

BEHAVIOURAL ASSESSMENTS IN CONSTRUCTION PROCUREMENT: A BANDWAGON OF INSTITUTIONAL WASTE?

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ABSTRACT:

The drive to create integrated and collaborative project teams has seen the behavioural assessment of suppliers become increasingly common in construction procurement exercises. Within the stated objectives of this are the desire to procure supply partners with the right ‘collaborative working capabilities’ and ‘cultural alignment’. The belief in the benefits of behavioural assessments in procurement has become so prevalent as to be referenced in the Infrastructure Client Group’s ‘Alliancing Code of Practice’ published by HM Treasury in 2015. However, the spread of this resource intensive practice has occurred without published evidence that it increases the effectiveness of procurement objectives. The purpose of this study is to examine the efficacy and value of behavioural assessment practices commonly used in UK infrastructure procurement exercises. The analysis of the study draws on theories of organizational psychology and sociology as well as the industry experience of the co-authors. In doing so, the study addresses ARCOM’s 2018 central theme, ‘Balancing fragmentation and integration’. Importantly, the study addresses practices attempting to secure integration but which evidence suggests generate actual and potential waste.

It is concluded that the practices commonly used in behavioural assessment in construction procurement have little validity - the degree to which available evidence supports inferences and judgments made from scores on assessment measures. Also, the practice of using a small sample of assessed individuals to predict the behaviour of an organization as a whole over the life of a project has no known evidential foundation. The study’s findings shed light on institutional pressures in the development and introduction of management policies and construction procurement practices and call for greater collaboration between behavioural scientists and construction management disciplines. Such collaboration can be used to critically examine change proposals that may go on to generate ‘institutional waste’.

Key words: behavioural assessment, construction procurement, performance prediction, social science, waste.

INTRODUCTION

The inclusion of a process of behavioural assessment in UK construction programme procurement has grown in the past decade. Puckett (2007) reports on the team simulation exercises used in the procurement of the delivery partner contract for the Olympic Delivery Authority (ODA). Doyle and Jones (2009) describe a behavioural assessment approach used in the procurement of a partner for the decommissioning of the Sellafield nuclear power station. Jensen (2015) describes how Network Rail used behavioural assessment in the procurement of its Wessex Capacity programme. Mitchell (2016) refers to the use of behavioural assessment in the context of large scale alliance procurement by the Environment Agency, Highways England and High Speed 2 (HS2). Among the authors’ experience is providing support for procuring authority and supplier preparations for behavioural

assessment processes in procurement for Thames Water's AMP6 capital works programme, Heathrow's Q6 investment programme, Crossrail2 design and the Palace of Westminster project services.

The intent of using behavioural assessment as part of the process of selecting suppliers has been variously mentioned as to "*isolate the precise attitudes and personality traits they're [clients are] after*" (Puckett, 2007, p.44b), "*estimate how well bidding contractors will collaborate*" (Mitchell, 2016, p.36), "*evaluate how potential partners would perform in the future*" (Doyle and Jones, 2009, p.44b) and, "*to gauge whether a contractor's behaviour and working style will be a good fit with the project team*" (Mitchell, 2016, p.36a). The belief in the benefits of behavioural assessments in procurement has become so prevalent as to be referenced in the Infrastructure Client Group's 'Alliancing Code of Practice' published by HM Treasury in 2015. The process is seen as being able to "*expose flaws that the bidding team can conceal in standard written and oral presentations*" (Puckett, 2007, p.43c). It is also seen to be able to address shortcomings in traditional evaluation methods, involving written and oral submissions, perhaps countering a view that "*promises are not a predictor of delivery*" (Doyle and Jones, 2009, p.46b). The latter point could construe an argument that behavioural assessments in procurement are initiated in a climate lacking trust because of past experiences and prevailing beliefs.

