CONSTRUCTION MANAGEMENT TEAMS & PROJECT PERFORMANCE -A DIAGNOSTIC TOOLKIT-

Stuart Tennant[1] and Prof. Dave Langford

[1]*School of Science & Technology, Bell College, Almada Street, Hamilton, ML3 0JB, UK*
[2]*Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow, G4 0BA, UK*

Team theory is a resilient management theme, its academic and practical contribution to human resource management has been the subject of countless studies. Over the last decade corporate team philosophy has shifted the team paradigm away from a traditionally tactical purpose towards an increasingly strategic perspective. The research programme investigates the relationship between construction site management team efficiency and project performance. Ten construction project case-studies have been undertaken to assess levels of site management team working with the results evaluated against project performance. The case-study has two principle data collection methods. The team rating is assessed using an attitude questionnaire completed by all participating site team members. The individual responses are collated, averaged and presented as a percentage rating on a team radar chart. Project performance is calculated by applying Kaplan and Norton's balanced scorecard template together with seven key performance indicators endorsed by the DTi's Constructing Excellence initiative. The KPI's are collated, benchmarked and presented on the appropriate axis of a project radar chart. Analysis of the results suggests a significant strength of relationship between the construction site team rating and project performance. Various statistical configurations have also been identified, indicating possible weaknesses within the team dynamic that may be addressed in an effort to achieve improved project performance. Further research has the potential for the development of a diagnostic toolkit that may reveal some of the behavioural and contextual barriers associated with construction site management teams.

Keywords: Construction, Management, Performance, Teams.

INTRODUCTION

Team theory is a resilient management theme; the notion of team working has a long established status. The quantity of readily available team management literature, team-building seminars and conferences act as a tangible testimony to the enduring appeal of team working philosophies. In the current management climate "teams are considered to be on the leading edge of management and human resource development" (Harris and Harris, 1996). Although, in terms of purpose, there has been a subtle change in the corporate interpretation of team benefits compared with the management perspective of previous years. The traditional teamwork research of the founding behavioural scientists was in essence, benevolent in its concern, "the principal managerial and social science concerns have been with morale, (Buchanan, 2000). Contemporary team management theories now focus primarily on the needs of the business, "considerations of performance have obviously contributed to the growth in importance of team working during the 1990's," (Cully *et al*, 1998). Therefore, the

[1] s.tennant@bell.ac.uk

Tennant, S and Langford, D (2005) Construction management teams & project performance - a diagnostic toolkit. *In:* Khosrowshahi, F (Ed.), *21st Annual ARCOM Conference*, 7-9 September 2005, SOAS, University of London. Association of Researchers in Construction Management, Vol. 2, 939-48.

current wave of management thinking has shifted the typical team paradigm, from a principally tactical approach used to improve productivity and operative morale to a present-day attitude that views the application of team working as a wide-ranging corporate aspiration that will shape most aspects of business performance. The rationale for the adoption of team working in the twenty first century is "to improve the organisations competitive position through effective utilisation of human resources", (Morley and Heraty, 1995). In other words, "the objectives…..are strategic rather than operational", (Procter and Mueller, 2000).

Research Rationale

For an industry profoundly reliant on teamwork there would appear to be little evidence of formal team management philosophies being implemented at a construction site level. Therefore, high performing construction teams are more likely to come about more by accident than by design. The rationale for this research project is to develop a diagnostic toolkit that can identify the strengths and weaknesses of various collaborative work compositions and directly relate to the corresponding project performance.

