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The influence of personal characteristics on effectiveness of construction site managers

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It has been suggested that construction site managers' career progression may be affected because of the existence of certain personal characteristics that conform to industry stereotypes. These stereotypes need to be identified and examined in a systematic manner to ensure that the rationality of human resource management policy is indeed justifiable. A set of 26 personal characteristics believed to influence the effectiveness of construction site managers is identified by senior construction managers using the nominal group technique. These characteristics are tested for correlation with effectiveness using a non-results-based effectiveness index. A questionnaire survey was completed by 61 site managers for this purpose. The results suggest that of 26 identified personal factors believed to be important the only ones which may actually be related to effectiveness are: involvement in continuing professional development, number of firms worked for, use of addictive substances, education level, membership of professional bodies, job satisfaction, motivation level, career aspiration, stress level, leadership style and the need to work. The findings will assist those recruiting, retaining or promoting site managers to make a more informed judgement of key factors influencing effectiveness.

Keywords: Site management, effectiveness, influences, personal characteristics

Introduction

There is a considerable folklore in the construction industry surrounding the factors and characteristics that influence the effectiveness of construction site managers (CSMs). This is crystallized in the form of 'beliefs' regarding the reasons that some CSMs are perceived as effective and some CSMs as ineffective (Fraser, 1999). These beliefs frequently encompass a wide range of personal characteristics of the CSM. They extend over issues as diverse as family background, education level and alcohol consumption. However, beliefs may not be based on factual, scientific evidence. It is possible therefore that individuals may be wrongly inhibited from (or wrongly marked for) career progression as a result of exhibiting certain personal characteristics that conform to industry stereotypes. These stereotypes need to be identified and examined in a systematic manner to ensure that the rationality and fairness systems within human resource management policy are indeed true.

This paper describes the process of identifying and testing the parameters of these beliefs against performance. It presents the method employed, and the results that were obtained. The commonly held beliefs were explored using a panel of 16 experts in construction site management. The panel produced a list of 26 characteristics which were not only believed to be related to the CSMs' effectiveness, but also to be accurately representative of the industry folklore. The method described in this paper differentiates clearly (on the basis of statistical evidence) between the really salient characteristics and those personal characteristics which are believed to be salient but for which there is no evidence to support their having a significant impact on the measured effectiveness.

Literature review

This work is concerned primarily with the beliefs currently held by managers in the construction

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industry. Therefore it is necessary to define the concept of a 'belief' and place it within the given context. Sproull (1981) describes a belief as an understanding that represents credible relationships between objects, properties, and ideas. Beliefs result from individuals' reactions to given stimuli, and may well be affected by such factors as national, industry or organizational culture and enhanced by high levels of social interaction (Zarkada, 1998). Through the mechanism of strong industry culture and the collegial professional environment found in construction (Zarkada, 1993) these beliefs are further established as 'truth' and become more widely diffused (Zarkada and Fraser, 1998).

Sproull (1981) also notes that an awareness of certain types of behaviour may involuntarily emphasize the very ideas that create the behaviour. In essence, individuals justify behaviour both prospectively and retrospectively by what they believe. CSMs may be recruited, retained or promoted on this basis. These all too human tendencies have been reported in various situations (Garfinkel, 1967). Just because they are frequent, however, does not mean that they can be left unexamined to rule over processes that are purported to be rational and structured.

In summary, it would appear that beliefs provide a level of perceived justification for organizational actions and are used to clothe, in quasi-rationality, choices based on stereotypes, some of which amount to pure prejudice. For these reasons, it is vital to go to the source of the beliefs in order to find *real* justification for accepting them as part of the shared body of knowledge of the contemporary construction industry. The present research acknowledges this need, and aims to investigate whether or not beliefs concerning the personal factors which influence the effectiveness of CSMs are justified or not. For more about beliefs in organizations, the reader is directed to Eiser (1980), Sproull (1981) and Morley (1984).

In the context of construction site management, it is clear that, with the notable exception of Mustapha (1990), previous studies (e.g. Fryer, 1979; Brown, 1983) have not directly addressed the source, the validity or the impact of established beliefs held regarding the desirability of certain personal characteristics of CSMs. Moreover, there has been no theoretical framework, or methodology, capable of supporting a study of the effect of personal characteristics on CSM effectiveness. It is obvious that there are both conceptual and methodological gaps in the construction management literature. Even though mainstream management science literature provides a set of general guidelines for the development of a framework, its findings are too broad and general, and thus in need of adaptation and refinement. Some ideas, but no concrete findings, are offered by the authors in the construction management discipline. None of these, however, is aimed directly at checking the validity of the commonly held assertion that there is a relationship between certain personal factors of CSMs and their effectiveness. The closest related works are concerned primarily with construction management skills. These are briefly reviewed here.

