

Measurement and antecedents of cooperation in construction

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Abstract

The cooperation construct in construction lacks conceptual-definitional clarity. A multi-dimensional model of cooperation is proposed in which the construct is conceptualized as comprising four related yet conceptually distinct behaviors: in-role, extra-role, compliance, and deference behavior. The construct validity of this model is assessed using confirmatory factor analysis and a sample of 140 professional managers in Hong Kong. Structural equation modeling is then used to test specific predictions linking the four cooperative behaviors with two extrinsic (incentives and sanctions) and intrinsic (intrinsic job satisfaction and legitimacy) job cognition variables. Findings confirm the convergent, discriminant, and nomological validity of the proposed model. Between them, the two intrinsic job cognition variables predict all four behavior dimensions: intrinsic job satisfaction predicts in-role and extra-role behaviors; and legitimacy predicts compliance and deference behaviors. In contrast, the influence of the extrinsic job cognition variables on cooperative behavior is imprecise and weaker. The research suggests that initiatives aimed at improving the level of cooperation in construction project settings should focus more attention on stimulating the internal motivations (enhancing 'personal causality') of project actors.

CE Database subject headings: Cooperation; motivation; performance; personnel management.

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Introduction

As a concept, cooperation is essentially implied in the collaborative interdependence context of construction (Harty, 2005; Turner, 2004). Yet, destructive conflict and adversarialism, rather than cooperation, have become the norm in the construction sector (Bresnen and Marshall, 2000). Courtney and Winch (2003) summarized the fundamental issues in construction as being organizational and behavioral. There is a paucity of construction management research that focuses on the behavioral theme (Cox *et al.* (2005). What research there is largely adopts either an 'interventionist' (e.g. Eriksson and Pesämaa, 2007; Pesämaa *et al.*, 2009) or competency (e.g. Ahadzie *et al.*, 2008; Cox, *et al.*, 2005; Dainty *et al.*, 2005) approach. The former focuses mainly on the identification and implementation of effective strategies for improving the pattern and quality of project work group interactions, activities and social relations and the latter, on the identification of skill sets and dispositional factors that are the most predictive of project managers' performance. While united in ultimate purpose (i.e. improving the effectiveness of collective action), the research described in this paper is different; it focuses on the identification and facilitation of the workplace behaviors that contribute to the achievement of organizational effectiveness.

It is clearly impossible to define the variety of individuals' behaviors in their work settings. However, it is possible to identify behaviors which constitute performance-of-a-kind. From an organization's perspective, employees' behaviors that are relevant and contribute to the achievement of organizational goals constitute performance (Katz, 1964; Katz and Kahn, 1978). Role incumbents who exhibit such behaviors with zeal and vigor are thus cooperating with their organizations. Thus, whether or not a particular behavior constitutes cooperation will depend on the organizational context. Also, the propensity with which role incumbents engage in cooperative behavior is shaped by the individual and situational factors at play in the workplace (Smith *et al.*, 1995). In particular, research shows that

proximity and saliency of environmental elements (Gold, 1999) and group boundaries (Tajfel, 1982) greatly influence individuals' behaviors in social contexts. Given the many circles of inclusion in a construction project setting, the medium with the most impact on a role incumbent's cooperative behavior is the proximal work group. According to Anderson and West (1998), the proximal work group is the primary medium through which shared climate phenomena (e.g. justice climate, innovation climate, empowerment climate) emerge, evolve and ultimately become embedded into the fabric of an organization or network of organizations. Thus, this research focuses on the cooperation of individuals' with their cross-functional TMO project work groups. A further focus of this research is the cooperative behaviors of management-level staff in TMO project settings as inter-organizational cooperation ultimately reduces to cooperation between individual managers representing those firms (Smith *et al.*, 1995; Phua, 2004) whose decisions and actions have a profound impact on project outcomes (Dainty *et al.*, 2005).

Cooperation is defined in the current study as behavior which promotes the goals of the proximal cross-functional TMO project work group one belongs to. This definition is consistent with other definitions of the concept in the extant literature (for a review, see Anvuur and Kumaraswamy, 2008). Construction management research studies which specifically address this notion of cooperation as performance *behavior* are scarce, and existing studies (Dulaimi and Langford, 1999; Mustapha and Naoum, 1998; Phua, 2004) generally cast cooperation as a one-dimensional construct. However, the seminal work of Katz (1964; Katz and Kahn, 1978) and others building on this work (e.g. Smith *et al.*, 1983, Borman and Motowidlo, 1993; Williams and Anderson, 1991; Tyler and Blader, 2000) demonstrate that cooperation is a multi-dimensional construct. Thus, previous research suggests that studies such as Dulaimi and Langford (1999), Mustapha and Naoum (1998) and Phua (2004), which focus on only one dimension of cooperation provide an important but incomplete picture of the theoretical reach and practical

importance of the construct. The purpose of this study is, therefore, to propose and undertake empirical tests of the construct validity of a theory-based multi-dimensional conceptualization of an individual's cooperation with the proximal TMO project work group. As Winter *et al.* (2006) note, such efforts are central to the advancement of theory building research in, and the further development of the construction management discipline. In the sections that follow, we outline the conceptual background of the proposed four-dimensional cooperation model. Subsequently, we report on the research design employed to test the construct validity of the proposed four-dimensional cooperation model and also to place the four cooperation dimensions in their larger nomological network. Finally, we outline the theoretical and practical implications of our research.

Conceptual background

The four-dimensional conceptualization of cooperation that is developed in the current study has its roots in the seminal work of D. Katz (1964; Katz and Kahn, 1978). Katz (1964:132) identified two basic types of performance required from members of an organisation: (1) they must execute their prescribed roles in a dependable fashion and (2) they must undertake innovative and spontaneous activity that transcends their role prescriptions. Katz related the first type of behavior to productivity, which, as a function of the formal organisation (role specifications, authority structure, and technology), is often subject to reinforcement mechanisms. However, reinforcement mechanisms only ensure minimal observance of role requirements (Katz (1964). Also, measurement difficulties mean an emphasis on performance quantity, with performance quality consigned to quality controls. Therefore, according to Katz (1964), dependable role performance requires role incumbents to consistently strive to do more than the minimum required to get by, and with a focus on quality. The intentionality of such behavior makes it cooperation (Tyler and Blader, 2000).

The second category of role incumbents' performance Katz (1964) identified is non-role performance behaviors. These include, broadly, helping co-workers with their job tasks, making innovative suggestions or engaging in spontaneous behavior that helps the organisation as a whole, and rule-following behavior that protects the organisation or its members from harm. Katz applied the label 'cooperation' to this class of behaviors, although we use the term cooperation in the current study to refer to all types of a role incumbent's performance. While acknowledging that rule-following can also be a function of sanctions, Katz (1964:135) argued that "for the citizen of modern society the observance of legitimized rules has become a generalized value". Thus, Katz considered non-role performance behaviors to be subject to the informal organisation.

As this brief review shows, the four dimensions of a role incumbent's cooperation were already discernible from Katz's seminal work. Specifically, carefully reading of Katz's (1964) work shows that role incumbents' cooperation can be distinguished based on the *function* of the behavior (production-function focus; protection from harm) and the *source* of the behavior (formal organization; informal organization). In the sections that follow, we briefly review conceptual developments in the criterion domain of role incumbents' cooperation subsequent to Katz's (1964; Katz and Kahn, 1978). Three models of employee performance are included in this review: task performance and contextual performance or organizational citizenship behavior (OCB) (Borman and Motowidlo, 1993; Van Scotter and Motowidlo, 1996; Smith *et al.*, 1983; Organ, 1988, 1997); counterproductive workplace behavior (CWB; Sackett, 2002; Robinson and Bennett, 1995; Gruys and Sackett, 2003); and Campbell *et al.*'s (1993) eight-factor performance model. The basic tenets of each performance model are outlined and their factor-structures are compared with one another, and evaluated for their fit (or lack thereof) with one or more of the four types of cooperative behavior discernible from Katz's (1964) seminal

conceptualization. Subsequently, we provide a brief commentary on the literature review and then present our four-factor cooperation model.

