Measuring Quality: how does this improve construction performance?

Vaughan Coffey,
School of Urban Development Queensland University of Technology, Australia
(email: v.coffey@qut.edu.au)

Abstract

The paper charts the history and development of the Hong Kong Housing Department (HKHD) Performance Assessment Scoring System (PASS) from 1990 to the present day and examines its effect on facilitating change to the quality of construction work of building contractors engaged in the production of public sector housing projects Hong Kong. The paper builds partly on empirical research carried out by the author as part of a doctoral thesis from 2000 to 2005, on experiential knowledge and also on some relevant case studies. The outcomes from this earlier research and validation of PASS based on results derived from the system since the research was originally undertaken are of benefit to practitioners and academics working and studying in the areas of performance assessment and organisational culture and change. The conclusions presented in the paper further underpin the connection established in previous research between strong organisational culture and project and corporate success. Organisational culture was measured using a survey instrument originally developed by Denison and Neale (1994), adapted for the environment of the study, and corporate success was measured by the PASS system mentioned above. The major results of the original study indicate that there is significant linkage between strong organisational cultures and business success and the detailed findings were that, (1) strong organisational culture was positively associated a high level of company effectiveness, (2) a high level of company effectiveness was positively associated with the cultural traits of ‘consistency’, ‘adaptability’ and ‘mission’, and (3) a high level of company effectiveness was positively associated with the combined cultural traits represented by the dimensions of ‘external focus’ and ‘stable culture’. Several opportunities to take forward this research have been identified, including extending the study to other countries and also longitudinally re-evaluating some of the original case studies to ascertain how organisational cultures have changed or further developed in relation to the changing construction climate in Hong Kong.

Keywords: Public housing construction, performance measurement, organisational culture, procurement, quality.
1. Background

1.1 Public housing in Hong Kong – a brief history

Public housing in Hong Kong has a fairly modern history, which began in 1953 with a fire at Shek Kip Mei that destroyed a large area of ‘squatter’ huts housing predominantly families of refugees from China who had descended on the territory between 1947 and 1949 following the civil war on the mainland (Leung, 1999: 23). This fire left over 60,000 people homeless overnight and the story of how this tragedy was one of the triggers that over the next 55 years has lead to the roll-out of one of the largest and most successful public housing programmes in the world is well documented (Agassi, 1969; Drakakis-Smith, 1979; Bristow, 1984; Leung, 1999). Whilst fascinating, this is not the topic of this paper, but the story that maybe does require telling here (albeit very briefly) is a description of what happened to the quality of public sector housing construction during the late 1970s and early 1980s, that then leads us to a consideration of the topics covered in this paper.

Early on in the housing construction efforts that occurred after 1953, familiar low-rise building techniques were prevalent (the Bowring Bungalows) and much assistance was rendered by the British Army and a small dedicated band of professionals employed by the Public Works Department to overcome the immediate housing problems of those made homeless by the original fire disaster. However, as more and more refugees continued to flow down from the mainland of China, the problems of where and how to house thousands of people meant that the early temporary barrack-style accommodation would not suffice in the longer term. A series of simple low-rise multi-storey buildings were developed and constructed and in various forms formed a workable solution until the late 1960s; amongst these were the ‘H’ shape resettlement blocks built on the site of the original fire in Shek Kip Mei. With land in urban Hong Kong being in such short supply, it was maybe logical that planning densities should be maximized and taller buildings constructed to house more people in a shorter programme time. However, this approach was not without its downside, much of which was not immediately visible at the time the new ‘high-rise’ apartments were actually handed over and it would only be a decade down the timeline when the devastating problems of these buildings would become horrifyingly obvious. Lack of technical expertise by the construction companies which had sprung up in Hong Kong over the preceding 20 years, coupled with insufficient financial resources and a small number of qualified supervisory professionals meant that the core superstructure and rather poor standards of very basic finishes did not possess the structural integrity or durability needed for the task in hand.

An increasing spate of serious maintenance issues began to grow in intensity in the early 1970s and after investigation by the new breed of architects, engineers and surveyors who had been recruited from overseas by the HK government or had been employed by private developers to lead the new private housing boom that was taking off in the territory, 26 multi-storey low and high rise blocks were deemed to have serious or dangerous structural deficiencies. They were classified into several distinct types according to severity of the defects and placed on short-term, median and long-term demolition schedules with the worst being demolished almost
immediately. Once this disastrous situation became public knowledge, all government
departments and especially the Hong Kong Housing Authority (HKHA) and it’s executive arm,
the Hong Kong Housing Department (HKHD), were forced to reconsider their construction
quality control systems to assure a distraught public that this could never happen again.