The work of Fryer (1979) epitomizes the approach taken generally to study the CSM as an individual. He focused his work on what CSMs actually *do*, as opposed to their personal characteristics. He found that his subjects spent a considerable amount of their time outdoors talking to people, mainly supervisors, about technical matters. Thus, they were mainly concerned with coordinating the people involved in performing the technical tasks, welding together effective teams. They attached rather less importance to planning and programming their projects and to their dealings with the design team and client. The CSMs were asked to rank the five managerial skills, allocated by Fryer (1979), that they thought they personally possessed, in order of importance for effective management. The combined order, from the most to the least important was:

1. social skill;
2. decision making;
3. handling problems;
4. recognizing opportunities; and
5. managing change.

This research project described here identified the personal factors which may facilitate the CSMs ability to perform these skills, and thus be *effective*.

Another attempt at determining the components of a common core of criteria that can be used to assess the skill (and subsequently the CSMs' effectiveness) was made by Brown (1983). His survey of 54 managers working in construction identified the following issues as being important factors:

1. achievement of quality;
2. responsibility acceptance;
3. decision-making skills;
4. ability to handle stress;
5. interpretation of design information;
6. record of safety on site;
7. utilization of resources available;
8. communication;
9. accuracy;
10. judgment;
11. organizational ability; and
12. technical knowledge.

Again, this study did not consider the actual personal characteristics of the CSM. Moreover, it has not really

provided the required empirical, or even conceptual, links with effectiveness.

Another approach is that of examining behaviour and skills in the context of specific tasks at hand and the stages in the construction process. Rowlinson *et al.* (1993) have examined variations of leadership style employed by the same construction managers in different circumstances plus the culture-specific results of managerial behaviour modification (Lingard and Rowlinson, 1994). The surrounding circumstances have been documented and analysed successfully but their impact is considered only in relation to one important personal characteristic: leadership style. They found, for example, that project leaders tended to use a supportive style in feasibility study and pre-contract stages of works and a directive style as construction progressed. The relevance of these studies is not just restricted to the obvious fact that leadership style is a crucial personal characteristic of an individual. The deeper relevance of their work to the present analysis is that they have demonstrated the dynamic nature of personal characteristics, that are adaptable to job needs and circumstances and manageable attributes of the individual. What still remains to be done is a similar, comprehensive study of a wide range of characteristics.

Mustapha (1990) provides the only study which, among other factors, considers some personal characteristics which may influence CSM effectiveness. For example, he concludes that a high qualification is particularly important for projects of a high value and, in the case of civil engineering projects, a degree is important regardless of the project value. He states that membership of professional bodies and overseas experience 'might' be important, and that job satisfaction is an important consideration. Another conclusion of Mustapha (1990) is that long years spent in the industry and the company can no longer be considered a prerequisite in recruitment and selection policy. However, Mustapha's (1990) work is much more comprehensive than just considering personal factors, and a need still exists for an evaluation of a wider ranging pool of personal characteristics.

Given the limited existing literature pertaining directly to CSMs, there would appear to be a need to identify and empirically establish the characteristics that potentially influence the CSM's level of effectiveness. This work aims to fulfil this need.

Empirical identification of potentially salient personal characteristics

A number of conditions determined the methodological approach to the study. First, the lack of a comprehensive list of individual characteristics that have an impact on managerial effectiveness indicated that the pooled intelligence of a select group of knowledgeable individuals was desirable. Second, as explained by Delbecq *et al.* (1975), in order to understand social phenomena, often it is necessary to obtain the views of the actors. Certain group processes enable the researcher to obtain the views of the critical actors.

A literature review alone, especially when it does not uncover any relevant empirically founded work, may provide generalizations that do not necessarily reflect reality. As the preceding analysis has demonstrated, this applies directly to the issues under study here. What was sought in this research project was the formation of a review panel comprising decision-makers in contracting organizations. The individual participants would have to be in a position where they are asked, in the course of their duties, to assess the new entrants to the site management field and act as mentors preparing them for their future tasks. The same people are also expected to be acting as advisers to the CSMs' employers.