Task performance and Contextual performance

Borman and Motowidlo (1993) later used the terms task performance and contextual performance to refer to Katz's (1964) role and non-role performance behaviors respectively. Van Scotter and Motowidlo (1996) identified two dimensions of contextual performance: *interpersonal facilitation*, helpful acts that assist co-workers' task performance; and *job dedication*, exercising self-discipline and self-control, following rules to support organizational objectives. Smith *et al.* (1983) used the term organizational citizenship behavior (OCB) to capture the non-role performance behaviors. Smith *et al.* (1983) initially identified two dimensions of OCB: *altruism*, helping others with work-related problems; and *generalized compliance*, internalizing and scrupulously following organizational rules and procedures even when no one is observing or monitoring. These were later expanded to five dimensions by Organ (1988): altruism, courtesy, civic virtue, conscientiousness, and sportsmanship. In 1997, Organ redefined OCB to be conceptually synonymous with contextual performance. Organ also reverted to the two-dimensional conceptualization of OCB but settled instead for Williams and Anderson's (1991) labels of OCB-I for non-role performance behaviors directed towards individuals (thus subsuming altruism and courtesy) and OCB-O for non-role performance behaviors directed towards the organisation (thus subsuming civic virtue, conscientiousness and sportsmanship). Thus, OCB-I (altruism) and OCB-O (generalized compliance) are conceptually synonymous with interpersonal facilitation and job dedication respectively.

Counterproductive workplace behavior (CWB)

Sackett (2002) argued that counterproductive workplace behavior (CWB) qualifies as a third domain of performance along with task performance and contextual performance. Sackett (2002:5) defined CWB as “intentional behavior on the part of an organization member viewed by the organization as contrary to its legitimate interests”. The lines of literature on CWB draw heavily on Robinson and Bennett’s (1995) seminal work on the typology of deviant behaviors and the works of other researchers (e.g. Gruys and Sackett, 2003) building on Robinson and Bennett’s work. Categories of CWB include (Robinson and Bennett, 1995): theft; acts of vandalism; substance (drugs, alcohol) abuse; abusive behavior (both physical and verbal) towards coworkers; breaches of safety procedures; poor attendance; and misuse of time, resources and information. According to Gruys and Sackett (2003), CWB categories vary on two dimensions: an interpersonal-organizational dimension; and a task relevance dimension, which distinguishes between job specific and non-job specific CWBs. Robinson and Bennett (1995) argued that organizational norms are the primary formal defense against CWB. These norms extend beyond formal rules and regulations to include other standards of behavior that evolve over time to define what constitutes appropriate and acceptable behavior in the workplace. The CWB construct, therefore subsumes the OCB-O/job dedication construct.

Campbell *et al.*'s (1993) eight factor performance model

Proceeding from a job-analytical perspective, Campbell *et al.* (1993) proposed eight factors designed to sufficiently describe the latent performance structure of all jobs. According to Campbell *et al.* (1993), the eight factors, although sufficient, are not all necessary in every job. The factors are: job specific tasks proficiency, non-job specific tasks proficiency, written and oral communication, demonstrating effort, maintaining personal discipline, facilitating peer and team performance, supervision/leadership, and management/administration. Motowidlo and Van Scotter (1994:476) concluded that “task performance includes primarily the two task dimensions in Campbell *et al.*'s (1993) performance model, along with

elements of written and oral communication, supervision and leadership, and management and administration". Campbell *et al.*'s (1993) 'maintaining personal discipline' performance factor is similar to the OCB-O/job dedication construct, while the 'facilitating peer and team performance' factor is similar to the OCB-I/interpersonal facilitation construct. As Stone-Romero *et al.* (2009) note, the supervision/leadership and management/administration elements in Campbell *et al.*'s model will tend to depend on an individual's hierarchical position within an organisation.

Factor structure of the job performance domain

As the above review shows, there is a high degree of similarity and overlap between the dimensions of performance in the three models and conceptual fit with the four types of employee performance discernible from Katz's (1964) seminal work. However, Campbell *et al.*'s (1993) performance model and later works on task performance and contextual performance (e.g. Borman and Motowidlo, 1997; Organ, 1997), in contrast to earlier works (e.g. Smith *et al.*, 1983; Organ, 1988; Borman and Motowidlo, 1993), have tended to operationalize performance as proficiency (what employees *can do*), and to confound this with other notions such as affect, loyalty and intent to remain, which are not behaviors at all (cf. Stone-Romero *et al.*, 2009; Sackett, 2002). This downplays or ignores altogether Katz's (1964) formal – informal organization distinction and 'performance as behavior' conceptualization. Instead, task-contextual performance researchers emphasize the role of dispositional variables like the Big Five personality traits (Borman and Motowidlo, 1997). However, meta-analytic results of the performance consequences of dispositional variables have been disappointing (e.g. Hurtz and Donovan, 2000). Tubré *et al.* (2006) argue that, because of this, there is to date no consensus on the factor structure of the job performance domain.

Weiss and Ilgen (2002:92) suggest that one way to better understanding of the performance domain would be to return to “general principles, latent processes if you like, that underlie behavior more broadly defined than performance but central to it”. This entails investigating employee performance in the context of the individual and situational factors at play in the workplace (e.g. Hoffman *et al.*, 2007). To do this requires models and measures of performance that reflect what role incumbents *will do*, rather than *can do* (Sackett, 2002). These calls essentially warrant a return to first principles, to the seminal writings of Katz (1964; Katz and Kahn, 1978). This is attempted in the present paper.

Four-factor model of cooperation

As discussed earlier, Katz’s work recognized that role incumbents’ cooperative behaviors can be distinguished based on the *function* of the behavior (production-function or coordination focused) and on the *source* of the behavior (formal or informal organisation). Note that as these distinctions take the perspective of a role incumbent’s organization/work group, the interpersonal-organizational distinction in the task-contextual performance literature becomes redundant. The two dimensions result in four types of cooperation: extra-role; in-role; deference; and compliance.

Extra-role behaviors are informal (voluntary) production-function focused behaviors and include volunteering to carry out extra task activities or helping others with task-related problems which are *not* formally part of one’s own job role. This dimension thus subsumes OCB-I/interpersonal facilitation behaviors. In-role behaviors are formal (obligatory) production-function focused behaviors. This dimension consists of performance behaviors that involve role incumbents in carrying out tasks that are formally part of their job roles, thus, it subsumes the performance behaviors typically associated with the task performance construct.

Deference behaviors (name after Tyler and Blader, 2000) are voluntary behaviors that aid coordination and restrain CWB and include, willingly following organisational/work group rules or deferring to relevant authorities or best standards of appropriate behavior where rules/norms do not exist. This dimension reflects Katz's (1964) notion of the observance of legitimized rules as a generalized value, and subsumes behaviors associated with OCB-O/job dedication. Compliance behaviors are calculative rule-following behaviors referenced to reinforcement mechanisms and include both task-specific and general organisational/work group rules (e.g. health and safety rules).

The distinctions between the four types of cooperative behavior are context-dependent, hence what is considered extra-role, in-role, compliance or deference will vary with the nature of a role incumbent's organisation (Stone-Romero *et al.*, 2009) as well as with his/her hierarchical position in that organization (Turnipseed and Wilson, 2009). However, the four dimensions are proposed as constituting distinct but related manifestations of a latent construct of cooperation. Thus, role incumbents across jobs and organizations must exhibit significant amounts of each type of behavior in order to score significantly on the latent cooperation construct (cf. Law *et al.*, 1998). Indeed role incumbents across organizations may well be expected to routinely engage in all four types of behavior because of the following two reasons: (a) rapid changes in the organisation of work (towards flexible, team-based structures) place great emphasis on employee and team empowerment (Tuuli and Rowlinson, 2009); and (b) the generality of role descriptions, role sending and role socialization (Katz and Khan, 1978; Stone-Romero *et al.*, 2009), which can expand role expectations beyond formal role prescriptions.

Research provides general empirical support for the construct validities and independent organisational performance consequences of the cooperation dimensions: in-role and extra-role behaviors (e.g. Orr *et al.*, 1989; MacKenzie *et al.*, 1991); extra-role and deference behaviors (e.g. Smith *et al.*, 1983; Organ,

1988; Podsakoff *et al.*, 1997); in-role, extra-role and deference behaviors (e.g. Conway, 1996; Motowidlo and Van Scotter, 1994; Williams and Anderson, 1991). Tyler and Blader (2000) provided proof of the construct validities and independent effects of all four cooperation dimensions. In this sense, the present study constitutes a conceptual replication of their study.