1.2 Ensuring the quality of public housing in Hong Kong

Whilst the HKHA was now firmly committed to obtaining good quality, because of public
funding, this needed to be at a fair price and was driven by a belief that quality assurance starts
at the beginning of a project not at the end. New leadership in the HKHA and highly-qualified
professional staff in the HKHD were committed to a vision that quality is not something which
is applied by rectifying defects in buildings found at the final inspection, it requires managing
from the top downwards and throughout the life of the project. The unprecedented levels of
public housing expenditure on capital works that was now being provided to the local
construction and allied industries, entitled the HKHA to expect and receive full value for
money. The underlying philosophy has always been, certainly since the late 1980s, “quality is a
value and will not be foregone” (Mortiboys, 1991: 4).

At this time, contractors from the Works Branch (WB) List I and II were employed by the
Authority on its building contracts, which meant that up to 220 (Group A, B & C) firms were
invited to tender by means of open gazette and usually at least 50 tenders were returned for
every major contract. Whilst this method of tender invitation ensured that the whole process
could be deemed ‘fair’ and ‘competitive’, it also meant that companies with reasonably
unknown or even poor track records in building work could tender and be awarded quite
sizeable contracts. Although any known past performance was taken into account when
appraising firms for the award of contracts, the methodology for assessing such performance
was somewhat crude and subjective, relying on a simple tick-box grading system based on
appraising just a few major building elements.

As by 1989, the HKHA was the major user of the larger Group C companies on the WB List,
the establishment of the Authority’s own list of contractors seemed a logical development. It
was also apparent by that time that some contractors tended to concentrate only on the work of
the Authority and had set up specialized operations within their companies to handle such work.
A list of contractors was therefore promulgated in April 1990, which was to be dedicated only
to the HKHA works. A comprehensive set of Rules for Administration of the List (the “Rules”)
was produced to regulate all listing matters. Using only companies from its own list meant that
the HKHA could exercise direct control in the vetting, prequalification and subsequent
performance monitoring of these companies. It also allowed the Authority to operate a reward
and penalty mechanism for good and bad performance.

In order to be admitted onto the HA List, contractors were required to fulfill the following basic
criteria as advocated in the “Rules”:

(a) Certified to of ISO 9000.
(b) Ability to meet List financial requirements
(c) Company organization and staff resources capable of taking on work in the appropriate
    List group and category and of a relevant value.
(d) A good relevant performance track record.
Once listed into various categories (i.e. new works or maintenance), contractors were then subdivided into groups based on thresholds related to the financial workload limits that accountancy and organisational checks determined they could safely work within without serious risk of causing disruption to the HKHA’s all-important housing programme. Should the companies fail to deliver on time, cost and quality, they would be seriously censured including being removed from the List. The new list of contractors was administered by three high-level committees of the HKHA and HKHD shown in Figure 1 below:

![Diagram of committee structure](image)

**Figure 1- The Hong Kong Housing Authority and Department committee structure**

As the ‘owner’ of the list, the HKHA’s Building Committee (BC) approved all recommendations from HKHD’s List Management Committee (LMC) regarding new contractors to be admitted onto the list and changes to the listing status of the existing listed contractors. It set out the “Rules” and executed the authority to implement the laid down policies, and approve disciplinary actions against contractors.

On a quarterly basis, the LMC selects eligible tenderers for upcoming new works contractors and awards tendering opportunities based on previous 6 months performance as measured under a robust and objective performance-based methodology known as the Performance Assessment Scoring System (PASS). The Housing Department Contractors’ Performance Review Committee (HDCPRC), on a quarterly basis considers project performance and provides project scores and recommendations on performance and penalty/reward consideration to the LMC.

### 1.3 The Performance Assessment Scoring System (PASS)

A simplified model of the constituent measures used in PASS 1997 to generate an effectiveness (i.e. performance) score is shown in Figure 2 below.
Every 3 months, the Quarterly PASS Composite Scores (QPCS) of all projects being undertaken by individual contractors are then amalgamated to form a Quarterly Contractor Score for each active company, an important component of the PASS Contractors’ Score-league measuring the comparative achievement of building contractors across all of their public housing contract works, as follows:

a) **Project League** – shown in Table 1 below, reflects contractors’ performance on individual projects. It triggers discussion of, or action on, poor performance of a contractor for a particular project. The league is categorized into three bands with two benchmark lines:

- Composite Target Quality Score (CTQS) is drawn at the upper quartile (25 percentile) of the league.
- Composite Lower Score Threshold (CLST) is drawn at the lower quartile (75 percentile).