The behavioural assessment process can, however, be resource intensive (Hancock, 2015). For example, there were two assessment centres (ACs) used for the Sellafield project, each bringing together teams of 15 to 20 people (Doyle and Jones, 2009, p.46c). The behavioural assessment process for Highways England's Collaborative Delivery Framework (CDF) involved assessing 36 bidders over a four-month period (Turton, 2015). In January 2016, a notice was published in the Supplement to the Official Journal of the European Communities (OJEU) relating to the award of a contract by Parliament UK for 'STC1115 - Behavioural Assessment Services for use in major programme procurements'. The contract value was stated as £477,216 for the duration of 2 years. Puckett (2007, p.44b) notes a company that will, "*set up and run "soft issues assessments" at a cost of anything from £50,000-250,000*" As well as the cost of consultants engaged to design and manage a behavioural assessment process for procuring authorities, other tangible and intangible resource costs accruing will include the staff time of procuring authorities, supplier staff time taking part in assessments and the cost of consultant support for suppliers preparing for the assessment process. The costs incurred by suppliers may be reflected as added premiums in tender prices or contribute to reduced supplier margins (Sarhan *et al.* 2017).

Within the construction industry discourse, the origins, and perhaps by inference, the face validity of behavioural assessment in construction supplier selection has been attributed to its development in the military (for example, see Puckett, 2007, p.43c). The organizational psychology literature commonly acknowledges the origin of ACs as from German, British and Australian military officer selection efforts in the 1930s and 1940s and the Office of Strategic Services (Lance, 2008). However, whereas this study can find no literature pertaining to the validity of measures used for selecting supplier organizations using behavioural assessment, the organizational psychology literature concerning selection methods for individuals and the validity of AC measures is extensive and has developed over thirty or more years (see for example, Lance, 2008; Jackson *et al.*, 2016).

Drawing upon this organizational psychology literature this study questions the efficacy and value of behavioural assessment practices used in construction procurement. It acknowledges that although no single approach to behavioural assessment in procurement exists, there appear to be practices and assumptions commonly used and made for which there is no

evidence for utility in relation to the purposes for which they are intended. Common practices for which there is no evidence of utility include the use of multi-situational, multi-dimension approaches to assessment in ACs and interviews, and the extrapolation of the results of assessments of individuals to infer behaviour at an organizational level. This study therefore provides a critical discussion and proposes that behavioural assessment processes commonly used in UK construction programme procurement are counterproductive, as they consume resources and may generate wasteful behaviours without adding practical value. This study further proposes that, in the face of a lack of evidence for their utility, the use of behavioural assessment in construction procurement has spread because of institutional forces that have parallels with a ‘bandwagon effect’ found among consumers (Kuwashima, 2015), social legitimacy (Meyer and Rowan, 1977), and a normative form of institutional isomorphism to which the professional environments of public sector organizations can be susceptible (DiMaggio and Powell, 1983; Frumkin and Galaskiewicz, 2004; Kallio and Kuoppakangas, 2013). The spread of this ineffective process therefore seems to constitute an element of ‘institutional waste’ in construction procurement processes (Sarhan *et al.*, 2018).

BEHAVIOURAL ASSESSMENT IN CONSTRUCTION PROCUREMENT – A CRITICAL REVIEW

Behavioural assessment processes in procurement are often used in conjunction with technical, commercial and management approaches submissions. They generally include some, or all of the following: simulation and other team exercises at an assessment centre (AC) **style workshop**, interviews with project team and ‘corporate’ leaders, site visits, evaluation of written team member biographies and project case studies (Mitchell, 2016, p. 37b, Turton, 2015). **Table 1 is adapted from** Turton (2015) to illustrate behavioural assessment practices commonly found in UK construction procurement exercises. Additionally, among the authors’ experience is witness to the use of psychometric tests and organization cultural inventory questionnaires.

Table 1: Typical UK behavioural assessment practices [Source: Turton, 2015, p.14]

Behavioural Assessment Activity	Data Evaluated/Nature of Evaluation
Behaviour Biographies	Biographies of bidders’ core team including professional qualifications and collaboration experience.
Case Studies	Examples of how the bidders’ organisation has demonstrated the required behaviours with other organisations (clients, other suppliers).
Workshops	Residential workshops with core bidders’ teams to observe their ability to collaborate and understanding of the required behaviours.
Leadership Team Interviews	Panel interviews with key individuals who have full accountability for overall delivery within the bidding organisation.
“Site and Premise Visits”	Validation of behaviours and collaborative working in practice at an operational site.

This section raises the following concerns relating to the efficacy and value of behavioural assessment processes commonly used in construction procurement: (1) the use of assessments based on job-relevant competencies (e.g. “teamwork”, and “communication ability”) instead of simply examining how well candidates perform in job-related situations; (2) the validity of tests used to evaluate the performance of individuals in multi-situation, multi-competency approach AC settings; (3) the assumptions of the prediction of organizational performance in a future context based on the evaluation of the performance and assessed characteristics of a

small sample of individuals in a competitive procurement process; (4) ethical issues relating to the well-being of candidates taking part in ACs.