Finally, it is often beneficial to use groups, according to Delbecq *et al.* (1975), in order to ensure the applicability of the research results. More specifically, if the goal is to solve a problem of a particular group, it is reasonable to expect that the group will eventually be more likely to accept the research findings if they have participated in the research design and concept generation process. This can occur only through direct communication between decision-makers and researchers. The group setting is the perfect context for such communication.

Composition and function of the panel of experts

In order to identify people that could provide the list of potentially salient personal characteristics, a qualitative empirical research design was utilized. First, the top 20 construction companies in Australia were contacted and were asked to provide a representative to participate in the panel of experts. The nominated representatives had to fulfil the following essential criteria. They had to 1. hold a senior position in the company (contracts manager, chief construction manager or construction director); 2. have at some stage in their career been a CSM; 3. be actively involved in the recruitment and promotion of CSMs; 4. have experience of a variety of large scale projects, including multi-storey residential construction as used in this current work; and 5. be willing to participate in the research and commit the time and effort required. Finally, it was desirable (and indeed all respondents were found to feel) that: 6. their personal beliefs regarding personal characteristics that determine a CSM's effectiveness were at least consistent

with, if not highly representative of, the views held generally in the industry.

Of the 20 companies approached 16 companies were able to provide a representative. The panel consisted of these 16 senior head-office-based construction managers. It was convened in Brisbane, Australia, using the nominal group technique (Delbecq *et al.*, 1975; Olsen, 1982). This process has been used extensively in business and government for identifying problems, exploring solutions, and establishing priorities.

The nominal group technique (NGT) allows individual judgments about a topic or issue to be pooled and used where uncertainty or disagreement exists about the nature of a problem and possible solutions. A comprehensive description can be found in Delbecq *et al.* (1975). The four steps of NGT are: 1, the silent generation of ideas in writing; 2, recording of ideas; 3, serial discussion of the list of ideas; and 4, voting.

The members of the panel were asked to identify the personal characteristics that influence a CSM's effectiveness. Their lists were pooled and each person was then asked to nominate the characteristics from the extended list that they believed most influenced effectiveness. Finally, after the second round of voting, agreement was reached to select the 15 overall highest-scoring personal characteristics for inclusion in the research. These characteristics are listed in Table 1. Operationalization of these 15 broad characteristics to enable measurement resulted in an end total of 26 characteristics. The final 26 characteristics used for measurement were presented to the panel in order to verify that none of the original concepts which were excluded would be more important than the broken down characteristics. Unanimous agreement was attained from the panel that the 26 characteristics finally used for measurement were indeed considered most appropriate for the study. The 26 characteristics that were actually measured are listed in Table 2.

Data collection

Following a pilot study, a questionnaire survey was conducted with a sample of CSMs working on high rise residential construction projects in Australia. All the sites were sufficiently operational and well established for all members of staff to be familiar with each other and in a position to have formed an opinion on the job requirements and how well these were met by the CSM under evaluation.

The CSMs' effectiveness index was calculated using Fraser's (1999) method. The selection of the samples for the questionnaire survey was as follows. After two pilot studies, the effectiveness measurement method that was developed was used to evaluate a random sample of CSMs. Uniformity was sought in terms of

Table 1 15 identified personal characteristics

Characteristic	Measurement method
Experience	Experience was to be measured over years in the construction industry, with the company, with full responsibility for a construction site, interstate experience, overseas experience, managerial and non-managerial posts held outside construction
Formal education	As classified by Queensland Department of Education
Craft training	Completion of accredited apprenticeship programme
Stress	Measured as 'boss stress' (stress emanating from one's superior), 'job stress' (stress directly related to the project itself), and 'environment stress' (stress from external sources e.g. family) as developed by Djebarni (1996)
Leadership style	Measured using the Blake and Mouton (1964) 5 point scale (survival, family, production, compromise and team)
Motivation	Measured on a 1–5 Likert-type scale based on Hellriegel and Slocom (1992)
Conflict management style	Measured using the 5-point Thomas (1976) conflict management style grid (avoidance, smoothing, compromise, forcing and collaborative)
Satisfaction	Measured on a 1–5 Likert-type scale based on Hellriegel and Slocom (1992)
Career aspiration	Measured on a 1–5 Likert-type scale
Gambling	Total amount spent per month
Addictive substances	Subdivided into tobacco and alcohol
Leisure activity	Measured in total hours
Professional body membership	Measured in terms of level of commitment, as monitored by the Queensland Chapter of the Australian Institute of Building
Need to work	Measured by the 3 point scale of Kahn (1981). If the respondent was financially independent , would he/she stop work, continue present employment or seek alternative employment
Number of construction firms	Number of companies worked for