**Table 1 - Sample of the Quarterly Project Score League**

<table>
<thead>
<tr>
<th>Project</th>
<th>Contractor</th>
<th>QPCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>Contractor A</td>
<td>93.05</td>
</tr>
<tr>
<td>Project 2</td>
<td>Contractor A</td>
<td>92.90</td>
</tr>
<tr>
<td>Project 9</td>
<td>Contractor B</td>
<td>91.25</td>
</tr>
<tr>
<td>Project 10</td>
<td>Contractor B</td>
<td>91.09</td>
</tr>
<tr>
<td>Project 11</td>
<td>Contractor B</td>
<td>90.89</td>
</tr>
<tr>
<td>Project 12</td>
<td>Contractor C</td>
<td>89.20</td>
</tr>
<tr>
<td>Project 13</td>
<td>Contractor C</td>
<td>89.14</td>
</tr>
<tr>
<td>Project 14</td>
<td>Contractor B</td>
<td>87.36</td>
</tr>
<tr>
<td>Project 15</td>
<td>Contractor D</td>
<td>87.25</td>
</tr>
<tr>
<td>Project 27</td>
<td>Contractor D</td>
<td>87.01</td>
</tr>
<tr>
<td>Project 28</td>
<td>Contractor E</td>
<td>86.86</td>
</tr>
<tr>
<td>Project 29</td>
<td>Contractor E</td>
<td>6.68</td>
</tr>
<tr>
<td>Project 30</td>
<td>Contractor F</td>
<td>86.08</td>
</tr>
<tr>
<td>Project 31</td>
<td>Contractor F</td>
<td>85.60</td>
</tr>
<tr>
<td>Project 32</td>
<td>Contractor A</td>
<td>85.27</td>
</tr>
<tr>
<td>Project 39</td>
<td>Contractor B</td>
<td>84.18</td>
</tr>
<tr>
<td>Project 40</td>
<td>Contractor C</td>
<td>83.50</td>
</tr>
</tbody>
</table>

**Figure 2 - Simplified model of PASS 1997 Version**
b) Contractors’ League – shown in Table 2 below, considers overall performance of contractors across all projects being undertaken (i.e. a contractor’s composite score would be the average of all it’s individual project scores).

The CTQS and CLST lines, drawn from the Project League, are superimposed onto the Contractors’ League. Higher tendering opportunities would be given to those contractors who fall in the upper band of this league (i.e. above CTQS). These contractors will normally be invited to tender for all upcoming contracts in the next quarter, whereas contractors in the lower band, i.e. below CLST, will not be invited to tender for any projects during the next quarter. Those contractors falling between CTQS and CLST will be given varying tendering opportunities, as decided by the LMC.

Table 2- Sample of the Quarterly Contractors’ Score League

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Composite Score</th>
<th>Eligibility to Tender</th>
<th>Based on 6 Projects to tender in the Quarter under Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor A</td>
<td>92.98</td>
<td>6</td>
<td>Composite Target Quality Score (CTQS)</td>
</tr>
<tr>
<td>Contractor B</td>
<td>91.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor C</td>
<td>90.01</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Contractor D</td>
<td>87.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor E</td>
<td>86.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor F</td>
<td>86.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor G</td>
<td>85.89</td>
<td>2</td>
<td>Composite Lower Score Threshold (CLST)</td>
</tr>
<tr>
<td>Contractor H</td>
<td>85.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor I</td>
<td>85.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor J</td>
<td>84.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor K</td>
<td>84.12</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Contractor L</td>
<td>84.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.4 The impact of PASS on performance of contractors

Figure 3 above clearly demonstrates the overall performance improvement of contractors on projects during the first four years of introducing PASS 1997. This improvement was in part due to the reward component of the system, but also to the disciplinary actions imposed on poor performers. These actions ranged from a 3-month
restriction from tendering through to longer periods of formal suspension, and in extreme cases, removal from the list. With the exception of the removal in 1993 of 63 companies, due to their not attaining the required ISO 9000 Standard certification by the official deadline date set by HKHD, the actual number of removals from the HA list and suspensions for disciplinary reasons of companies on the list has been quite small. However, the numbers of contractors restricted from tendering for a prescribed 3-month interval due to poor PASS results since 1997 has been much more significant. Given the existence of quality problems described in the earlier section of this paper that directly affected both the business success of companies involved in the construction of public housing as well as the customer satisfaction of recipients of their product, the possession and maintenance of a robust and accurate performance monitoring system is one of the most important assets to the HKHD’s construction managers and project teams.