Relevance of the cooperation dimensions to construction

The conceptualization of cooperation in the present study has substantive relevance in the construction context. Construction contracts, as instruments of adaptation, are unavoidably incomplete (Stinchcombe, 1985), hence the reliance on incentivisation (e.g. Turner, 2004), mutual adjustment processes (e.g. Shirazi *et al.*, 1996), interventions for socialization (e.g. Anvuur and Kumaraswamy, 2007), and project learning (e.g. Puddicombe, 2006) for controlling both the quantity and quality of performance. These control modes essentially entail the interplay between instrumental and social identity motives; hence result in both formal and informal cooperative behaviors. Construction is also a highly localized sector with a lot of local rules, regulations and laws, which are often also subject to reinforcement mechanisms. These regulations/laws pertain to, for example, health and safety, inclusivity (e.g. of ethnic minorities, women) and environmental conservation, and (in addition to task-specific rules) are crucial to the success of any construction project. Thus, the production function–coordination focused cooperative behavior distinction is also relevant in construction project contexts.

The bulk of the construction management literature on job performance is directed towards the development of behavioral competency frameworks for project managers (e.g. Cheng *et al.*, 2005; Dainty *et al.*, 2005; Ahadzie *et al.*, 2008; Cheng *et al.*, 2007). Generally, these studies focus on the identification or development of attributes, traits and characteristics considered to be associated with or predictive of – that is, critical success factors for – construction project managers' performance. For

example, these studies (e.g. Ahadzie *et al.*, 2008; Cheng *et al.*, 2007; Dainty *et al.*, 2005) identify job knowledge, self-facilitation and self-regulation as competencies that are the most predictive of project managers' performance. While functional to the effectiveness of collective action, such perspectives, by operationalizing performance as proficiency, downplay the role of the individually and situationally based variables at play in project settings.

Construction management research which conceptualizes performance as behavior include: Dulaimi and Langford (1999) and Mustapha and Naoum (1998) who investigated the project management performance consequences of the in-role behaviors of project and site managers respectively; Phua (2004) who investigated the social identity antecedents of individuals' extra-role behaviors in project settings; and, recently, Tuuli and Rowlinson (2009) who investigated the multi-level effects of empowerment on individuals' in-role and extra-role behaviors. While these studies provide support for the relevance and construct validities of in-role and extra-role behaviours, they present only a partial and incomplete picture of the reach of the cooperation construct.

Thus, taken together, both the 'performance as proficiency' and 'performance as behavior' lines of literature in construction management provide some support for – and would benefit from – the four-dimensional model of cooperation presented in this paper. Later, we undertake tests of the construct validity of the four cooperation dimensions. Construct validity assessments are important because they indicate the extent to which measured items actually reflect the theoretical latent constructs they were designed to measure (Hair *et al.*, 2010). But first we make predictions connecting four job cognition variables (intrinsic and extrinsic) to the four cooperation dimensions. These predictions place the item measures in their larger nomological network while also providing further support of their construct validity.

Hypotheses linking the cooperation dimensions to proposed predictors

Two extrinsic variables and two intrinsic variables were included as potential antecedents of the four cooperation dimensions. The two extrinsic variables were performance contingent rewards (i.e. incentives) and punishment for rule-breaking (i.e. sanctions) while the two intrinsic variables included were intrinsic job satisfaction and legitimacy. These variables have all been heavily researched in the past and specific predictions connecting them to cooperation were already tenable before the present study. The predictions below are about the most significant relationships based on the proposed four cooperation dimensions and, therefore, could be qualified by the results of the statistical analyses. The following section sets out the hypotheses linking the cooperation dimensions in-role, extra-role, compliance and deference to the four job cognition predictor variables.

Linking incentives and sanctions to cooperation

Instrumentality refers to the perceived linkage between high performance and rewards (i.e. incentives) and by corollary, between non-compliance and costs (i.e. sanctions). As a concept, instrumentality is centrally connected with Vroom's (1964) expectancy theory. Research (e.g. Kelman, 1958; Thompson *et al.*, 1998) has consistently shown that the use of sanctions in work settings encourages compliance behavior. On the other hand, research on the use of incentives (e.g. Eisenberger *et al.*, 1986) suggests that an employee's work effort on job tasks (i.e. in-role behavior) increases with the strength of the incentives favoring the exchange of extra work effort for material rewards. Hence, the following specific hypotheses:

Hypothesis H₁: Sanctions is positively related to compliance behavior.

Hypothesis H₂: Incentives is positively related to in-role behavior.

Linking intrinsic job satisfaction and legitimacy to cooperation

Intrinsic job satisfaction reflects internally orientated notions of how self-satisfying a person's job/group role is (Cameron and Pierce, 2006); hence, it is devoid of any instrumental considerations. Although the majority of research on intrinsic satisfaction focuses on the controversy relating to its precise relationship with incentives, there is great consensus on the consequences of intrinsic job satisfaction (e.g. Cameron and Pierce, 2006, Ryan and Deci, 2000): intrinsically satisfied individuals tend to execute their work-related tasks with great zeal and a focus on professional excellence; and also tend to engage in discretionary cooperative behaviors. Tyler and Blader (2000) provided empirical support for such predictions linking intrinsic satisfaction to in-role and extra-role behaviors.

Hypothesis H₃: Intrinsic satisfaction is positively related to in-role behavior.

Hypothesis H₄: Intrinsic satisfaction is positively related to extra-role behavior.

Kelman's (1958) experimental study of attitudinal/behavioral change processes showed that when people view organizational policies and rules – both as articulated/stipulated and as enacted by authority figures – as credible or legitimate, they tend to internalize the values that underpin them and subsequently voluntarily follow those rules and policies. The construct of legitimacy, thus, reflects a feeling of obligation to obey group rules and to defer to group authorities because one regards those rules and group authorities as being credible or legitimate. Kelman's (1958) findings have subsequently been replicated in several other field studies (e.g., O'Reilly and Chatman, 1986). Consistent with previous studies, legitimacy is expected to explain both compliance and deference behaviors; more formally:

Hypothesis H₅: Legitimacy is positively related to compliance behavior.

Hypothesis H₆: Legitimacy is positively related to deference behavior.

Method

Sample

The questionnaire responses analyzed were from 140 chartered built environment professionals in Hong Kong, comprising 135 men and 5 women. Average age of the participants was 44 years. Average total experience of the participants in construction was 20 years and average experience in current position was 7 years. All but three participants had at least a bachelor's degree. The sample consisted of 101 Chinese, 37 Caucasians and 2 participants with other ethnic backgrounds. The survey and data examination procedures, as described below, provide methodological and empirical reasons to believe that the analysis sample was not biased.

Data collection and examination procedures

Items for the present study were merged into a larger questionnaire (see Anvuur, 2008) and sent out to 1100 chartered (before 2006) built environment professionals (engineers, project managers, quantity surveyors, and architects). Their postal and/or email addresses were retrieved from relevant professional membership directories. Respondents were included in the study only if they had *directly* participated in a recently completed (i.e., within the past 5 years of 2007) or an ongoing but relatively advanced construction project. A skip routine was used to direct all 'non-eligible' respondents to answer only questions relating to their demographics and social preferences. The questionnaire items (save the demographic and social preferences items) were tailored to a project context by expressly asking respondents to focus on their proximal cross-functional work group within one and the same specific recent project that they have been directly involved in. After two mailings, interspersed with two e-mail reminders, a total of 153 'eligible' responses were received, representing a response rate of 18% or the

higher rate of 20% if adjusting for 'non-eligibles'. This response rate compares favorably with those reported in many similar previous studies.

This initial dataset was examined for (item and unit) non-response bias, violations of multivariate normality, and social desirability bias. Missing value analysis in SPSS using conservative guidelines outlined by Hair *et al.* (2010) resulted in a total of eight cases being dropped for significant (> 10%) missing data. The resulting missing data process was declared as being MCAR (Missing Completely At Random) as Little's MCAR test was non-significant ($\chi^2_{df = 2820} = 1904.000, p = 1.00$). Examination of advanced diagnostic (and influence) statistics using conservative guidelines outlined by Hair *et al.* (2010) resulted in a further five cases being discarded, after which no further violation of the assumptions of multivariate normality were observed. Missing metric data values in the resulting sample of 140 cases were imputed using the Expectation Maximization procedure in SPSS.