Table 2 Potential salient personal characteristics

Ref	Characteristic
A	Involvement in CPD
B	Length of service in construction
C	Length of service with current company
D	Length of service with full responsibility
E	Experience interstate
F	Experience overseas
G	Non-construction management experience
H	Non-management experience
I	Construction companies worked for
J	Total leisure activity
K	Membership of non-professional bodies
L	Tobacco consumption
M	Alcohol consumption
N	Amount spent on gambling
O	Level of formal education
P	Craft training
Q	Membership of professional bodies
R	Job satisfaction
S	Motivation
T	Career aspiration
U	Boss stress level
V	Job stress level
W	Environment stress level
X	Leadership style
Y	Conflict management style
Z	Need to work

construction type, size, and procurement method in order to standardize the job requirements and minimize the impact of exogenous factors. The type of project chosen was high rise residential construction.

There were 61 participants, and each of them nominated five individuals, with whom they had a close working relationship, as their evaluators. The criteria for selecting evaluators were that they had to be willing to participate and knowledgeable in terms of the construction process, what is required of a CSM, and of the performance of the individual they were to assess. Evaluators included architects, quantity surveyors, subcontractor managers, engineers, client's representatives and immediate superiors/subordinates of the CSM. In addition, in the questionnaire for the CSMs themselves, the personal factors were sought out through multiple choice questions with reference to education, background, work satisfaction, motivation and behaviour. Information on work experience and habits was sought through open-ended questions that could be completed in a single word. A combination method of personal introduction, mail distribution and telephone data collection of the responses was used. The overall response (61 CSMs), represented a 48% response rate.

The assessment process used in Fraser's (1999) method employed a modified version of Mustapha's (1990) list of competence elements, each element detailing a particular aspect of the CSM's job. The evaluators were asked to assess the CSM's level of ability on each of 52 elements on a five point scale defined as follows: 1 = incompetent, 2 = weak, 3 = fair, 4 = good and 5 = outstanding. They were also asked to indicate the importance of each competence elements on a five point scale defined as: 1 = no importance, 2 = limited importance, 3 = important, 4 = of great importance and 5 = of paramount importance. A sample of the instrument used is shown in Figure 1.

Analysis

The effectiveness score represents the average of the sum of points each evaluator assigned to each one of the 52 competence elements used. The range of possible scores was from 52 (if all evaluators had given the minimum one point for each competence element) to 260 (if all evaluators had given the maximum five points for each competence element). The range of scores that the subjects actually achieved extended from 111 to 231. The mean score was 169.

Depending on the type of measurement used for each personal characteristic, different statistical tests were used to investigate the relationship between effectiveness score and personal characteristics. When the characteristic under investigation was measured on a continuous scale, giving interval data (where the difference between 1 and 2 is the same as that between 15 and 16, for example), correlation tests between effectiveness scores and the characteristic were performed. These were the non-parametric Spearman's rank correlation, the parametric Pearson's correlation, and the non-parametric measure of concordance between judges, Kendall's tau. These tests measured whether the existence of the characteristic tended to increase

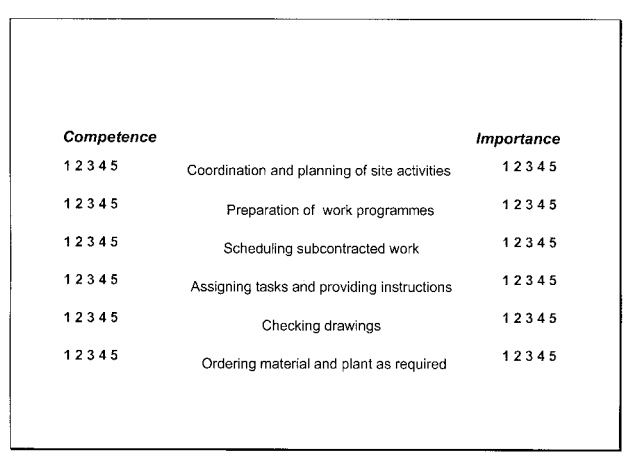

Figure 1 Research instrument format

or decrease the effectiveness scores. When the personal characteristic was measured on the nominal (categorical) scale or the ordinal (rank) scale, the non-parametric Kruskal-Wallis one-way Analysis of Variance test was used. This test measures whether the effectiveness scores were different for each level of response to the question posed.