1.5 PASS – The future

To ensure the continued effective operation of PASS, HD has needed to constantly monitor, review and enhance the system, the last major review being undertaken in 1997. The reviews identify the main areas of performance shortcomings revealed on projects and raised by assessors, contractors and client. In 1998, following concerns expressed by the Building Committee, HD’s senior management decided that a major system review and if necessary, system overhaul should occur. Various system reviews have occurred since the introduction of the 1997 version of the system and the latest review was undertaken in early 2006. In a bid to streamline the system operation and facilitate project teams to concentrate on managing projects, all major monthly PASS assessments are now carried out by dedicated independent teams and project teams contribute by way of daily site inspection records and Management Input scores on a quarterly basis. Figure 4 below shows how the newest major version of the system (i.e., PASS 2000) has continued to improve performance in the years following 2001:

---

**Figure 4** PASS Score trends 2001 – 2004
Given such a robust system, it was logical to use the measured performance outcomes as a basis for determining the varying organisational and business success of HKHA listed companies. However, given that by the mid-1990s all companies were constructing a highly standardized product (i.e., public housing was using standardized modular building types and identical construction methods, particularly mechanized formwork and large-panel precast facades), what determined the differences in performance, as there certainly were such differences? It was clear to the author (who was managing projects at this time) that the largest determinant of differing performance appeared to be due to the different cultures, approaches and attitudes of the various companies and so the research problem evolved from this consideration. The next major question became “how to ascertain a suitable methodology for measuring organisational culture?”

1.6 Measuring Organisational Culture

Following a detailed investigation of the wide range of definitions of ‘organisational culture’ that exist in the extant literature, a fairly concise operational definition of culture taken from Bates and Plog (1990) was used for this study “Culture is the system of shared beliefs, values, customs, behaviours, and artefacts that the members of society use to cope with their world and with one another, and that are transmitted from generation to generation through learning.”

Several methodologies and instruments used previously for measuring organisational culture were examined and the Denison Organizational Culture Survey (DOCS) was eventually selected as being the most suitable to use in the context of this research due to its suitability for use in, and wide acceptability by, the business environment. Based on 15 years of research drawn from data obtained from over 1,000 high and low-performing organizations, Denison and Mishra (1996) found that the following four culture traits have a significant impact on organisational performance:

- Involvement
- Consistency
- Adaptability
- Mission

Figure 5 below shows the operational dimensions of the Denison Organizational Culture model, which has been derived from the DOCS results over a period of years:
According to Brislin (1976), there are problems relating to the use of such instruments outside of their ethnic development environment due to the difference in *emic* and *etic* perspectives and as it was necessary to allow respondents to DOCS to input in English and/or Chinese and in order to overcome any potential translational equivalence problems, DOCS was taken through a de-centering and back-translation process as shown diagrammatically in Figure 6 below:

![Figure 6 - Adaptation of DOCS for use in Hong Kong](image)

### 1.7 Measuring corporate performance

As discussed briefly in the introduction of this paper, much of the previous research on organisational effectiveness undertaken since the early 1970s has relied on the use of financial measures to determine performance levels, typically individual accounting indices such as return on investment (ROI), return on assets (ROA) and return on equity (ROE) have been used (Grinyer & Norburn 1975; Karger & Malik 1975; Thune & House 1970). Longitudinally measured multiple financial accounting indices were used in some later studies (Hitt, Ireland, & Stadler 1982; Rumelt 1974) and the capital asset pricing model performance indicators evolved by Lubatkin (1983) were also used as a basis for research by Hitt and Ireland (1984). Despite the popularity of such models and indicators, their use to represent organisational effectiveness has been criticized over the last twenty years. Hitt (1998: 30) notes that they “have deficiencies as ‘true’ indicators” and their use “does not capture the essence of organizational effectiveness.” As had been the case with the lack of consensus amongst both researchers and managers on defining organisational effectiveness, a similar dilemma existed in relation to agreement on the
most effective measurements of the phenomena (Bourgeois 1980; Cunningham 1977; Hrebiniak 1978; Molnar & Rogers 1976; Steers 1975; Tsui 1990). Some researchers questioned whether in view of the lack of agreement on such fundamental questions as definitions and measures, organisational effectiveness should even be researched at all Hannan and Freeman, 1977; Bluedorn, 1980).

In an attempt to utilise measures which were determined on a non-financial basis and also reflected ‘customer satisfaction’, the objective dependent variables used to operationalise ‘organisational effectiveness’ in this research were the success ratings of building contractors employed on public sector housing contracts awarded and operated by the HKHA. These variables were drawn from the component assessments of the HKHD’s PASS scores of contractors and based therefore on quantitative and objective evaluation and measurement of the real-time quality of built output against the specification requirements, over the period from 1997 to 2002.

1.8 The link between organisational culture and performance

Several researchers and authors have presumed a link between organisational culture and corporate performance and some of these research studies have established evidence of such a link and thus concluded that it does indeed exist Denison (1990), Gordon & DiTomaso (1992), Kotter & Heskett (1992); Petty et al. (1995) and Wilderom & van den Berg (2000). However, other critical reviews of the methodologies and findings used in such research challenge such conclusions, Lim (1995).