Armstrong and Overton's (1977) popular "successive waves" extrapolation procedure was used to test for systematic differences in 14 key respondent demographic variables between early respondents (after first mailing; $N_1 = 99$) and later respondents (after second mailing; $N_2 = 41$), acting as surrogates for non-respondents. The demographic variables comprised gender, age, education, ethnic background, overall construction experience and experience in current position (with the categorical variables dummy coded), three items measuring the values subscale of Wagner's (1995) individualism-collectivism scale, and five items measuring Rosenberg's (1965) global self-esteem scale. Wilks' Lambda was not significant ($\Lambda = .869, p = .190$). The 'eligible' ($N_1 = 140$) and 'non-eligible' ($N_2 = 21$) respondent groupings were also tested for systematic differences in the 14 demographic variables. Again, Wilks' Lambda was not significant ($\Lambda = .903, p = .342$). The results suggest that unit nonresponse bias is unlikely to be a major problem in this study.

Bivariate correlations between 28 behavioral and attitudinal scales in the broader study and Strahan and Gerbasi's (1972) 10-item short version of the Crowne and Marlowe (1960) 33-item social desirability scale were near zero (i.e. $|r| < 0.20$) and statistically non-significant ($p > 0.10$), thus providing adequate proof that social desirability bias ("faking good") is not a problem in this study (Mitchell and Jolley, 2001). The proportion of women managers in the sample (about 4%) compares favorably with the total proportion of women employed in the Hong Kong construction sector (about 9%; Hong Kong Census and Statistics Department, 2011) and in the construction sectors of other developed countries such as Australia (about 13%; Francis, 2010) and the UK (about 10%; Worrall *et al.*, 2010). The final analysis sample of 140 cases can, thus, be considered to be fairly representative of the target population and suitable for the subsequent analyses.

Measures

The dependent variables (cooperation dimensions) were measured with 5-point Likert scales with anchors that ranged from 1 = *never* to 5 = *very often*. Items measuring individuals' in-role, extra-role, compliance, and deference behaviors were developed in line with the seminal explications by Katz (1964; Katz and Kahn, 1978) and other researchers (e.g. Smith *et al.*, 1983; Williams and Anderson, 1991; Borman and Motowidlo, 1993) closely building on this work. Item wordings were adapted from Tyler and Blader (2000). The independent variables in the study were measured with 5-point Likert scales with anchors that ranged from 1 = *strongly disagree* to 5 = *strongly agree*. The three items measuring sanctions and the three items measuring legitimacy were adapted from Tyler and Blader (2000). Incentives was measured with two items adapted from Colquitt (2001) while intrinsic job satisfaction was measured with three items based on Warr *et al.*'s (1979) intrinsic job motivation scale. Instructions preceding the measures oriented each respondent to answer the questions with regard to

his or her role in the cross-functional work group in the referent construction project. Item measures for the variables in this study are presented in the Appendix.

As the sample consisted predominantly of male Chinese, we included controls for the effects of gender and ethnicity on cooperation in the statistical analyses. Previous studies have found or argued the two demographic variables to be associated with one or more of the attitudinal and behavioral variables in the present study. For instance, Chinese have been shown to be generally collectivists, with a high level of long-term orientation and power distance when compared to other cultures (Hofstede, 1980) and so tend towards self-restraint and compliance, even self-deprecation (e.g. Markus and Kitayama, 1991). In their study of the effects of demographic differences on organizational commitment, Tsui *et al.* (1992) found that not only did gender and ethnicity influence facets of commitment but also the effects were nonsymmetrical for unbalanced groups. Therefore, controlling for gender and ethnicity in the present study ensures that any variances explained by them are partialled out. Gender and ethnicity were dummy-coded as follows: gender, 0 = male and 1 = female; ethnicity, 0 = non-Chinese and 1 = Chinese.

While the cooperation measures in the Appendix have content validity, it is also important to demonstrate their convergent, discriminant and nomological validities in the context of construction. Satisfactory tests of these four validities are required in order to establish the construct validity of a proposed measurement theory (Hair *et al.*, 2010).

Analysis procedure

First a confirmatory factor analysis (CFA) of the cooperation and predictor variable items was performed using maximum likelihood estimation in AMOS software. We compared two competing a priori cooperation factor models: the four-factor model proposed in the present study and a three-factor

model, which combined the compliance and deference items into a latent factor of CWB. In other words, we compared nested measurement (CFA) models containing the same number of observed variables, yet representing different measurement theories. Because the difference of two chi-square (χ^2) values is itself χ^2 distributed (Hair *et al.*, 2010), the nested three-factor and four-factor CFA models were compared based on the statistical significance of the chi-square difference statistic ($\Delta\chi^2$). Once the better-fitting measurement model was found, we then proceeded to specify and test a structural model containing the hypothesized relationships between the cooperation dimensions and the predictor variables. This two-step approach to structural equation modelling (SEM) has significant value in the sense that a recursive SEM model (i.e. one with no reciprocal paths between any two constructs) cannot fit the data better than the CFA model from which it was developed (Hair *et al.*, 2010). This is because a recursive SEM model cannot have more relationships between constructs, hence a lower χ^2 value, than that obtained in the CFA. Therefore, the CFA model fit provides a basis for assessing the SEM model fit (Hair *et al.*, 2010).

Results

Confirmatory factor analysis

To assess model fit in this analysis and throughout this paper, we adopted established standards from the literature that, for smaller samples as in the present study, evidence of reasonable fit would include a significant χ^2 value, a normed χ^2 (i.e. χ^2/df) value below 5, comparative fit index (CFI) and incremental fit index (IFI) values of .90 or higher, and root mean square error of approximation (RMSEA) value of .08 (cf. Hair *et al.*, 2010). In comparing the nested three-factor and four-factor CFA models, two parsimony fit indices were also employed namely the parsimony normed fit index (PNFI) and the parsimony comparative fit index (PCFI). Parsimony fit indices are generally only considered useful when competing

models are being compared, and should be considered unreliable otherwise. Thus, in the present study, the nested CFA model with the higher PNFI or PCFI value would be the better supported.

This analysis confirmed the following goodness of fit statistics for the three-factor measurement model (which has the cooperation dimensions of compliance and deference merged into a latent factor of CWB): absolute fit indices; $\chi^2(df = 265) = 405.098$ and $\chi^2/df = 1.53$, $p < .001$, RMSEA = .062 and 90% confidence interval of (.049, .073); incremental fit indices; IFI = .91 and CFI = .90; parsimony fit indices; PNFI = .63 and PCFI = .74. The goodness of fit statistics for the proposed four-factor cooperation CFA model were as follows: absolute fit indices; $\chi^2(df = 256) = 326.098$ and $\chi^2/df = 1.27$, $p < .01$, RMSEA = .044 and 90% confidence interval of (.028, .058); incremental fit indices; IFI = .95 and CFI = .95; parsimony fit indices; PNFI = .64 and PCFI = .75. While both measurement models demonstrated reasonable fit based on their absolute and incremental fit statistics, clearly, the four-factor model produced a better fit compared to the three-factor model. The parsimony fit indices for the four-factor model are also marginally higher than those for the three-factor model, suggesting that the four-factor model is the better supported of the two. The chi-square difference between the three-factor model and the more constrained four-factor model is $\Delta\chi^2 = 79$, which is itself distributed as a chi-square with ($\Delta df = 265 - 256 = 9$) seven degrees of freedom is statistically significant at $p < .001$. The fact that this value is statistically significant would suggest that the four-factor measurement model is significantly better than the three-factor model.

It is important to point out that the analysis results demonstrate that the four-factor cooperation measurement model not only produces a better fit compared to a three-factor model but also achieves a close fit. Normed χ^2 values smaller than 2.0 are generally considered to be indicative of a very good fit. The normed χ^2 value of 1.27 for the four-factor model is well below this boundary value. Similarly

RMSEA values below .05 are generally considered to be indicative of a close fit. The RMSEA value of .044 for the four-factor model falls below this critical value of .05. Also, the p -value which examines the alternative hypothesis that the RMSEA is greater than .05 was nonsignificant (PCLOSE = .734), which suggests that the fit of the four-factor model is indeed “close”. The CFI and IFI values of .95 are also very good given the small sample size of 140 respondents and the complexity of the measurement model, involving ten constructs and 26 observed variables (cf. Hair *et al.*, 2010). Overall, the results suggest that the proposed four-factor cooperation model provides a reasonably good fit; hence it would now be examined further for its construct validity. Table 1 presents the standardized regression weights and squared multiple correlations (SMCs) for the four-factor CFA model.