The findings of this research are reported as p values. A p value is the probability associated with the testing of each statistical hypothesis. We interpret such a finding as evidence supporting the rejection of the null hypothesis and the acceptance of the alternative hypothesis. In this current work, these null hypotheses are based on the acceptance that the personal characteristic of the CSM appears to exhibit no relationship with effectiveness. As a guide to the level of significance, in this current work extremely significant is considered to be a p value $< 0.000\,05$, highly significant is considered to be a p value $< 0.01\%$, and significant is considered to be a p value $< 0.05\%$.

Results

The p-value results are presented in Table 3. On the basis that there is significance at $p < 0.05$, across all tests used it is suggested that the characteristics listed in Table 4 do not exhibit a relationship with managerial effectiveness. On the basis that there is significance at $p < 0.05$ across all tests used, it is suggested that there is a relationship existing between the personal characteristics listed in Table 5 and managerial effectiveness. A comment is provided next to each, based on observations obtained from graphical presentation of the results.

Table 4 Personal characteristics exhibiting no relationship with effectiveness

Ref	Characteristic
B	Length of service in construction
C	Length of service with current company
D	Length of service with full responsibility for site
E	Experience interstate
F	Experience overseas
G	Non-construction management experience
H	Non-construction non-management experience
J	Total leisure activity
K	Membership of non-professional organizations
N	Amount spent on gambling
P	Craft training
V	Job stress level
Y	Conflict management style

Table 3 Summary of results in terms of p values

Ref	Pearson	Kendall	Spearman	Kruskal-Wallis
A	0.000 068 424 4	0.086 750 43	0.031 710 88	
B	0.338 729 5	0.193 188 9	0.230 619 9	
C	0.445 795 7	0.793 694 4	0.792 470 7	
D	0.883 389 5	0.954 217 4	0.901 472 5	
E	0.678 092 8	0.749 489 7	0.769 893 4	
F	0.965 587 8	0.704 074 1	0.588 472 0	
G				0.169 087 3
H				0.696 955 9
I				0.494 462 7
J	0.422 420 7	0.848 245 7	0.880 278 02	
K				0.514 228 7
L				0.104 742 85
M				0.320 391 8
N	0.425 569 9	0.121 292 02	0.344 368 41	
O				0.048 843 54
P				0.365 902 2
Q				0.056 953 93
R				0.000 273 512 9
S				0.000 154 116 2
T				0.000 154 316 7
U				0.006 398 639
V				0.388 900 9
W				0.001 310 282
X				0.006 541 318
Y				0.597 200 5
Z				0.005 671 452

Table 5 Personal characteristics exhibiting relationship with effectiveness

Ref	Characteristic	Comments
A	CPD	There is a general trend for CSMs involved in some CPD to attain higher effectiveness scores
I	Construction firms	Most high scoring CSMs have worked for no more than three companies during their career in the construction industry
L	Tobacco	Effectiveness scores appear to decrease slightly with increased smoking if we discount the non-smokers
M	Alcohol	In general, as alcohol consumption increases there is a slight decrease in effectiveness scores
O	Formal education	Most of the CSMs with very high effectiveness scores had completed tertiary qualifications
Q	Professional bodies	The median effectiveness score for CSMs who were active members of professional bodies was much higher (230 points) than the median effectiveness score for those who were not members
R	Job satisfaction	All high scoring CSMs were either satisfied or very satisfied with their jobs and only higher scoring CSMs were extremely satisfied with their job
S	Motivation	Almost all CSMs who considered themselves to be extremely highly motivated were very high scoring
T	Career aspiration	All those actively seeking career development had higher than average effectiveness scores
U	Boss stress	Those CSMs under intolerable boss stress scored low in general; those under significant boss stress scored average effectiveness; and the CSMs with moderate boss stress included those with high effectiveness scores
W	Environment stress	All high scoring CSMs had limited stress or no stress at all from external factors and moderate or significant external stress coincided with low effectiveness scores
X	Leadership style	High scoring CSMs favoured team-style leadership; those CSMs following a production style of leadership scored the lowest of all; and CSMs using a compromise leadership style had middle `range effectiveness scores
Z	Need to work	In general, CSMs who would continue to work in their present job even if they had enough money to satisfy their needs scored much higher than CSMs who would not work at all or seek alternative employment