Following a detailed examination of 10 studies conducted into the OC performance link in Europe and the United States since 1990, Wilderom, Glunk & Maslowski (2000, p. 201) state “Nevertheless, the great intuitive appeal of the C-P linkage, the preliminary evidence found so far and the many research challenges involved in obtaining the evidence give some reason to still believe in this link.” These authors observed that whilst there are some similarities in the organisational culture dimensions investigated/measured, of the variety of performance measures used, most relied on financially based data sets.

It was this previous predominant use of financial measures to evaluate company success, coupled with the criticisms evident in the extant literature on measuring organisational effectiveness in this manner that prompted me to use a different measurement base, particularly in view of the fact that companies being evaluated were in the construction sector and there was an apparent lack of available financial information specifically related to their work in the public housing sector (i.e., most of the companies were not publicly listed and had parent companies whose financial results were generated based on their total development sector performance).
2. The Research

2.1 The research model

Based on the research objectives and main research problem described in the introduction of this paper, the three resultant research questions were:

*Question 1:* Do Hong Kong construction companies possessing relatively high combined levels of the four organizational cultural ‘traits’ i.e. adaptability, involvement, consistency and mission (as indicated by the Denison Organizational Culture Model) perform more successfully on public housing projects than those exhibiting lower levels of those traits?

*Question 2:* Are any of the four traits more significant in contributing to success levels than others?

*Question 3:* Are any combinations of the four traits, based on a horizontal or vertical split of the Denison Organizational Culture Model, more significant in contributing to success levels than others?

Figure 7 below presents the research model developed and used in the study, however in a short paper it is not possible to fully state all of the nine hypotheses which constitute the model and so the description which follows is restricted only to the three basic research questions giving rise to the various hypotheses.
The nine research hypotheses associated with the questions described above were:

(a) **Question 1 associated hypothesis** -

H1: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with high (i.e. third and fourth quartile) combined organisational culture scores, as measured by ‘The Denison Organisational Culture Model’.

(b) **Question 2 associated hypotheses** -
**H3**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with ‘adaptability’ in their organisational culture as measured by ‘The Denison Organisational Culture Model’.

**H4**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with the ‘involvement’ measure in their organisational culture as measured by ‘The Denison Organisational Culture Model’.

**H5**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with the ‘consistency’ measure in their organisational culture as measured by ‘The Denison Organisational Culture Model’.

**H6**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with the perception of ‘mission’ in their organisational culture as measured by ‘The Denison Organisational Culture Model’.

(c) **Question 3 associated hypotheses** -

**H6**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with third and fourth quartile ‘Denison’ rankings in ‘adaptability/mission’.

**H7**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with third and fourth quartile ‘Denison’ rankings in ‘involvement/consistency’.

**H8**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with third and fourth quartile ‘Denison’ rankings in ‘involvement/adaptability’.

**H9**: Position of ‘successful’ building contractors on the PASS score-league, is significantly associated with third and fourth quartile ‘Denison’ rankings in ‘consistency/mission’.

**Sample**

The DOCS was distributed to all 53 building contractors on the HKHA’s list in the Building (New Works) Category and the total number of returned survey sets was 29 (54.7%) and of these some 23 sets were eventually useable in the study data set (43.40%), based on post-return established cut-off criteria. As each company provided several returns drawn from different levels of management and control within the company, there were some 159 useable returns overall.

### 3. Results And Analysis

Question 1 explores the overall theoretical concept of a presumed link between organisational culture (OC) and organisational performance (OP) and so correlation was investigated between
the overall organisational culture raw scores of contractors and their PASS-measured performance.

Table 3- Pearson correlation results for overall organisational culture and overall performance scores

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Overall Cultural Score</th>
<th>Overall PASS Score (00-01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Cultural Score Pearson Correlation</td>
<td>Overall Cultural Score</td>
<td>Overall PASS Score (00-01)</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.532*</td>
<td>.019</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>19</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).

As can be seen in Table 3 above, the results show that in companies possessing high combined DOCS scores, their ‘strong’ organisational culture is positively and significantly associated with high levels of organisational performance measured by PASS. Based on the above results, hypothesis H1 is supported. Question 2 explored the original concept proposed by Denison (1990) and further developed with Neale (Denison & Neale, 1994) that the four cultural traits of ‘Mission’, ‘Consistency’, ‘Involvement’ and ‘Adaptability’ have a strong influence on organisational performance. The four cultural trait scores obtained from the DOCS and success levels of the respondent contractors measured as their overall PASS scores was tested and the results are shown in Table 4 below:

Table 4- Pearson correlation results for four organisational culture traits and overall performance scores