TEAMS

The word 'team' is a common expression yet a clear-cut definition remains elusive. Dictionary descriptions have a tendency to communicate a universal application of the team ideal and in the process over-simplify the multifaceted nature of the team dynamic. Katzenbach and Smith (1993) suggest that the team definition would be better articulated as a "discipline that real teams share", stating that "a team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable". Unfortunately, the unremitting 'casual' use of team vocabulary in everyday management language may dilute the true 'discipline' of team orientated activity and "carries with it the danger that team working will lose all meaning", (Procter and Mueller, 2000). In an effort to compliment team understanding within the environment they perform it may be reasonable "to focus attention on how aspects of organisational context influence the different forms of team working adopted", (Buchanan, 2000). Otherwise, failure to recognise corporate limitations may inhibit team efficiency. Jasmine Tata (2000), recognised the significance of corporate environments stating that "work teams do not exist in a vacuum, but are part of a larger organisational system with distinct cultural and structural characteristics". The statement implies that existing company practice may on occasion contradict team ideals and act as a barrier to high performance team (HPT) working. Companies should endeavour to establish compatibility between existing working procedure and those associated with a team-based orientation. Organisational context will shape the team dynamic and as such will redefine the generic meaning of the team within an organisation specific setting. Industry culture, particularly construction, may also influence the exactness of the team definition. It may therefore be argued that a standard team definition should be malleable enough to reflect the various contextual attributes that all teams invariably possess. The application of teams within the construction sector is extensive where, "construction is arguably the largest

collectivist activity", (Moore and Dainty, 1999). Construction project teams in particular require a multi-functional, inter-disciplinary representation, engaging a cross-section of industry professionals responsible for carrying out duties particular to their area of expertise. This type of team arrangement is representative of a cross-functional team formation. The appeal of high performance cross-functional teams (HPX_fT) in construction is likely to be commercially motivated, "the pay-off must be financial in the first instance and will only come when team working results in each business firm represented receiving the profit it expected", (Cornick and Mather, 1999).

PERFORMANCE MANAGEMENT

For Katzenbach and Smith (1993), the definitive characteristic that distinguished a group, taskforce, alliance or any other socially inclusive working party from a team is – performance. Historically, organisational performance has focused first and foremost on the financial aspects of business achievement. This blinkered approach to performance measurement has in recent times received frequent disapproval for "emphasising economy and efficiency and neglecting measures of customer satisfaction and quality," (Open University, 2001). This outlook fulfils manufacture accountability (economy and efficiency) but is of little consequence for the external consumer / customer, (effectiveness and ethics). Contemporary paradigm for Performance Management has widened the focus of performance techniques to include traditional as well as non-traditional performance criteria. In response to this need to portray a more holistic methodology for the assessment of corporate well being, Kaplan and Norton developed the 'Balanced Scorecard' concept. The assertion of the Balanced Scorecard was to construct a set of four interrelated measures that would give senior managers a fast and comprehensive information model that would be representative of corporate strategy and individual goals. The balance scorecard augments 1/ the financial viewpoint with three other business aspects: 2/ customer perspective, 3/ internal business perspective and 4/ an innovation and learning perspective. The four dimensions represent a more 'rounded' approach to performance assessment, acknowledging the importance of the various stakeholders, including the customer and the employee. Research suggests that although performance management is widely acknowledged as a prerequisite for competent corporate management, little has been done to assimilate and customise 'individualistic' performance management principles within a team orientated 'collectivism' environment. "One of the interesting findings of our research was that, although everyone we contacted talked about organisational and individual performance, relatively few organisations made specific arrangements for team performance management," (Armstrong and Baron, 1998).