Table 1 about here

Construct validity is assessed by simultaneously examining convergent, discriminant and nomological validities. Convergent validity is the extent of shared variance there is between the individual indicators of a construct. Good convergent validity is generally indicated by statistically significant standardized factor loadings (regression weights) of .50 or higher, variance extracted (VE) estimates of .50 or higher and construct reliability (CR) estimates of .70 or higher (Hair *et al.*, 2010). All standardized factor loadings were highly significant and ranged from .53 to .96 (see Table 1). Thus, all factor loadings were higher than the .50 cut-off value, those for the four cooperation dimensions considerably ($\geq .65$). The CR estimates for latent constructs ranged from .72 to .89 (see Table 2), thus all exceeding the threshold value of .70 and suggesting adequate reliability. Except for sanctions, all VE estimates in Table 2 achieved or exceeded the .50 threshold. The VE estimate for sanctions of .47 falls short of the conservative threshold of .50 despite it having achieved a respectable CR estimate of .72. All three indicators for the sanctions construct were retained, as dropping any indicator did not improve the VE

estimate. It is, however, not uncommon for acceptably reliable latent constructs to have VE estimates below .50 (Hair *et al.*, 2010), the high CR and low VE estimates for sanctions being just one instance of this. Overall, the evidence supports the convergent validity of the CFA model in general and the four-factor cooperation measurement model in particular.

Table 2 about here

Discriminant validity is established if the VE estimate for each construct is greater than the squared interconstruct correlations associated with that construct (Hair *et al.*, 2010). With the VE estimates presented along the diagonal of a matrix of interconstruct correlations as in Table 2, it is clear to see that each diagonal entry (VE estimate) is greater than the squared interconstruct correlations in the column or row in which it is found. The fact that each VE estimate is higher than the squared interconstruct correlations with which it is associated confirms the discriminant validity of the CFA model.

The pattern of correlations in Table 2, portraying positive and significant relationships among the latent constructs consistent with theoretical expectations, provides evidence of the nomological validity of the cooperation dimensions. As expected, except with compliance ($r = .32, p < .01$), the sanctions construct was not significantly related to any other construct. Also, consistent with expectations, ethnicity was significantly associated with compliance ($r = .21, p < .05$) and deference ($r = .19, p < .05$). Gender was not significantly related to any construct in the model. The only unexpected result was the lack of association between incentives and in-role behavior ($r = -.03, ns$), the implications of which are examined in the subsequent section on structural equation model. Overall, on a zero-order basis, the evidence supports the nomological validity of the four-factor cooperation model. Further support for

the nomological validity of the cooperation dimensions is examined below in the context of the structural model testing.

Figure 1 about here

Structural equation modeling

Having established that the four-factor cooperation model fits the data better, we then proceeded to test the structural model using maximum likelihood estimation. We also included controls for the effects of gender and ethnicity on all four cooperation dimensions. One advantage of this two-step SEM approach is that the CFA model fit then provides a basis for assessing the SEM model fit (Hair *et al.*, 2010). The full model fit the data reasonably well: $\chi^2(df = 272, N = 140) = 411.198$ and $\chi^2/df = 1.51$, $p < .001$, IFI = .91 and CFI = .91, RMSEA = .061 with a 90% confidence interval of (.048, .072). In this model, there was a significant, negative effect of gender on extra-role behavior ($\beta = -.21$, $p < .05$), but no significant effect for ethnicity. All predicted path coefficients were statistically significant and in the hypothesized direction except that for the sanctions→compliance relationship which was nonsignificant ($\beta = .18$, $p = .075$) and that for the incentives→in-role relationship, which was significant and negative ($\beta = -.41$, $p < .01$). The fact that (1) on a zero-order basis, no relationship existed between incentives and in-role behavior ($r = -.03$, *ns*) and (2) the regression coefficient for the effect of intrinsic job satisfaction on in-role behavior ($\beta = .70$, $p < .001$) was considerably higher than the corresponding zero-order correlation coefficient ($r = .36$, $p < .01$), indicated the presence of a classical suppression situation in the data (Paulhus *et al.*, 2004; Nickerson, 2008). To confirm this, we re-specified the structural model in line with the recommendations of previous research (e.g. Cheung and Lau, 2008; Shrout and Bolger, 2002). That research demonstrated that the same bootstrapping procedures used in testing mediation and moderation designs can also be used to test suppression situations.

In the re-specified structural model, the incentives construct was cast as an intervening variable in the structural relationship between intrinsic job satisfaction and in-role behavior. In line with the recommendations of previous research (Cheung and Lau, 2008), we used the bias-corrected and accelerated bootstrap (BC_a) procedure with 5000 resamples and maximum likelihood estimation in AMOS software to generate the 95% confidence interval estimates of the indirect effect of intrinsic job satisfaction on in-role behavior acting through incentives. Suppression is confirmed if a statistically significant estimate of the indirect effect is obtained and the 95% confidence interval for this estimate does not include zero (Cheung and Lau, 2008). The final model is shown in Figure 1. For visual simplicity, the error terms for factor loadings (e_1 to e_{24}) and disturbance terms (d_1 to d_5) for latent constructs, as well as all the objects, names and parameters associated with the two control variables (gender and ethnicity) are not displayed in Figure 1. However, the error/disturbance terms can easily be computed as 1 minus the squared multiple correlation. For example, $e_4 = 1 - 0.59 = 0.41$; and $d_1 = 1 - 0.30 = 0.70$.

The fit statistics for the model in Figure 1 suggested a good model fit: $\chi^2(df = 276, N = 140) = 417.754$ and $\chi^2/df = 1.51, p < .001$; IFI = .91 and CFI = .90; PNFI = .65 and PCFI = .77; RMSEA = .061 with a 90% confidence interval of (.049, .072), PCLOSE = .071. All coefficients with an absolute value of .20 or higher in Figure 1, including path coefficients, freely estimated factor loadings and correlation coefficients, were statistically significant at $p < .05$. For the two control variables (gender and ethnicity) included in the model, only the structural path from gender to extra-role behavior was significant. This effect was also negative ($\beta = -.20, p < .05$), suggesting that women were rated as engaging in less extra-role behavior than men. For the hypothesized relationships in the model, only the structural path from sanctions to compliance was nonsignificant ($\beta = .18, p = .081$). Hypothesis H_1 predicted that sanctions

would have a positive and significant influence on compliance behavior. Therefore, hypothesis H_1 was not supported.

The indirect effect of intrinsic job satisfaction on in-role behavior, acting through incentives was $(.548) \times (-.425) = -.233$, with a 95% confidence interval of $(-.569, -.079)$, $p < .01$. The fact that this confidence interval did not include zero confirmed the existence of a classical suppression situation (Cheung and Lau, 2008). In order to confirm that no other predictor (i.e. other than intrinsic job satisfaction and incentives) was involved in this suppression situation, we conducted additional analyses in which we tested a re-specified model with the same set of hypotheses but in this instance with incentives modeled as an intervening variable in the relationships of the other two correlated predictors (i.e. legitimacy and intrinsic job satisfaction) to in-role behavior. The results of those additional analyses confirmed a suppression situation involving intrinsic job satisfaction but not legitimacy. The substantive interpretation of these findings is quite interesting. First, the results indicate that, after clearing out criterion-irrelevant variance from intrinsic job satisfaction, incentives has a statistically significant and negative effect on in-role behavior ($\beta = -.43$, $p < .01$) (Tzelgov and Henik, 1991; Cheung and Lau, 2008). H_2 predicted that incentives would have a significant and positive effect on in-role behavior. Therefore, hypothesis H_2 was not supported. Second, the results show that, after clearing out criterion-irrelevant variance from incentives, intrinsic job satisfaction has a significant, positive effect on in-role behavior ($\beta = .72$, $p < .001$) (Tzelgov and Henik, 1991; Cheung and Lau, 2008). This result provides support for hypothesis H_3 , which predicted that intrinsic job satisfaction would have a significant and positive association with in-role behavior.