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Overall PASS Score (00-01)</th>
<th>Involvement</th>
<th>Consistency</th>
<th>Adaptability</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall PASS Score (00-01) Pearson Correlation</td>
<td>Overall PASS Score (00-01)</td>
<td>Involvement</td>
<td>Consistency</td>
<td>Adaptability</td>
<td>Mission</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.543*</td>
<td>.746**</td>
<td>.737**</td>
<td>1.000</td>
<td>.820**</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation analysis shows a positive relationship between each of 3 cultural traits of ‘Consistency’, ‘Adaptability’ and ‘Mission’ with the overall PASS score at the 5% significance level. Out of these three trait measures of organizational culture strength, ‘Adaptability’ has the strongest correlation; ‘Consistency’ has the least correlation, whilst ‘Mission’ is of moderate significance. Only the correlation between ‘Involvement’ and overall PASS score cannot be justified in this research study. Adaptability, according to Denison
(2000), is the organisational trait that demonstrates the capability of a company to receive, interpret, and translate signals from its environment into internal behavioral changes that increase its chances for survival, growth and development, i.e., to turn the demands of the business environment into productive and effective action. Three aspects of adaptability impact an organisation's effectiveness and these are:

- Creating Change
- Customer Focus
- Organizational Learning

The high significance of the relationship between 'adaptability' and performance strongly underpins the fact that in a sector such as the construction industry, where the business environment is so volatile and subject to massive and often swift changes, the companies most able to survive are those that are most capable of adapting to these changes. This is particularly pertinent in relation to the public housing sector where housing production levels, cost yardsticks and competitiveness are so dependent on public policy, as well as being directed and driven by altered public sentiment, peoples’ increasing aspirations and media and political pressure.

The significant relationship between the traits of 'consistency' and 'mission' and performance highlights the necessity for successful companies to possess core values that are understood by all players and well integrated throughout the organisation through commonly shared goals and objectives and a strong agreed strategic direction. These traits are strongly related to the stability of companies, that creates well-being, loyalty and satisfaction amongst staff. This stability must importantly be reflected in a long-term mission focus which although it may have to adapt, should not significantly change over short spans of time. Denison (2000: 356-7) states that “The most troubled organizations are often those that have had to change their basic mission…when an organization’s underlying mission changes, corresponding changes in strategy, structure, culture, and behaviour are also required.”

The low significance of the relationship between ‘involvement’ and performance is an interesting and somewhat surprising result as according to Denison (2000), organisational cultures characterized as "highly involved" strongly encourage employee involvement and create a sense of ownership and responsibility. Their internal management systems are based on informal, voluntary and implied control rather than on formal, explicit or bureaucratic control and strong commitment to an organisation develops from a sense of personal ownership and an increasing capacity for autonomy. Highly involved organisations seek input from their members in order to improve the quality of the decisions made and their subsequent implementation.

Question 3 explores the generic theoretical concept proposed by Denison and others (Denison, Cho & Young 2000; Denison, Hoojiberg, & Quinn 1995; Denison & Mishra 1996) that there are a set of tensions and contradictions existing within organization, which depending on if they are well or badly managed, also have a significant effect on organisational performance. In DOCS, four meaningful combinations of the cultural traits and their directions of influence can be made as follows:
• External focus: Adaptability + Mission
• Internal focus: Involvement + Consistency
• Flexible: Adaptability + Involvement
• Stable: Mission + Consistency

Measurement of the four combinations was obtained by taking average of the corresponding constituent cultural scores. The correlation was then investigated between them and company success represented by overall PASS score. The results of the correlation test are summarised in Table 5 below.

Table 5- Pearson correlation results for four combined organisational culture traits and overall performance scores

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Overall PASS Score</th>
<th>External Focus</th>
<th>Internal Focus</th>
<th>Flexible</th>
<th>Stable</th>
<th>Overall PASS Score</th>
<th>External Focus</th>
<th>Internal Focus</th>
<th>Flexible</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall PASS Score</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td>1.000</td>
<td>.552*</td>
<td>.014</td>
<td>19</td>
<td>.552*</td>
<td>1.000</td>
<td>.014</td>
<td>19</td>
<td>.552*</td>
<td>1.000</td>
<td>.014</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>External Focus Culture</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td>.465*</td>
<td>.853**</td>
<td>1.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Internal Focus Culture</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td>.486*</td>
<td>.927**</td>
<td>.525**</td>
<td>1.000</td>
<td>.866**</td>
<td>.866**</td>
<td>1.000</td>
<td>.866**</td>
<td>1.000</td>
<td>.866**</td>
<td>1.000</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Flexible Culture</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
<td>N</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td>.543*</td>
<td>.952**</td>
<td>.911**</td>
<td>.866**</td>
<td>1.000</td>
<td>.866**</td>
<td>1.000</td>
<td>.866**</td>
<td>1.000</td>
<td>.866**</td>
<td>1.000</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

