues such as leadership, training and motivation and external issues such as suppliers, customers and the community.

The second attempt was through the book, *The Machine that Changed the World.* In this book, Womack et al. (1990) provided Western managers with a thoroughly researched analysis of the difference between Japanese, European and US automotive manufacturing

processes and outcomes, in production management terms. Lean thinking was seen as a new production paradigm; it explained why Japanese manufacturers had become so successful by the early 1980s and, hence, many managers around the globe wanted to emulate this success.

Lean production principles represent a fundamental refocussing on the processes of production-key issues being the creation of value for the ultimate customer through process reliability and the elimination of all forms of waste. Commencing with the critical focus of value creation to satisfy customer needs, (Womack and Jones 1996) lean production has a dual interest in the efficiency of the production process and the motivation of the people who work in it. This is in stark contrast to traditional principles of hierarchical management and mass production, where the focus is on the creation of a highly structured, impersonal organisational system (Weber 1946).

According to Koskela (1992), the Toyota Production System (TPS)

> […] *completely eliminates unnecessary elements in production for the purpose of cost reduction. The basic idea is to produce the kind of units needed, at the time needed, and in quantities needed. The system has three sub-goals:*
>
> *1.   Quantity control, which enables the system to adapt to daily and monthly fluctuations in terms of quantities and variety.*
>
> *2.   Quality assurance, which assures that each process will supply only good units to subsequent processes.*
>
> *3.   Respect for humanity, which must be cultivated while the system utilises the human resource to attain its cost objectives.*

Lean thinking's organic approach to management incorporates every operational aspect of an enterprise. Cameron and Quinn (1999) describe the changes that took place at NUMMI, between 1982 and 1992, after a joint venture had been formed between Toyota and GMH to reform GMH's most inefficient factory, as follows:

> *Employees had simply adopted an entirely different way of thinking about the company, and their role in it. Higher levels of productivity, quality, efficiency and morale followed directly from this change in the firm's culture.*

Ginato (1996) believes that the success of the TPS is attributable to a combination of social, cultural, economic, political, organisational and competitive characteristics, many of which are ignored in Western management approaches. The resultant 'clan' like teams, working on the basis of trust and cooperation, have consistently provided higher quality products at reduced costs in comparison with traditional methods based upon the American model of mass production.

Subsequent analysis proposes a third characterisation of the TPS. Spear et al. (1999) suggest that the central pillar underpinning the success of the TPS is the extent to which all employees are trained to innovate within their processes using analytical techniques and implementing a commitment to continuous learning that takes place at all levels within Toyota factories.

To understand the role played by culture, and to test the hypothesis that culture is able to influence outcomes, an assessment of project cultures and project outcomes was undertaken. The research framework was structured so that the performance attributes associated with certain cultural characteristics could be determined.

ANALYSIS OF PROJECT CULTURES AGAINST QUALITY OUTCOMES

The Competing Values Framework (Cameron and Quinn 1999) was used to identify the cultural orientation on thirteen Australian projects with the aim of comparing the organisational culture of each project with overall quality outcomes

Table 1: Cameron and Quinn (1999) The four organisational culture profiles

The Clan Culture	The Adhocracy culture
A very friendly place to work where people share a lot of themselves. It is like an extended family. The leaders, or heads of the organisation, are considered to be mentors and perhaps even parent figures. The organisation is held together by loyalty or tradition. Commitment is high. The organisation emphasizes the long-term benefits of human resources development and attaches great importance to cohesion and morale. Success is defined in terms of sensitivity to customers and concern for people. The organisation places a premium on teamwork, participation, and consensus.	A dynamic, entrepreneurial and creative place to work. People stick their necks out and take risks. The leaders are considered innovators and risk takers. The glue that holds the organisation together is commitment to experimentation and innovation. The emphasis is on being on the leading edge. The organisation's long-term emphasis is on growth and requiring new resources. Success means gaining unique and new products or services. Being a product or service leader is important. The organisation encourages individual initiative and freedom.
The Hierarchy Culture	The Market Culture
A very formalised and structured place to work. Procedures govern what people do. The leaders pride themselves on being good coordinators and organisers who are efficiency minded. Maintaining a smooth running organisation is most critical. Formal rules and policies hold the organisation together. The long-term concern is on stability and performance with efficient, smooth operations. Success is defined in terms of dependable delivery, smooth scheduling, and low cost. The management of employees is concerned with secure employment and predictability.	A results-orientated organisation whose major concerns is with getting the job done. People are competitive and goal orientated. The leaders are hard drivers, producers, and competitors. They are tough and demanding. The glue that holds the organisation together is an emphasis on winning. Reputation and success are common concerns. The long-term focus is on competitive actions and achievement of measurable goals and targets. Success is defined in terms of market share and penetration. Competitive pricing and market leadership are important. The organisational style is hard driving competitiveness.