The results in Figure 1 also show that: intrinsic job satisfaction is positively and significantly related to extra-role behavior ($\beta = .63$, $p < .001$); and legitimacy is positively related to compliance ($\beta = .48$, $p <$

.001) and deference ($\beta = .61, p < .001$) behaviors. Hence, hypotheses H_4 , H_5 and H_6 were all supported. Overall, the results provide further support for the construct validity of the cooperation dimensions. The good fit of the four-factor cooperation model, VE estimates which are all higher than their associated squared interconstruct correlations (see Table 2), and parameter stability between the CFA and SEM models (allowing for expected insignificant factor loading fluctuations of $\leq |.05|$), all provide adequate support for the discriminant validity of the four-factor cooperation model (Hair *et al.*, 2010). The correlations among latent constructs in Table 2, the good fit of the structural model, and the fact that hypotheses linking the cooperation dimensions to heavily-researched instrumental and social identity predictors were generally supported, all suggest adequate nomological validity. These empirical findings, thus, support the value of conceptualizing cooperation as a four-dimensional construct.

Discussion

There has long been a recognized need for cooperation in temporary multi-organization (TMO) construction project settings, yet there is a paucity of research devoted to improving our understanding of the construct and how to foster it. The current study contributes to our understanding of cooperation by highlighting the potential value of adopting a multi-dimensional conceptualization of the construct that is rooted in principles of organizational behavior as outlined in the seminal work of Katz (1964; Katz and Khan, 1978). The CFA results show that the cooperation of individuals with their TMO project work groups can be understood in terms of four distinct, yet related performance dimensions: in-role, extra-role, compliance, and deference. This finding is consistent with and reinforces the findings of previous research by Tyler and Blader (2000) on the theoretical value of a four-dimensional conceptualization of cooperation. The current study makes a theoretical contribution to construction management research by confirming the factor structure of cooperation. Future research which builds on the strong theoretical

antecedents set out in the current study will extend the theoretical reach and substantive impact of the cooperation construct in construction.

The results of the current study support the four key hypotheses linking the two intrinsic job cognition variables examined in the current study to cooperation dimensions. First, the results show that intrinsic job satisfaction is significantly related to both in-role and extra-role behaviors. This finding corroborates the findings of previous research (e.g. Tyler and Blader, 2000; Tuuli and Rowlinson, 2009) and highlights the potential importance of paying close attention to the context and design of systems of work in TMO project setting. Second, the results show that legitimacy is significantly related to both compliance and deference behaviors. This finding is also consistent with the findings of previous research on the antecedents of rule-following in work organizations (e.g. Tyler and Blader, 2005).

The results of the current study do not find support the hypotheses connecting the two extrinsic cognition variables (incentives and sanctions) to cooperation. Specifically, there was no clear evidence of a significant relationship between sanctions and compliance. This finding is not consistent with the literature, which generally posits a positive relationship between the two variables (Thompson *et al.*, 1998; Kelman, 1958). Given that, on a zero-order basis, sanctions had a significant, positive association with compliance ($r = .32, p < .01$), a plausible explanation for the marginally nonsignificant regression weight for this relationship ($\beta = .18, p = .081$) may be a lack of statistical power. However, a more likely explanation may be that, after partialling out the variance shared with other predictors in the model, there was not enough unique variance left in the sanctions variable to significantly explain compliance behavior. This explanation is in accord with the findings of previous research. For example, in a study of the comparative effectiveness of intrinsic and extrinsic antecedents of rule-following in work settings, Tyler and Blader (2005) found that, in contrast to the intrinsic variables in their study (legitimacy and

moral value congruence), the extrinsic variables (which included judgments about sanctions and incentives consequent upon detected behavior) had no significant effect on either compliance behavior or deference behavior.

The result for incentives in the current study, although disconfirming our hypothesis, is quite interesting. The finding of a classical suppression situation makes an interpretation of the significant, negative effect of incentives on in-role behavior somewhat problematic. By conventional wisdom, this would be considered as an artifact of the regression process and therefore of no explanatory meaning beyond the near-zero bivariate correlation (i.e. $r = -.03$, *ns*; Courville and Thompson, 2001; Cramer, 2003). However, recent research shows that suppression situations are more frequent and replicable processes than previously thought and can be of theoretical importance (e.g. Paulhus *et al.*, 2004, Zhao *et al.*, 2010). The significant, negative effect of incentives on in-role behavior in the current study may be of theoretical import for two reasons. First, because incentives was included in the current study as a predictor of theoretical interest (i.e. based on evidence from previous research), it is not a 'classic suppressor' *per se* (Tzelgov and Henik, 1991). Therefore the suppression situation involving incentives and intrinsic job satisfaction can best be described as mutual suppression, with each variable clearing out criterion-irrelevant variance from the other (Tzelgov and Henik, 1991; Paulhus *et al.*, 2004). Second, and following on from the first point, the lack of a zero-order association between incentives and in-role behavior in the current study can be viewed as simply a sampling variation in the correlation between the two variables (Paulhus *et al.*, 2004; cf. Shrout and Bolger, 2002). Therefore, the significant, negative effect of incentives on in-role behavior in the current study may be one instance of the well-publicized view that the use of extrinsic rewards (incentives and sanctions) in work settings can undermine the very cooperative behaviors that management hopes to promote with their introduction (e.g. Kohn, 1993). This result implies that, when the criterion-irrelevant variance it shares with intrinsic job

satisfaction is suppressed, incentives may in fact have a negative relationship with in-role behavior. However, the relationship between extrinsic rewards, intrinsic job satisfaction and cooperative behavior is not that straightforward. Extrinsic rewards are effective only when they are used as reinforcement (Cameron and Pierce, 2006) and when that use does not lead to a reduction in the psychological empowerment ('personal causality') of the individuals concerned (Ryan and Deci, 2000)., Further research is therefore needed to substantiate the results for the extrinsic variables (sanctions and incentives) in the current study.

Overall, however, the evidence seems to suggest that, when considered together with intrinsic variables, extrinsic rewards have an imprecise and weaker influence on cooperative behavior. This finding is consistent with the findings of previous research (cf. Blader and Tyler, 2009; Tyler and Blader, 2005; Ashley and Workman, 1986) and lends support to previous construction management research (e.g. Phua, 2004; Tuuli and Rowlinson, 2009) in highlighting a need to move beyond command-and-control mechanisms in efforts to encourage cooperation in construction project settings. To our knowledge, however, the present study is the first construction management study to simultaneously model formal/contractual and socio-psychological antecedents of cooperation.

Practical implications

Between them, intrinsic job satisfaction and legitimacy predicted all four dimensions of cooperative behavior in the current study. These findings have important practical implications. They suggest that by shaping the context in which people work in ways that give them intrinsic satisfaction and by developing organizational norms that are perceived by those individuals to be legitimate, project managers can tap into the full spectrum of TMO work group members' cooperative behaviors. Achieving this requires a focus on both the design of work itself and of the working environment (systems of work): the former, in

ways that make it, for example, as challenging (Cameron and Pierce, 2006) and psychologically empowering (Tuuli and Rowlinson, 2009; Ryan and Deci, 2000) as possible; and the latter, in ways that, for example, ensure that individuals have participative safety and career development opportunities, and experience procedural fairness (Shalley *et al.*, 2004; Tyler, 2002). Furthermore, given the imprecise and sometimes counterproductive effects of extrinsic rewards, as observed in the current study, intrinsic job cognition variables such as intrinsic satisfaction and legitimacy may constitute more effective and efficient strategies for improving the cooperation of individuals with their TMO project work groups.