From these results, it can be seen that all four combinations of the cultural traits correlate positively with the overall PASS score at 0.05 significance level, but comparatively, ‘external focus’ and ‘stable culture’ correlate more significantly than do ‘flexible’ company structures’ and ‘internally focused’ companies. The purpose of examining these combined cultural trait combinations and their relationship with performance levels was to ascertain whether companies that could manage these apparently contradictory competing dimensions of the Denison Organisational Culture model performed better than those companies that did not handle them well. Denison (2000: 357) states that “Effective organizations find a way to resolve these dynamic contradictions without relying on a simple trade-off.” The trade-offs are:

• Stability versus flexibility;
• Internal versus external focus;
• Internal consistency versus external adaptation; and,
• Top-down mission versus bottom-up involvement.

4. Conclusions

4.1 Major findings

The main findings from the research are:
A high level of company effectiveness is positively associated with strong organisational culture;
A high level of company effectiveness is positively associated with the cultural traits of ‘consistency’, ‘adaptability’ and ‘mission’ but not with “involvement” trait; and,
A high level of company effectiveness is positively associated with the combined cultural traits represented by the dimensions of ‘external focus’ and “stable culture”.

These findings support the previous research of (Denison 1990; Gordon & DiTomaso 1992; Kotter & Heskett 1992; Petty, Beadles, Lowery, Chapman, & Connell 1995; Wilderom & van den Berg) and underpin the robustness and reliability of the DOCS for use in multi-cultural settings and in a technological business sector (construction) other than those such as commerce, production, manufacturing and information technology where the instrument had been previously tested.

The results of this research add to theory in the following areas:
- They support the outcomes of work of other researchers who have investigated the presumed link between organizational culture and organizational performance, in that there appears to be a strong association between the two constructs;
- They use an entirely new set of measures to operationalise business success and performance (i.e. the HKHD’s PASS scoring system) in a new sector of research (i.e. the construction industry) in which robust research effort is only recently beginning (e.g., CIB TG23 and CIB W112 initiatives);
- The original DOCS instrument of Denison and Neale (1994) has undergone a rigorous process of decentering and back-translation to better adapt it for use in a new research environment, i.e., Hong Kong, Construction, Public Sector Housing;
- Support for mixed method research approaches is provided by way of the use of simple qualitative enquiry to underpin quantitatively obtained data; and,
- These results posit the possibility to further develop the DOCS for specific use in the construction industry setting and as a longitudinal metric for change measurement in this dynamic industry.

4.2 Further research opportunities

Further research is needed to obtain a more detailed and deeper understanding of the organisational culture of the construction industry where study has so far been somewhat limited and longitudinal use of the DOCS and PASS in the research population established for this research would develop and hopefully strengthen the findings described in this paper. The organisational culture (OC) and organisational performance (OC) link

a) The organisational culture and performance link

Whilst much has been achieved by way of research into the OC-OP link since the late 1980s, many authors share the view expressed by Sparrow (2001:102) that “…in taking the more functionalist and positivist perspective of high performance culture research, it is important to
stress that this form of assessment \[i.e., \textit{the OC-OP research perspective}\] need not be limited to quantitative methodologies. Qualitative tools and techniques can sit just as easily in the consultant’s toolkit...there must be room for culture and climate diagnostics, informed by richer – and in some instances more qualitative–investigation, that tap the most relevant individual sense making processes.” Certainly, the qualitative investigation carried out for this thesis clearly indicated a rich source of alternative data to better inform the purely quantitative results of using an organisational culture measuring instrument and this accords with the view of the said instruments author who stated (Denison, 2000: 367) “Perceptive insiders and outsiders need to be involved in order to help translate the findings from a model-based analysis of the culture...depth of analysis is needed to support the insights from the survey data and bring them to life.” Clearly then, there is a need for more qualitative work to be linked with quantitative studies to increase our knowledge of organisational structure, culture and its affect on performance and although current studies are beginning to move us more swiftly in this direction, further work is required to strengthen this whole field of study.

\[b) \textit{The metrics of organisational performance}\]

Hopefully, this thesis has clearly demonstrated the benefits of considering alternative ways to operationalise organisational performance other than by the use of purely financial measures. As mentioned previously, Kennerley and Neely (20021) have summarised the main components of an effective performance measurement system as follows:

- Must provide a “balance” picture of the business,
- Needs to present a succinct overview of the organisation’s performance;
- Should be multi-dimensional;
- Requires comprehensiveness;
- Must be integrated both across the organisation’s functions and through its hierarchy; and,
- Business results need to be seen as function of the measured determinates.