The study found no evidence-based research literature pertaining to the prediction of organizational behaviour based on the assessment methods commonly used in construction procurement. Conversely, the evidence-based research concerning the measurement of the characteristics and the prediction of performance of individuals is extensive. Jackson al.'s (2016) work on the measurement of behavioural dimensions in ACs informs our findings and discussion. Their work draws upon hundreds of studies on ACs and the measurement of 'competencies' – behavioural dimensions that construction procurement behavioural assessment exercises commonly purport to attempt to measure (Doyle and Jones, 2009, p.47a).

Assessments based on job-related competencies

It is important to critically review the idea of 'competencies'; the behavioural dimensions against which candidates' behaviour is assessed in both selection procedures found across industry and reportedly used in construction procurement behavioural assessment. Reports of construction procurement behavioural assessment exercises refer to exercises based on 'simulations' (Doyle and Jones, 2009; Mitchell, 2016; Puckett, 2007) and the assessment of candidate performance in those simulations in relation to a set of competencies. This is consistent with experience among the authors; supplier candidates are given tasks to perform and are then 'scored' according to how well their behaviours indicate the presence of the prescribed competencies. Tasks or simulations can attempt to recreate some aspect of the project likely to occur, such as a "*first 100-day stakeholder engagement plan*" (Doyle and Jones, 2009, p.49b). An example of an AC scorecard is illustrated in Doyle and Jones (2009).

One of the first references to competencies in the academic literature on organizations was made in an article published in 1973 in the *American Psychologist* by David McClelland, a Harvard professor of psychology. McClelland argued that research indicated that intelligence was a poor predictor of performance at work. To evaluate job candidates, and to successfully predict their future performance, he suggested that assessing job-related "competencies" such as communication skills, patience, the tendency to set goals of moderate difficulty, ego development, as well as more traditional reading, writing, and calculating abilities, rather than intelligence, or personality, is the best way to predict the future performance of job candidates. In 1981, Richard Boyatzis, a consultant with the McBer Corporation, founded by McClelland, was commissioned by the American Management Association to examine whether a generic model of managerial competencies could be identified. Boyatzis reported the results of his work in his 1982 book *The Competent Manager: A Model of Effective Performance*. This book was highly influential in popularizing and fuelling the growth of competencies in organizations. This growth was further encouraged by the availability of the AC, a system for assessing the future performance of individuals developed by the military: the AC.

It is noted in this study that despite the widespread adoption of competencies and competency frameworks by human resource management practitioners, to date there is not a single study in academic, peer-reviewed journal articles, in which evidence is presented for the structure of human competences using the standard statistical technique of factor analysis to analyse data on the measured behaviour of people. This is in stark contrast to the hundreds of studies in which factor analytic techniques have been used successfully in this way to identify the structure of cognitive ability, and of personality. This study notes that this may seem radical and challenging.

The validity of tests in a multi-situation, multi-competency approach

The overall AC process of evaluating competencies across several exercises, and then using some method of integration to arrive at an overall evaluation of the candidate is generally known as a 'multi-situation, multi-competency approach'. The idea has military origins in Germany in the early 20th century and was drawn upon by the British Government's when setting up the War Office Selection Boards (WOSBs) in 1942 and the Civil Service Selection Board introduced in 1945. The private sector's use of 'multi-situation multi-competency assessment methods' was initiated by the American Telephone and Telegraph Company in 1956 in what they called 'assessment centres' (ACs). In the 1960's, 1970's and 1980's, there was considerable growth in the use of ACs to measure behavioural dimensions in public and private sectors organizations. The common, current construction industry practice of using interviews and sometimes site visits as well as ACs as methods to gather competency related data are simply an extension of the situations or exercises from which competency data is gathered in ACs. The discussion concerning the validity of multi-situation, multi-competency approaches in ACs therefore remains relevant.