Another practical application of the findings of the current study is in project performance evaluation and monitoring. Performance evaluation and monitoring systems are ubiquitous in construction project settings because of a need to demonstrate continuous performance improvement. This is typically undertaken through the administration, on a monthly basis, of (partnering) performance monitoring questionnaires with Likert scale response formats to key TMO project actors. The key performance indicators (KPIs) used typically comprise outcome criteria such as (likely) outturn time, cost, quality, and safety performance, and relationship measures such as trust, respect, quality of relationships, the number and magnitude of claims and disputes (Yeung *et al.*, 2007). The in-role, extra-role, deference, and compliance behavior subscales validated in the current (see Appendix) can be merged into the (partnering) performance monitoring questionnaire and administered on a monthly basis to the key TMO project actors in a construction project. The panel data can then be pooled and analyzed to assess the level of individuals' cooperation with the TMO project work group in a given month and in relation to previous months (e.g. using simple statistics such as subscale means, and subject to evidence of satisfactory rating consistency and consensus). This way, the level of cooperation on a construction project can be monitored on a consistent basis and strategies, such as those considered in the current study, can then be implemented if a low level of or significant reduction in cooperation is observed. The

inclusion of such scales, which measure performance as *the* behavior (not its antecedents or consequences) in performance monitoring questionnaires will answer the call for more direct and balanced *human* performance criteria, which temporally precede and are necessary for achieving the more demanding, 'harder' outturn project performance criteria (Dainty *et al.*, 2003; Anvuur and Kumaraswamy, 2008).

Limitations and directions for future research

The research reported in this paper, like any other research, is not without its limitations. First, the survey was undertaken in Hong Kong and the sample was predominantly Chinese (72%). Generally, Chinese are considered to respect and preserve social hierarchies and to prefer certainty and order (Markus and Kitayama, 1991). Given the increasing recognition of the cultural relativity of management theories (cf. Hofstede, 1993; Pfeffer, 1997), the positive support for the construct validity of the four-dimensional conceptualization of cooperation, with strong theoretical antecedents in the individualistic cultural context of the US, in a sample of predominantly Chinese professional managers may seem counter-intuitive. One plausible explanation for the positive support for the four cooperation dimensions in the current study may lie in the nature of construction contracting. Specifically, the TMO nature of construction projects, involving numerous professional specialists, many of them self-employed (one-third of the sample in the current study; cf. Koskela, 2003), may reduce the scope for the dominant Chinese norms and values to manifest themselves. Yet, our finding of positive support for the cooperation dimensions are consistent with the findings of previous research in other Chinese (e.g. Tuuli and Rowlinson, 2009; Hui *et al.*, 1999) and Western cultural contexts (e.g. Tyler and Blader, 2000, 2005; Williams and Anderson, 1991). This suggests that in-role, extra-role, compliance, and deference are robust behavior dimensions across cultural contexts. Further, we included statistical controls for the effects of ethnicity (dummy-coded as: 0 = non-Chinese, 1 = Chinese) on in-role, extra-role, compliance,

and deference behaviors in the structural model estimated but in no case did ethnicity have a significant effect. However, further tests of the four-dimensional cooperation model developed in the current study in different contexts are recommended to provide additional evidence of its construct validity and generalizability.

Second, the sample was predominantly male (96%), which may raise questions about the generalizability of the study findings. Although, as noted earlier, this proportion of males in a sample of built environment professional managers is not unusual, we included statistical controls for the effects of gender (dummy-coded as: 0 = male, 1 = female) on in-role, extra-role, compliance, and deference behaviors. We found a significant effect only on extra-role behavior. This effect of gender is negative ($\beta = -.20, p < .05$) and contrasts with the lack of significant association, on a zero-order basis, with any of the variables in the current study (with extra-role behavior, $r = -.13, ns$). Thus, there is evidence of the presence of a suppression situation. As gender was not included as a variable of theoretical interest in the current study, there can be no legitimate claim to any explanatory benefit of the suppression situation involving gender (Paulhus *et al.*, 2004; Shrout and Bolger, 2002). However, it is perhaps noteworthy that a suppression situation involving gender was also indicated in the study by Tuuli and Rowlinson (2009); although the effect for gender in that study was in the opposite direction to that in the current study. Future research might usefully shed light on the precise relationship, if any, between gender and cooperation in general and extra-role behavior in particular.

Third, the findings of this study seemingly suggest that social identity variables may have primacy over instrumental variables as predictors of individuals' cooperation with their TMO construction project work groups. However, given the presence in the current study of a suppression situation involving incentives and the lack of a significant effect for sanctions, despite a statistically significant zero-order

correlation with compliance behavior ($r = .32, p < .01$), further research is required to confirm this finding. Future research could also include other key instrumental (e.g. extrinsic job satisfaction, continuance commitment) and social identity (e.g. organizational identification, membership esteem) variables, which are reported in the extant literature to be antecedents of cooperation. Direct and conceptual replications of the current study using larger samples are also encouraged, although the issue of power in structural equation modeling is a lot more complicated than implied by this suggestion (cf. Hair *et al.*, 2010).

Fourth, all the endogenous and exogenous variables were measured using self-report data obtained from the same source, at the same time. This limitation points to a potential concern about effect size inflation due to common method bias. While the design of the current study followed all the procedural remedies for controlling common method bias, including disconfirming evidence from tests of its very existence using Strahan and Gerbasi's (1972) 10-item short version of the Crowne and Marlowe (1960) 33-item social desirability scale, future research could use more objective data (e.g. supervisor ratings) and/or more complex statistical techniques capable of modeling the effects of common method bias (e.g. multitrait-multimethod matrix; cf. Chang *et al.*, 2010). Finally, besides the refinements identified above, future research could usefully also include data at the work group level (e.g. group climate, group efficacy data). Such research (e.g. Tuuli and Rowlinson, 2009) that begins to disentangle the individual and group level antecedents of cooperation as well as model their cross-level interactional effects will be a useful extension of the current study.

Conclusions

The theoretical dimensionality and antecedents of the cooperation of an individual with the cross-functional TMO project work group are investigated using a sample of 140 built environment

professional managers in Hong Kong, and employing CFA and SEM techniques. The findings confirm the construct validity of the compliance, in-role, deference, and extra-role cooperative behavior dimensions. Providing further support for the multi-dimensional conceptualization of cooperation, the results of the structural equation modeling show that intrinsic job satisfaction predicts both in-role and extra-role behaviors. Legitimacy predicts both compliance and deference behaviors. Sanctions do not have a statistically significant effect on compliance behavior. With respect to incentives, the preliminary finding is that it may have a negative influence on in-role behavior, after clearing out the criterion-irrelevant variance it shares with intrinsic job satisfaction.

The current study makes three important contributions to knowledge. First, by demonstrating the potential value of the four-dimensional conceptualization of cooperation, the current study provides a sound theoretical basis for future construction management research to expand the criterion domain of individuals' cooperation to encompass all four cooperative behavior dimensions of in-role, extra-role, compliance, and deference. Second, the scale items for the cooperation dimensions validated in the current study could be incorporated into project performance evaluation/monitoring questionnaires, thereby answering recent calls for more direct (behavioral) and timely managerial performance criteria to underpin project control decision-making. Third, as the first construction management study to empirically investigate the comparative effectiveness of extrinsic and intrinsic predictors of cooperative behavior, the findings of the current study provide a clear message to project managers and policy makers: in order to improve the level of cooperation in construction projects effectively and efficiently, focus must be placed more on stimulating project actors' internal motivations (enhancing 'personal causality') than on the provision of behavior-modifying extrinsic rewards (incentives and sanctions).

Given specific limitations imposed on this study by virtue of its context and the sample analyzed, further corroboration of the findings reported in this paper is needed. Future research based on or using the cooperation dimensions and measures validated in the current study is also recommended to extend and complement the findings reported here as well as from existing general research on the concept of cooperation in construction.

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Appendix

Construct	Item measures
Dependent variables (cooperation dimensions): Scale anchors (1 = <i>never</i> to 5 = <i>very often</i>)	
In-role	How often have you: <ol style="list-style-type: none"> 1. fulfilled the responsibilities specified in your job description? 2. performed the tasks that are expected as part of your job? 3. met the performance expectations for your job role? 4. adequately completed your required work tasks?
Extra-role	How often have you: <ol style="list-style-type: none"> 5. volunteered to do things that are not required in order to help your work group? 6. volunteered to help orient new work group members? 7. made innovative suggestions to help improve your work setting?
Compliance	How often have you: <ol style="list-style-type: none"> 8. complied with work related rules and regulations? 9. followed the policies established by your supervisor? 10. carefully tried to carry out the instructions of your supervisor?
Deference	How often have you: <ol style="list-style-type: none"> 11. willingly followed your project organization's policies? 12. done what your supervisor expected of you, even when you did not think it was important? 13. willingly accepted the decisions made by your supervisor?
Independent variables: Scale anchors (1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>)	
Incentives	<ol style="list-style-type: none"> 14. If I perform well for my work group, I'm usually rewarded; 15. I see a clear linkage between my performance and the rewards I receive
Sanctions	<ol style="list-style-type: none"> 16. My supervisor pays attention to whether or not I follow work rules; 17. If I were caught breaking a work rule, it would hurt my rewards and benefits; 18. If I were caught breaking a work rule, my supervisor would be upset
Intrinsic job satisfaction	<ol style="list-style-type: none"> 19. My job is worthwhile 20. My job is enjoyable 21. My job is better than most
Legitimacy	<ol style="list-style-type: none"> 22. Respect for authority is an important value that employees should have; 23. Work groups are effective when people follow leaders' directives 24. The work group is better off if workers willingly follow the rules

Notes:

Instructions preceding these measures guided respondents to answer the questions with regard to their proximal cross-functional work group in the referent project and their role within that work group. Item numbering reflects that used in Table 1 and Figure 1.