METHODOLOGY

The research methodology adopted for this programme focused on the measurement of data gathered from both the team participants (a team rating) and their associated projects (project performance). In the first instance the data could be collated to establish the strength of relationship between the perceived level of team cohesion / working and the level of performance attained. Secondly the information may provide insight into the strengths and weaknesses of the variable(s) assessed. The team rating is derived from a team member questionnaire that all company project team members complete. There are three primary categories and seven different variables. Each section relates to a variable, (1)Interdependency, (2)Membership Diversity, (3)Team Dynamics and (4)Trust are variables within the Group Compatibility and Diversity category. (5)Corporate Intent and (6)Systems Procedures & Customs relate to Organisational Context and (7)Culture relates to Industry Context. The response to the various statements are scored on a scale of 1 to 5, the higher the score the greater the perceived level of team characteristics associated with that particular variable. The individual variable ratings are then presented on a radar chart as well as averaged to provide an overall indication of the team rating for the project group. The project performance is measured using recognised construction industry key performance indicators (KPI's) advocated by the DTi Constructing Excellence programme. The selection criteria for suitable KPI's have been based on the Kaplan and Norton Balanced Scorecard template. A customised suite of seven KPI's address each of the four business perspectives. The selected KPI's are (1) Predictability – Construction Cost (Financial), (2) Predictability – Construction Time (Financial), (3) Client Satisfaction – Service (Customer), (4) Client Satisfaction – Product (Customer), (5) Employee Satisfaction (Internal), (6) Hours Worked (Internal) and (7) Training Days (Innovation & Training). The data is collected from three information sources, the team member, the team leader and the client / client representative. The information is collated and transferred in to a benchmark score using the appropriate Constructing Excellence KPI information chart(s). Each of the KPI's are plotted on the appropriate axis of the radar chart as well as averaged to provide an overall evaluation of the project performance.

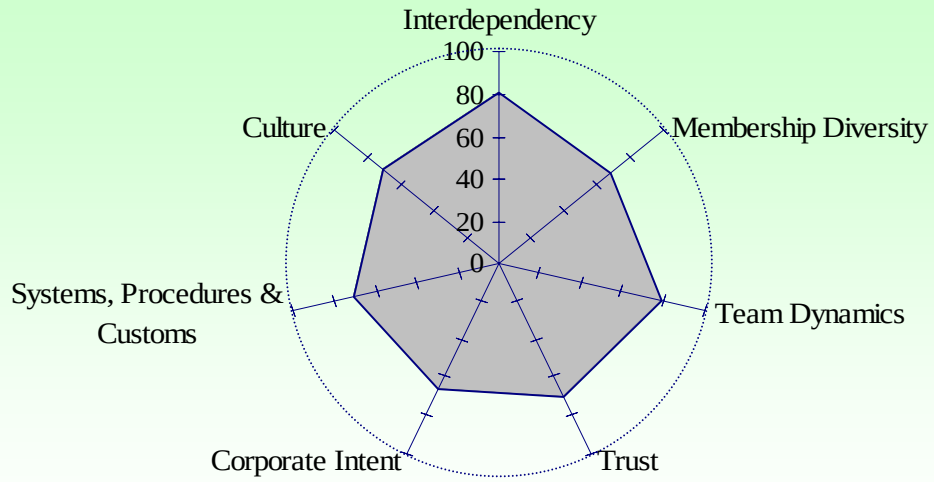
CASE-STUDY

The following project case-studies were carried out between August 2004 and February 2005 with the help and cooperation of two major UK contracting organisations. Company A has a combined corporate turnover in excess of £1.47 billion. The Scottish regional office provides contracting services across the central belt and is a division of the largest business sector within the group, contributing to an annual sector turnover of £788 million. Company B provides an integrated range of property services including construction. The parent group ranks among the largest construction firms in Europe with a corporate turnover of approximately £4.5 billion. The construction arm turnover for 2004 was £1.47 billion. Ten construction projects within the Scottish region, five from company A and five from company B where identified as suitable for this case-study. The projects selected represented an array of team composition and size. The smallest team had two participants and the largest nine participants, project valuations also varied with project costs ranging from £2.9m to £25m. There was also a cross representation of procurement routes, clients (private and public), new build and refurbishment as well as building type including office

development, health care facilities, research laboratories, art centres and local community facilities.