'The concept of 'validity' in AC processes is of strong relevance in being able to demonstrate that a fair process of evaluation has been followed (Petrides *et al.*, 2010). 'Validity' concerns the degree to which available evidence supports inferences or judgments made from scores on selection measures (Gatewood *et al.*, 2015). An AC is essentially a technique for measuring behavioural performance. As with all other measurement techniques, the validity of this measurement is a primary concern. There are several ways of examining validity (Gatewood *et al.*, 2015); the two aspects of the validity of ACs which have attracted by far the most research are (1) construct related validity - do ACs measure what they are designed to measure; and (2) criterion-related validity - to what extent do they predict what they are designed to predict (which is normally the future job performance of candidates).

Construct validity

'Construct validity', as the question of whether ACs measure what they are purportedly designed to measure has been the subject of considerable research and debate (Sakoda, 1952; Sackett and Dreher, 1982; Jackson *et al.*, 2016). This debate was sparked by the observation that there appears to be a greater correlation between the ratings given to candidates and the exercises they are taking part in than the correlation between the ratings they are given and the competencies that they are intended to be rated against. This phenomenon appears to contradict the notion that ACs are primarily measuring candidate competencies; instead it suggests that they are primarily measuring the candidates' overall performance on different exercises. It is known as 'the exercise effect' and is an important observation in relation to the validity of ratings and, consequently, the presence of a fair evaluation process (Petrides *et al.*, 2010).

Until recently it has not been possible to resolve this debate because the rating given to a candidate on any one exercise, when evaluated on any one competency, is influenced by several variables (e.g. who is doing the rating, the competency in question, the exercise in question, the overall performance of the candidate irrespective of specific exercises and specific competences etc.). However, in the last few years advances in generalizability (or 'G') theory statistical techniques mean that it is now possible to answer the question of what ACs measure. Two major studies (Putka and Hoffman, 2013; Jackson *et al.*, 2016) have been conducted using these techniques, both focusing on 'state of the art' ACs. The findings generated by these studies are remarkably similar and striking. They indicate that ACs measure two things: (a) the performance of candidates on specific exercises, and (b) the general performance of candidates across all exercises and competences. However, crucially,

they do *not* measure a candidate's competencies. There appears to be no evidence that suggests competencies are measured in ACs; even in 'state of the art' ACs.

Criterion-related validity

'Criterion-related validity' refers to the extent to which ACs predict what they are designed to predict - which is normally the future job performance of candidates. The approach commonly used to establish the criterion-related validity of ACs is meta-analysis (Hoffman *et al.*, 2015). This technique involves obtaining the results of multiple academic studies of the correlation between: (a) overall assessment ratings (OARs) given to candidates in ACs, and (b) subsequent job performance of these candidates. This information is then combined statistically to obtain an overall indication of how well OARs predict job performance.

Past meta-analyses estimate the criterion-related validity of ACs to be between .23 (Hermelin, 2007) and .37 (Gaugler, 1987). This indicates that the results obtained from ACs may account for somewhere between 5% and 14% of the variance in job performance between different people, meaning that the results from ACs do not strongly predict differences in job performance between different people. A related issue is the extent to which OARs add to the prediction of job performance over and above other assessment techniques such as interviews, cognitive ability tests, and personality questionnaires. A recent meta-analytic study by Hoffman *et al.* (2015) found that although cognitive ability testing and personality questionnaires jointly accounted for 20% of the variance in a candidate's future job performance, five AC exercises accounted for an additional 3%, to 23% of the variance in job performance. There is some evidence therefore that ACs offer some incremental validity over other widely used selection techniques. However, it should be noted that the Putka and Hoffman (2013) and Jackson *et al.* (2016) studies outlined above suggest that any predictiveness in AC's is derived from the measurement of the overall performance of assessees, and their performance on exercises, and *not* from the measurement of individual competencies.

In a recent study meta-analytic, in which the predictiveness of cognitive ability tests and ACs were *directly* compared, using the same candidates and the same job performance criteria, Sacket *et al.* (2017) estimated the criterion-related validity of cognitive ability to be only .22 whereas that for ACs was considerably higher, at .44. Discussing the possible reasons for the discrepancy between this finding and the findings of previous studies, Sacket and his colleagues speculate that this may have arisen because of the criteria against which job performance is evaluated. They suggest that in previous studies these criteria (i.e. quality of work, quantity of work, job knowledge, adeptness in performing the job, ability to perform a variety of job tasks, level of complexity of satisfactorily performed job duties, problem solving, and overall accomplishment) are more closely associated with candidate cognitive ability than the criteria commonly used in AC validation studies (e.g. leadership, communication, initiative, judgment, conflict management, teamwork and self-discipline).