The standard Competing Values Framework questionnaire and another designed to assess the quality of project outcomes were sent to representatives of the design and construction organisations participating in on 13 projects. . The framework, extensively tried and tested in thousands of organisations around the world, is based on four basic organisational forms: *Market, Clan, Hierarchy and Adhocracy*.

Using this framework, it was found that projects achieving below average performance showed a strong orientation towards *market* forms of culture, which are paradoxically, results orientated. The management styles (implicitly) inherent within this culture are focused on short-term goal attainment and project managers are 'hard-driving' and competitive. This type of culture focuses on the individual and his/her ability to produce. These forms are not conducive to developing co-operative, open, team environments, but rather, adversarial, conflict-ridden projects concerned with individual, or organisational, self-preservation.

Conversely, projects that produced above average results exhibited considerably weaker Market characteristics while possessing strong traits associated with Clan types of organisation. These are organisations that place a premium on team cohesion, consensus and morale and are led by managers with a mentor or facilitator style-they were people orientated. They recognised and were receptive to the needs of the individual and the team as a whole. It logically follows that this approach to managing projects is most likely to nurture an environment conducive of proactive, committed, and open team working.
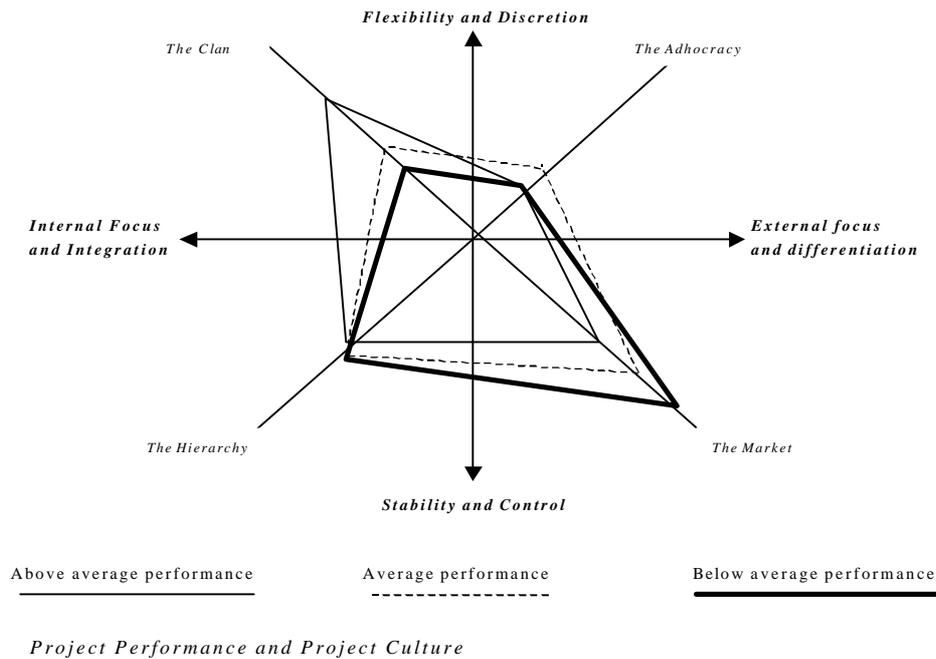

Project Performance and Project Culture

Figure 2: The relationship between project performance and project culture on 13 projects

As shown in the diagram above, organisational culture orientation on the clan/market axis was found to have a relationship with project outcomes. However, characteristics on the adhocracy/hierarchy axis were found to have little affect on performance, with hierarchy characteristics being marginally stronger in better performing projects.

CONCLUSION: THE NEED TO CHANGE

This paper provides both a general overview of historic influences on quality management and a discussion of the limitations that traditional approaches have for construction quality management. Existing quality control practices employed within the Australian construction industry are by and large conceptually flawed. They are still largely cast in an error *detection* paradigm and it is only very recently that error *prevention* has become of serious interest to leading contractors. It is noteworthy that this comes some 40 years after error prevention captured the interest of lead manufacturers. This lag may be largely due to the complexity of construction processes in comparison to manufacturing.

Using the Competing Values Framework, this paper has presented the findings from research that shows that *clan* orientated cultures produce better quality outcomes than *market*

orientated cultures. This suggests that construction would greatly benefit from the development of forms of management that create deeper relationships than those common in the industry today.

Organisational culture guides and controls employee behaviour and action. In a team, strong, culturally motivated forces engender participation rather than the more traditional competitive project environments which are supported by coercion. A project culture should be designed to align organisational goals and objectives with those of the individual participants. Commonly accepted social, economic, political and procedural understandings reduce conflict within the organisation and enhance communication and coordination, and increase the ease with which project objectives are achieved.

The initial step in any successful change initiative is, firstly, to recognise that there are problems with the present practice and to see the opportunity for improved techniques to achieve better outcomes, for both the industry and its customers. This paper argues for a shift to *clan* type cultures on construction sites.

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