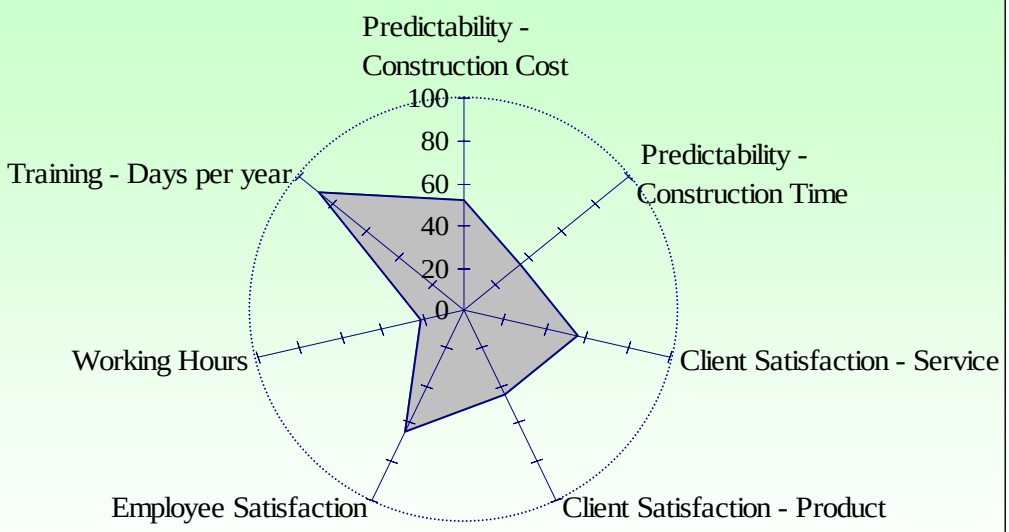
RESULTS

Fig. 1: Team Rating Radar Chart (Case-Study Project Average)



Average Team Score = 72%
Standard Deviation = 5.7

Fig. 2: Project Performance Radar Chart (Case-Study Project Average)



Average Project Score = 51%
Standard Deviation = 22.6

Note: The results are presented using a Radar Chart format. In general, the nearer the plotted line is to the outer perimeter of the radar chart, the higher the overall performance.

Table 1/ illustrates the individual project results along with a project average for both the 'Team Rating' and corresponding 'Project Performance'.

Company:	Project No.:	Team Rating	Project Performance
Company A	Project A1/	72% (rank 5th.=)	54% (rank 5th.)
Company A	Project A2/	68% (rank 9th.)	47% (rank 6th.)
Company A	Project A3/	62% (rank 10th.)	29% (rank 10th.)
Company A	Project A4/	70% (rank 7th.=)	42% (rank 7th.=)
Company A	Project A5/	74% (rank 4th.)	61% (rank 3rd.)
Company B	Project B1/	72% (rank 5th.=)	40% (rank 9th.)
Company B	Project B2/	77% (rank 2nd.)	42% (rank 7th.=)
Company B	Project B3/	76% (rank 3rd.)	63% (rank 2nd.)
Company B	Project B4/	79% (rank 1st.)	74% (rank 1st.)
Company B	Project B5/	70% (rank 7th.=)	59% (rank 4th.)
Project Average:		**72%**	**51%**

Table 2/ is a breakdown of the seven-team variable averages from the ten construction projects participating in the case-study:

Team Variable	Team Category	Score
1/ Interdependency	(Group Diversity & Compatibility)	- 81%
2/ Membership Diversity	(Group Diversity & Compatibility)	- 68%
3/ Team Dynamics	(Group Diversity & Compatibility)	- 79%
4/ Trust	(Group Diversity & Compatibility)	- 70%
5/ Corporate Intent	(Organisational Context)	- 66%
6/ Systems, Policies & Customs	(Organisational Context)	- 70%
7/ Culture	(Industry Context)	- 70%

Table 3/ is a breakdown of the seven KPI Construction Industry Benchmark percentages from the ten construction projects participating in the case-study:

Key Performance Indicator	Perspective	Benchmark Score
1/ Predictability - Construction Cost	(Financial)	- 52%
2/ Predictability - Construction Time	(Financial)	- 34%
3/ Client Satisfaction - Service	(Customer)	- 56%
4/ Client Satisfaction - Product	(Customer)	- 44%
5/ Employee Satisfaction	(Internal)	- 64%
6/ Working Hours	(Internal)	- 21%
7/ Training - Days per year	(Innovation & Learning)	- 88%

Note: The project performance results are all from the relevant Headline Construction Performance Benchmark for 2004. KPI 1/ to 4/ is taken from the All Construction suite and KPI 5/ to 7/ is taken from the Respect for People suite, (Constructing Excellence, 2004).