Inferring prediction of organizational performance from a sample of individuals

The general intent of the behavioural assessment processes commonly used in construction procurement seems to be to predict the future performance of tendering organizations. Doyle and Jones (2009, p.44b) describe "*an assessment centre approach involving team simulations to evaluate how potential partners would perform in the future*". However, of behavioural assessment processes commonly used, only one, the evaluation of case studies, is at the organizational level of analysis. Others, such as biographies, interviews, and behavioural assessment in ACs, focus on individuals rather than the organization for which they work. Commonly used behavioural assessment processes used in construction procurement adopt

processes originally developed to predict the future performance of *individuals*, and do so in order to predict the future performance of *organizations*. Whether or not such an approach can, in principal, be successful is unclear. There is, to our knowledge, no scientific evidence that the future performance of organizations, or parts of organizations, can be predicted by evaluating samples of behaviour, in samples of people, from those organizations. Sample sizes in relation to host organization sizes are a concern in this respect, as are the vastly different contexts of conditions in which assessments are made and in which actual performance takes place. In any statistical analysis designed to estimate the average performance, or characteristics, of individuals in an organization, adequate sample size is critical. This study would therefore strongly suggest that sampling adequacy, both in relation to sample size and sample representativeness, is an issue of very significant concern in current behavioural assessment exercises in construction procurement. The issue of sample and process inadequacy is compounded further by the possibility or even likelihood that supplier candidates assessed may not actually take up a role in the project being procured or may only take up a temporary role. These concerns are in the context of expectations that behavioural assessment is being used to determine whether clients and suppliers can work together for the duration of a contract (Puckett, 2007, p.43c) that may last for several years.

Ethical issues relating to the well-being of AC candidates

Puckett (2007, p. 44b) notes the ‘toughness’ of the ‘team simulation’ process and how one veteran of the technique describes it as a way of "*testing people almost to destruction, seeing how far you can upset people before they crash out*". Approaching the design and administration of behavioural assessment in this way may not only detract from the assessment of the competencies that are purported to be the subject of evaluation but may breach ethical codes; AC managers and the client organization perhaps exercising power through dictatorial behaviour and AC candidates believing it important to comply (Liefoghe and MacKenzie Davey, 2001) within a competitive process, risking undue stress or humiliation. Indeed, Dewberry and Jackson (2016) noted the prevalence of concern among candidates of lack of ‘consideration for candidates’ among ACs more generally.

The British Psychological Society’s Division of Occupational Psychology has published a standard for the Design and Delivery of Assessment Centres; within that are references to fairness of process, objectivity and ethical standards. This study has found no references to that or any other AC design and management standards in literature pertaining to the use of ACs in the construction programme procurement. Having discussed the main concerns in relation to the efficacy and validity of behavioural assessment in procurement, next the study provides possible explanations, underpinned by well-established social science theories, to the wide-spread of this seemingly inefficient and ineffective procurement process

THE BANDWAGON EFFECTS AND INSTITUTIONAL WASTE

Work by Sarhan *et al.* (2018) introduced the concept of ‘institutional waste’ within the construction procurement context, which emphasises the significance of how imperfect regulations, norms, cultural and cognitive assumptions may influence our approaches to construction procurement, leading to irreconcilable and self-perpetuating cycles of waste. Waste here can be in the form of monetary, time, effort or value loss, and can occur prior to or post contractual stages. Their study argues that many counterproductive construction procurement arrangements are formed and prevail in the industry, due to social legitimacy and mere ceremony (Meyer and Rowan, 1977) or flawed risk-averse safeguarding considerations compounded by vested interests of external consultants and third parties (Sarhan *et al.*, 2017). These wasteful procurement governance arrangements dominate the

management of the project delivery often to the detriment of the project itself; but because there is a belief that interests are safeguarded, construction buyers and decision makers feel they have taken the best course of action (Sarhan *et al.*, 2017).