Table 1. Standardised regression weights and squared multiple correlations (SMCs) for the four-factor

CFA model

Item	Standardized								SMC
	IRB	ERB	COB	DFB	IC	SA	IJS	LE	
1	.83								0.69
2	.82								0.67
3	.84								0.71
4	.79 ^a								0.62
5		.81							0.65
6		.65							0.42
7		.69 ^a							0.47
8			.81						0.66
9			.96						0.92
10			.77 ^a						0.59
11				.78					0.61
12				.78					0.61
13				.79 ^a					0.62
14					.91				0.83
15					.79 ^a				0.62
16						.59			0.35
17						.75 ^a			0.56
18						.70			0.49
19							.74		0.54
20							.71 ^a		0.50
21							.66		0.43
22								.53 ^a	0.29
23								.93	0.87
24								.63	0.40

Note: All factor loadings and SMCs are from analyses that included gender and ethnicity as dummy-coded variables (each specified with a value of 1 and an error variance of 0). All freely estimated factor loadings are significant at $p < .001$.
^a p -value not estimated as factor loading was fixed to 1.00 to set a scale. IRB, In-Role Behavior; ERB, Extra-Role Behavior; COB, Compliance Behavior; DFB, Deference Behavior; IC, Incentives; SA, Sanctions; IJS, Intrinsic Job Satisfaction; LE, Legitimacy; SE, Standard Error.

Table 2. Construct reliabilities, construct correlations, variance extracted estimates and squared interconstruct correlations

Construct	CR	1	2	3	4	5	6	7	8	9	10
1. Compliance	.89	.72									
2. In-role	.89	.41***	.67								
3. Extra-role	.76	.37***	.60***	.52							
4. Deference	.83	.67***	.31**	.35**	.61						
5. Incentives	.84	.32**	-.03	.29*	.34**	.73					
6. Sanctions	.72	.32**	.04	.20	.18	.20	.47				
7. Intrinsic satisfaction	.75	.24*	.36**	.47***	.26*	.51***	.07	.50			
8. Legitimacy	.75	.35**	.23*	.34**	.47***	.35**	.20	.43**	.51		
9. Gender	1.00	.05	-.04	-.13	.05	-.01	-.02	.09	-.12	1.00	
10. Ethnicity	1.00	.21*	.00	-.03	.19*	.14	.17	-.03	.06	.03	1.00

Notes: $N = 140$. CR, Construct Reliability. Entries below the diagonal are correlations among constructs. Diagonal entries (in bold text) are variance extracted (VE) estimates. Entries above the diagonal are squared interconstruct correlations. Gender and ethnicity were dummy-coded as follows: gender, 0 = male and 1 = female; ethnicity, 0 = non-Chinese and 1 = Chinese.

* $p < .05$.

** $p < .01$.

*** $p < .001$

Figure Captions

Figure 1. Structural equation modeling results

Note: $N = 140$. e = error term; d = disturbance term. $\chi^2 (df = 276) = 417.754$ and $\chi^2/df = 1.514$, $p = .000$;

IFI = .906; CFI = .903; PNFI = .650; PCFI = .767; RMSEA = .061, 90%CFI (.049, .072), pclose = .071. All

coefficients $\geq |.20|$ are statistically significant at $p < .05$.

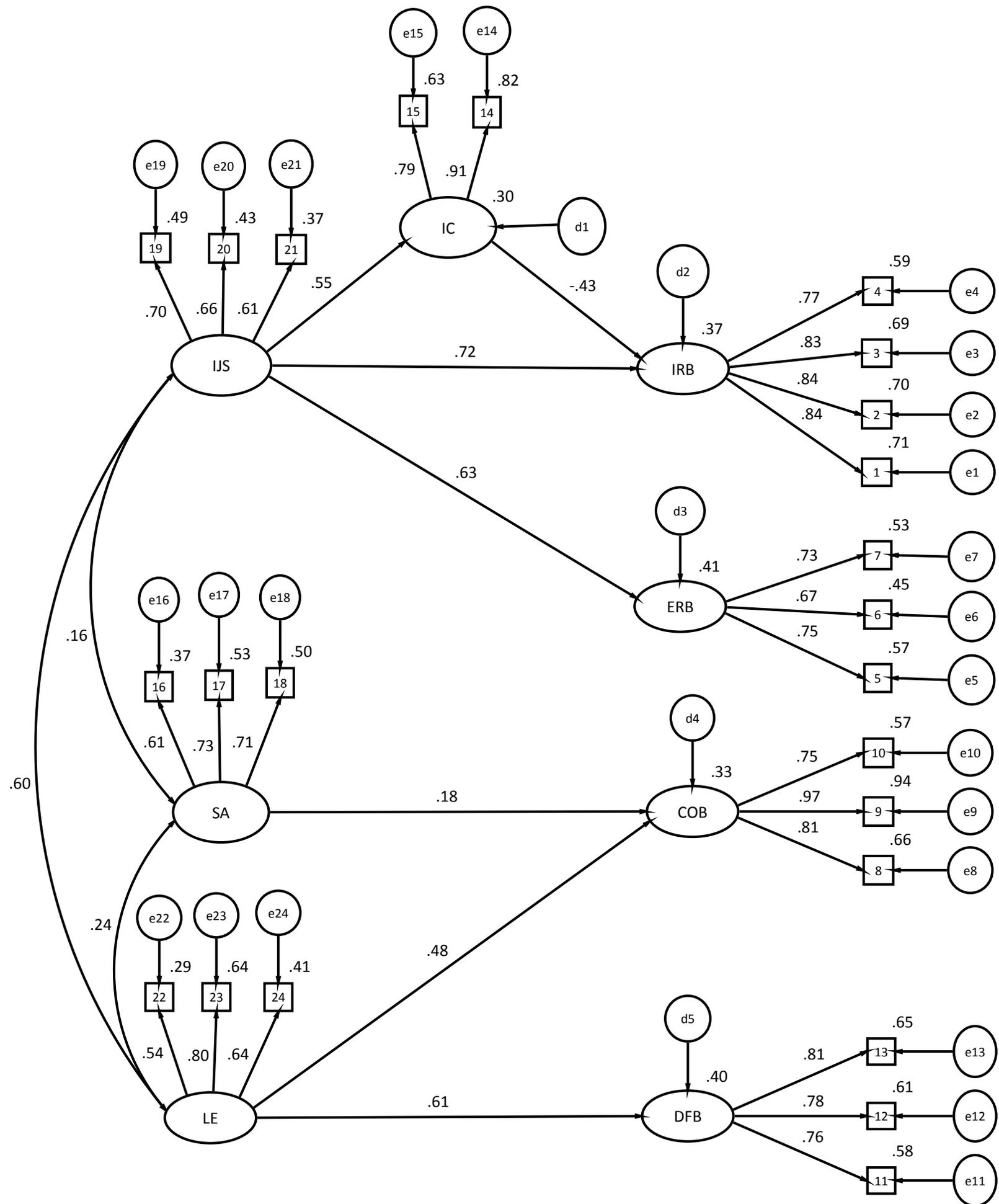


Fig. 1. Structural equation modeling results

Note: N = 140. e = error term; d = disturbance term. X^2 (df = 276) = 417.754 and $X^2/df = 1.514$, $p = .000$; IFI = .906; CFI = .903; PNFI = .650; PCFI = .767; RMSEA = .061, 90%CFI (.049, .072), pclose = .071. All coefficients $\geq |.20|$ are statistically significant at $p < .05$.