ANALYSIS

A number of important issues need to be clarified prior to the interpretation of the results. At present the case-study companies does not employ the existing Key Performance Indicators (KPI's) developed by the DTi. In the application of performance management is it fundamental that the participants are fully aware of the standard against which they will be measured, this information permits the targeting of resources in to areas that will contribute to the final evaluation of the project. At the time of the study, all ten case-study participants where unaware of the measures against which the site performance was being evaluated for this study. Therefore, due to likely deviations between current company performance measures and those used for the purpose of the research it would be unreasonable to interpret project outcomes' in terms of good or bad. They may be used in comparison with other contractors, sites and/or as a starting point for future company benchmarking initiatives.

TEAM / PROJECT RELATIONSHIP

Three statistical techniques where carried out to ascertain an empirical relationship between the two principal project variables. A student's two-tailed t-test of the research hypothesis that there is no relationship between the team rating and project performance was undertaken; H_o: $\mu_1 = \mu_2$. This was rejected in favour of the alternative hypothesis (H_A: $\mu_1 \neq \mu_2$) with a level of confidence at 99%, (highly significant). The result is corroborated by a Pearson's correlation coefficient of +0.7; this figure demonstrates a strong link between the two principle project variables. The coefficient of determination (RSQ) of Pearsons correlation indicates that the strength of relationship may be calculated at approximately 50%. Although the project performance may vary for many reasons, it would appear that in this study a sizeable percentage of the variation in project performance may be attributable to the variance in the team rating. In terms of comparison, it is interesting to note that the highest and lowest team ratings correspond with the highest / lowest project performance. In total there are four exact matches when ranking the team / project results. More rigorous statistical analysis needs to be undertaken to develop confidence in the patent cause and effect relationship of team working and project performance. At present, the case-study findings suggest a highly significant level of association.

TEAM ANALYSIS

The team rating average for the ten case-studies was 72% with a standard deviation of 5.7. The highest individual variable score was interdependency with 81%. This suggests that generally within construction project team compositions there is a recognised need for a collaborative, mutually supportive effort. This may be supported by industry norms; industry context recorded a variable rating of 70% (culture). Team dynamics recorded a second highest rating of 79%. Across most of the projects studied communication, formal and informal would appear to be frequent. It is likely that the relatively small team numbers, the largest team had nine members, promoted the amount of interface between the participants. The lowest team variable was corporate intent with 66%. This result implies that the need for team working as a corporate strategy for competitiveness is not always recognised by the team players. Feedback from various company representatives noted that although the companies make various efforts to communicate team objectives in context with the wider corporate goals it would appear that dialogue, on occasions, did not filter down through middle management levels. Membership diversity recorded the second lowest score of 68%. In some respects this is unsurprising due to the general nature of the project tasks undertaken. Although it does highlight an opportunity for companies to investigate the possibility of personality profiling in an effort to more efficiently balance the team compositions. It was also noted that out of a total of fifty two team member questionnaires only one respondent was female, representing less than two percent of construction site team personnel participating in this research programme.