The references in construction industry publications to military origins and the ODA (Puckett, 2007) may represent social legitimacy in action as an explanation for the industry's widespread adoption of practices with no known evidence base for efficacy, yet which become desired and established norms. The Infrastructure Client Group's 'Alliancing Code of Practice' published by HM Treasury in 2015 articulates beliefs in the benefits of behavioural assessments in procurement. This may again both reinforce social legitimacy and suggests that behavioural assessment is included in the construction procurement process to act as a safe-guard against perceived opportunism (Sarhan *et al.*, 2017). Yet again, known evidence for efficacy is absent.

The spread of behavioural assessment in procurement has occurred over ten years within an industry where independent client authorities have a choice about procurement practices to adopt yet have seemingly chosen to do similar things without evidence that it works. This study posits this phenomenon has similarities with the 'bandwagon effect' found among consumers (Kuwashima, 2015). Veblen (1899) suggested that consumers are concerned about others' perception about them rather than private utility gained from products themselves. Leibenstein (1952) quantitatively proved the links between this and consumption patterns and termed it a 'bandwagon effect'. In the context of this study we propose that the behavioural assessment process has strong parallels with the 'product' being consumed – the consumers being procuring authorities or their representatives. Burt (1987) proposed the idea that 'social contagion' is prevalent among actors having 'structural equivalence' in a network – i.e., the same relationship with others within that network; a phenomenon not uncommon in professional networks in the construction industry. Explaining the growth in municipal enterprises in Finland, in spite of a lack of rational reasoning for their form, Kallio and Kuoppakangas (2013) attributed growth to a bandwagon effect in which institutional isomorphism had an essential role. Frumkin and Galaskiewicz (2004) examined the susceptibility of public sector organizations to institutional pressures, including normative isomorphism, that result from belonging to an association of peer organizations and stemming from "the collective struggle of members of an occupation to define the conditions and methods of their work" (DiMaggio and Powell, 1983).

This study proposes the close relationship of the forces of social legitimacy, bandwagons and institutional isomorphism, rather than evidence and rational reasoning, as the reason for growth of a behavioural assessment process in construction procurement. Further, the study proposes that the lack of evidence for the efficacy of the process has generated institutional waste. **Social actors (e.g. individuals and supply-chain organisations) typically conform to institutional pressure, in order to gain self-interested rewards (e.g. access to resources/work, stability, legitimacy, expedience to avoid questioning). Their strategic responses can range from passive to active resistance (i.e. acquiescence; compromise; avoid; defy; and manipulate) (Oliver, 1991). Within the construction industry, the audible voices of dissent in relation to the use and value of behavioural assessment in procurement appear to be few; Hancock (2015) reports the scepticism of one industry supplier. Giving "a very strong message to the supply chain regarding collaboration" (Turton, 2015, p. 24) may be an important aspect of creating expectations of a working relationship. Supply team employees may feel they have "personally benefitted" from attending behavioural assessment workshops (Turton, 2015, p. 20). However, it is suggested that using prevailing behavioural assessment methods in construction procurement for those ends, without addressing the concerns raised**

in this study, sustains a false process that can damage project performance and worsen relationships rather than improve them.

CONCLUSION AND RECOMMENDATIONS

This study critically articulated how organizational psychology literature gives rise to concerns related to the validity of behavioural assessment processes used in construction procurement. Extensive empirical evidence finds against the efficacy of ‘multi-situation, multi-competency assessment processes in the recruitment and selection of individuals’. The evidence for the efficacy of multi-situation, multi-competency based behavioural assessment processes in construction procurement is therefore unsupported. This lack of support is compounded by the absence of studies concerning the efficacy of behavioural assessment in construction procurement and the industry practice of extrapolating the scores assigned to individuals to infer an ‘organizational score’ for behaviour; a practice unsupported by evidence from any organizational context.

The study also sought to seek explanations for the increasing trend in the use of behavioural assessment in construction programme procurement over the last ten years without evidence that it works. In doing so, the study noted similarities between the ‘bandwagon’ effect characterising the spread of ACs in the selection of personnel in industry and the spread of behavioural assessment processes in construction. It is further suggested that the spread of an ineffective process constitutes an element of ‘institutional waste’ in construction procurement processes. Further studies are therefore recommended to investigate the underlying paradigms and contextual factors that make construction buyers and suppliers more or less obedient to institutional and commercial pressures imposed on them. Another important recommendation of this study is to encourage closer collaboration between the behavioural science and construction management disciplines to use extensive knowledge from both to develop and critically examine construction management practice developments.

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