Conclusions

The main striking conclusion of this research is the fact that only half of the identified personal characteristics appear to exhibit a relationship with the effectiveness of CSMs. It would appear that the factors listed in Table 3 are being falsely taken into consideration in the recruitment, retention and promotion of CSMs.

However, more positively, the characteristics listed in Table 4 do indeed appear to exhibit a relationship with the effectiveness of CSMs, and therefore should, as far as the spirit of employment law permits, be taken into consideration. The extent to which each factor should be taken into consideration or any relationship existing between these factors is still the subject of further investigation as detailed in the appropriate section. The strength of this exploratory research is not necessarily in the actual conclusions given, but in the framework provided for the further development of the findings into a structured recruitment, retention and promotion system for use by construction firms.

Application of the research results

By collecting information on the salient personal characteristics, the decision makers, or the CSMs themselves, can identify the 'strong' and 'weak' points in each individual, cultivate the former and modify the latter. In the event that the Fraser (1999) assessment process results in unsatisfactory effectiveness scores, an important application of this research lies in its provision of a reliable means of identifying and positively addressing the specific reasons behind low achievement. So, as an alternative to dismissing an underperforming CSM, the organization can consider training, professional development, behaviour modification or counselling to improve performance. Use of this second stage of the effectiveness assessment process can improve employee confidence in the organization and general morale, thus eventually reducing employee turnover and increasing the quality of the service they provide to the organization. This process is illustrated in Figure 2.

Recommendations for further work

The aim of this paper has been to identify salient personal characteristics of effective CSMs, rather than the relationships existing between them. However, it is desirable to develop a profile of the 'ideal' CSM based on relationships existing between factors. Numerous statistical techniques have been applied in

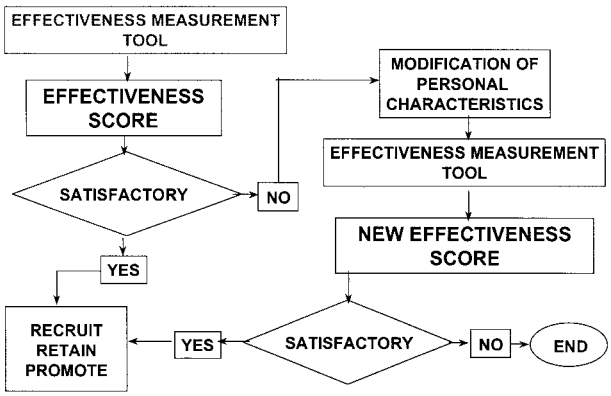

Figure 2 Conceptual model of contribution to industry

order to test for correlation between factors identified as significant. So far, there has been no conclusive evidence. Some insights could possibly be achieved using a neural network.

It would also be useful to take a subset of overall effectiveness and correlate it with personal characteristics with a view to behaviour modification. For example, this current work could build on the work of Lingard and Rowlinson (1994) on behaviour modification and site safety by considering the personal characteristics that may support such initiatives.

The evaluators of the CSMs' effectiveness came from different disciplines and backgrounds within the construction industry. Their perceptions on what it is the CSMs do well and where they need skill development can be aggregated and compared on the basis of the evaluators' positions. Thus, it would be possible, for example, to see the aggregate profile of the CSM through the eyes of the quantity surveyor. This kind of approach, apart from its intrinsic interest and contribution to the body of knowledge, could also be used to explain some of the sources of tension and conflict in construction. When used alongside qualitative data on expectations that other construction professionals have of CSMs, the role of the CSM can be defined better.

The list of personal characteristics was devised empirically. Alternative lists produced by differing methods could enhance or expand the existing list. One possible method would be through a theoretical rather than empirical approach. In mainstream management literature, a large number of factors have been associated with managerial effectiveness and many personal characteristics have been tested through in-depth sociological and psychological studies. These have yet to be applied to the particular conditions of the construction industry.

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