Andy Neely’s own integrated and stakeholder-focused 2001 performance measurement model, the Performance Prism, appears to satisfy the parameters described above and should be more widely used, together with other instruments such as the Balanced Scorecard (Kaplan and Norton, 1992), in order to become more universally accepted measures of organisational effectiveness. This would then allow the development of local, national and global performance databases for use by both researchers in academic studies but by businesses themselves for benchmarking and setting up strategic organisational change programmes.

\[c) \textit{The Hong Kong Construction Industry}\]

Researching the culture of the 23 companies involved in constructing public sector housing in Hong Kong has been a first step only into an area where more research is clearly needed (Root, Hancock & Chapman 1996; Chinowsky and Meredith., 2000; Fellows and Seymour 2002), however the results of this research need to be extended both laterally (i.e., launched into
construction companies outside public sector housing) and longitudinally (i.e., how have the organisational cultures of companies surveyed using DOCS changed since the time of the original study and what affect have changes had on organisational performance as a result?). Through the efforts of the CIB Task Group TG23 and later CIB W112, research into organisational and corporate culture in the construction industry is now progressing ahead and this will be at a global as well national level of consideration. It is interesting to note in this context that the chosen instrument of culture measurement is the Organisational Culture Inventory (Cooke and Rousseau, 1983) and this methodology promises to build up a global database of cultural profiles of construction organisations user-friendly and highly useable at a national and global level for research purposes. The measures and instruments used for determining organisational culture traits and strengths matter less than the actual studying of what differentiates one company in an industry from another and hopefully this author’s research has added to the extant knowledge of this, particularly in the construction field.

4.3 Final reflections

The topic extracted from this author’s thesis and embodied in this paper was conceived from the researcher’s interest and belief in the existence of a demonstrable link between the cultures of organisations and the impact that different levels of cultural strength may have upon effectiveness and performance of these organisations. Building on the theory which has developed out of the many studies carried out in the last decade or so that have demonstrated such a link exists (Denison, 1990; Gordon and DiTomaso, 1992; Kotter and Heskett, 1992; Chapman and Connell, 1995; Wilderom and van den Berg, 1998), whilst at the same time recognising the important contribution of other studies which have been critical of the validity of such presumptions (Saffold, 1988; Siehl and Martin, 1990; Lim, 1995; Wilderom et al, 2000), this research thesis was designed to test both sets of views.

A large part of the doubt expressed by the latter group of authors related to the measures of organisational culture and effectiveness currently being used in such research, in particular the reliance on financially-based measures of effectiveness rather than other tangible metrics. This discussion on differing theoretical opinions, methodologies and measurement tools for investigating the existence of the culture-performance link, presented a fascinating opportunity for further research and given this researcher’s long-time experience and specific placement in the construction industry since 1977, a topic developed that not only examined the organisational culture and performance link, but also carried the research specifically into construction industry organisations and public sector building projects, which according to some authors, (Chinowsky and Meredith, 2000), is a sector of business where a need exists for more research into those management and organisational issues that impact on the efficacy of construction companies to perform more effectively. The basic research question addressed within this thesis was born, i.e., why are some companies able to produce built output that better satisfies their customers, when many others cannot and does the organisational culture of the construction company impact on its performance?
Using the list of new works building contractors of the Hong Kong Housing Authority (HKHA), secondary data drawn from that organisation’s objective quality measurement tool known as the Performance Assessment Scoring System (PASS) as an alternative objective measure of effectiveness and the Denison Organisational Culture Survey (DOCS) instrument developed in 1984 by Dr. Daniel Denison, research was then undertaken on the relationship between organisational culture and organisational performance.

The outcome of the research was that a link does indeed exist between the two and that also there is significant correlation between the strength of an organisation’s culture and its comparative effectiveness in performance terms when investigated in the specific setting of Hong Kong. The thesis makes a contribution to theory by further validating the work by Denison (1990) and others not only in that it successfully demonstrates a link between organisational culture and performance, but it also contributes to management and public policy by identifying particular cultural factors in organisations that appear to be significantly responsible for achieving successful outcomes and reveals opportunities for further research into the organisational culture of construction companies.

References


[22]. Hong Kong Housing Authority (1990) Rules for Administration of the List of Building Contractors. Hong Kong, Housing Department Technical Secretariat.

[23]. Hong Kong Housing Department (1997) Hong Kong Housing Department. Performance Assessment Scoring System (April 1997 Edition). Hong Kong, Housing Department PASS Control Unit.

[24]. Hong Kong Housing Department (2002) Hong Kong Housing Department Performance Assessment Scoring System 2000. Hong Kong, Housing Department PASS Control Unit.