PROJECT ANALYSIS

The project performance average for the ten case-studies was 51% with a standard deviation of 22.6. The high standard deviation may be attributable to the methodology adopted for calculating project performance. By embracing four distinct business perspectives in an attempt for a holistic measure, individual performance indicators range from a high of 88% (Training – days per year) to a low of 21% (Working hours). The highest key performance indicator was 88% for training days per year. Both companies stated that training was a core constituent within their business outlook and the results verify this claim. The second highest KPI was employee satisfaction with 64%. Suggesting that in the main they are reasonably content with their current employment. Although ‘working hours’ (21%) was the notable weakness in the balanced suite of seven KPI’s this does not appear to have significantly influenced employee satisfaction. The construction industry does have a ‘culture’ of long working hours and therefore likely to be accepted as an intrinsic part of the construction environment. The average working week for the ten projects reviewed was approximately 49 hours. This highlighted a trend across all the projects and may be meaningful in view of recent EC indications that it is considering ending Britain’s opt-out from EU limits on the working time directive. Client satisfaction – service and product recorded KPI’s of 56% and 44% respectively. Predictability – construction cost and time recorded KPI’s of 52% and 34% respectively. In this analysis it is necessary to distinguish between the two participating companies when interpreting the results. Company ‘A’ has more moderate results whereas company ‘B’ has below average results for predictability – construction cost and time but above average KPI’s for client satisfaction, service and product. The research does not take in to account any mitigating circumstances associated with the various projects and

therefore client initiated changes and / or other project variations are not factored into the predictability equation. With regard to company 'B', it would appear that the 'unpredictability' of the projects studied has not significantly influenced client perceptions. Indicating that in respect to company 'B', variations in cost and time had been reached through consensus. Company 'A' in contrast had considerably lower levels of client satisfaction despite mediocre results for predictability. The disparity between the two companies in this case is in all likelihood associated with corporate intent determining the character of the construction project team – client relationship.

CONCLUSION

From the results of this series of ten construction project case-studies it may be concluded that enhanced levels of team working has a positive influence on project performance. The positive correlation in itself is not necessarily unforeseen but the potency of the relationship between the two variables is surprising. The significance of the case-study results encourages further development of a construction team - performance diagnostic toolkit that would 1/ encourage companies to benchmark their project performance, 2/ evaluate performance against current levels of team efficiency and 3/ help align HRM policies to compliment a team orientated environment. By focusing on the weaker team variables identified by the diagnostic toolkit, High Performance Cross-Functional Team (HPX_fT) working may become a more realistic and achievable objective within a vibrant construction setting. The toolkit has the potential to highlight organisational strengths and weaknesses along with specific project team - performance issues in the pursuit of best practice and construction excellence. In short, the research programme demonstrates that in construction, the team does work.

ACKNOWLEDGEMENTS

The author would like to thank the construction companies for their co-operation and in particular, the Project Managers and their site team(s) for participating in this research project. Their time and contribution is greatly appreciated.

REFERENCES

Armstrong, M. and Baron, A., 1998. "Performance Management – the new realities". Institute of Personnel Development.

Buchanan, D., 2000. "An eager and enduring embrace: the ongoing rediscovery of teamworking as a management idea". Teamworking, MacMillan Press Ltd.

Constructing Excellence (2004). "KPI Pack 2004", London DTi.

Cornick, T. and Mather, J. 1999. "Construction project teams: making them work profitably". Thomas Telford Publishing Ltd.

Cully, M., Woodlands, S., O'Reilly, A., Dix, G., Millward, N., Bryson, A. and Forth, J., 1998. "The 1998 Workplace Employee relations Survey: First Findings". London: DTI.

Harris, P. R. and Harris, G. K., 1996. “Managing effectively through teams”. Team Performance Management: an international journal, Vol. 2. No.3. pp. 23 – 36.

Katzenbach, J. and Smith, D. 1993. “The Discipline of Teams”. Harvard Business Review, March / April, pp. 111 – 120.

Moore, D. R. and Dainty, A. R. J. 1999. “Integrated project teams’ performance in managing unexpected change events”. Team Performance Management: an international journal, Vol. 5. No. 7. pp. 212 – 222.

Morley, M. and Heraty, N., 1995. “The high-performance organisation: developing teamwork where it counts”. Management Decision, Vol. 33. No. 2 pp. 56 – 63.

Open University, 2001. “High Performance Teams”. The Open University.

Procter. M. and Mueller. F., 2000. “Teamworking: strategy, structure, systems and culture”. Teamworking, MacMillan Press Ltd.

Tata, J. (2000). Autonomous work teams: an examination of cultural and structural constraints. Work Study, Vol. 49. No. 5. pp. 187 – 193.