Cooperation in Engineering, Procurement, and Construction (EPC) Project Team: The Impact of Ethical Climate among General Contractor

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Abstract

For an engineering, procurement and construction (EPC) project team, cooperation between different functional departments has been concerned as the core factor which lead to success among all phase. However, researches about the role of general contractor in cooperative behaviors are still limited. This study aims to explore the relationship between ethical climate in EPC project's general contractor and cooperation within its different branches. Ethical climate questionnaire (ECQ) is used to identify the atmosphere in general contractor. Data are collected from 192 respondents which have EPC contracting experience, and analyzed by partial-least squares structural equation modeling (PLS-SEM). We find out that some dimensions such as rules and code, efficiency have a positive effect on cooperation. The results show that the working environment which rules can be followed willingly and the work can be done efficiently tend to have more cooperative behaviors. Despite the linkage between ethical climate and cooperation, it also suggests in this work that the ways to improve cooperation, such as holding ethics training workshops and heavier punishment on unethical behavior or individuals. Also, we broaden the use of ethics related theory in construction project and industry.

Introduction

Currently, the Engineering, Procurement and Construction (EPC) general contracting mode is one of the mainstream modes in the international project contract. Compared with traditional contract, the general contractor of EPC project needs to take more risks because of the EPC projects have the characteristics of large scale, complex construction process, and multi-participations (Jaafari, 2001). Many problems exist in the operation level, such as hostile relationship, quality problem, schedule delay problem, and information distortion problem (Eriksson, 2010). Members in this kind of group need to span boundary to collaborate with each to deal with the problems, and also cooperation between multi-participations has a positively and significantly effect on EPC project performance (Hong Ke, 2015).

Numerous methods have been raised to deal the cooperation issue within traditional areas, and these methods can be divided into two mainstreams: contract governance and relational governance. Contracting is chosen as a governance mechanism in a formal way, because various project processes are generally organized into distinct firms which are related

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to each other through transactions governed by contractual relation (Winch, 2001). Beside the primary means, the implications of relational governance which often emphasizes trust among all the participations have attracted much attention. Relational governance mechanisms (such as trust) are regarded as a way to enhance transaction-specific investments associated with less monitoring and bargaining (Barney, 1994). As the satisfaction transact from each parties, relational norms of flexibility, participation, and solidarity are established (Griffith, 2005; Tangpong, 2010) maintaining the relationship and curtailing behavior promoting the goals of the parties (Zhang, 2009). But researchers indicate that contractual governance's effect on cooperative behavior is not significant in EPC project (Hong Ke, 2015). Also the different dimension of trust has different effect on cooperative behavior (Hong Ke, 2015). Thus further research is needed to discover the potential reason which related to the cooperative behaviors in EPC project team.

One possible factor that has not been investigated fully is the ethical climate within organization. Previous researches have shown that ethical climate's varying dimensions may be associated with different types of ethical behavior (Cullen, 1989; Shepard, 1994), and it describe the shared cognitions of code, value and behavior within an organization (Ken Rasmussen, 2003). Also shared cognitions about the work environment and its expected behavior can promote effective teamwork and cooperation (DeChurch, 2010; Mohammed, 2010).

But to the best of author's knowledge, there is no empirical study on the linkage between ethical climate and cooperative behavior in EPC project team. To fill this gap, this study first identify the ethical climate of each general contractor by using Ethical Climate Questionnaire (ECQ). Secondly we investigate the relationship between ethical climate and cooperative behaviors, and give strong evidence linking three dimensions of ethical climate to cooperative behaviors. Finally, we propose some recommendations to enhance cooperation among all the parties.

Literature Review
Ethical climate

Although there are many identifications of "climate" which could be relevant, the most suitable theoretical concept for this study is "ethical climate" first proposed by Victor and Cullen (1988), their ethical climate dimensions have been proved to capture the organizational climate's characteristics (Gray, 2001; Smith, 2001).In this study, the dimensions are: *self-interest*, *instrumental* (related to the company profit dimension), *team spirit* (also referred to as caring, encompassing friendship as well), *rules and code* (encompassing law and code as well as rules and procedures), *personal morality*, *social responsibility* and *efficiency* (Vaicys, 1996).

Cooperative behaviors

Cooperation is conceptualized as individuals' performance behaviors that advance the goals of their proximal workgroups, and has four dimensions in terms of whether and to what extent role incumbents (Tyler, 2001): creditably perform their work roles (*in-role behavior*);

help colleagues with their work-related problems undertake extra task activities (*extra-role behavior*); loyalty to work-related rules and procedures (*compliance behavior*); and defer to relevant authorities or best practice standards of appropriate conduct where rules or norms are nonexistent or vague (*deference behavior*). The construct validity and substantive utility of this four-dimensional conceptualization of cooperation in construction has been established in previous studies (Anvuur, 2012; Anvuur, 2012; Anvuur, 2016).

Effects of ethical climate on cooperative behaviors

    Because very little research has been done which directly related to our study, considering collaboration among different departments more or less reflect team members ethical intension, we believe that at least four of the seven ethical climate dimensions would have influence on cooperative behaviors.

    Rule and Code & Social Responsibility: In contrast, members make decisions adhere strictly to organizational rules and policies, as well as laws and professional codes and regulations. In such a climate, most members exhibit a strong desire to follow these rules and policies, as they realize that such behavior is the key to obtain success. However the research on the influence of Rules and Code organizations has been mixed. One might expect individuals in Rules organizations to be more inclined to engage in ethical behavior in their attempts to avoid any possible perception that a policy has been violated (Attanassiades, 1973). Banerjee et al. (1998) found a positive influence of Rules on ethical intention, and researchers observed that Rules had a dampening effect on lying and disobedience (Wimbush, 1997; Wimbush, 1997). Just like *Rule & Code*, *Social Responsibility* should also promote cooperative behaviors. Organizations which are dominated by this environment focus on serving the public interest and increase welfare of society, and members are likely to believe their colleagues share the same vision. Also employees with a shared vision and same goals could help them collaborate with each other to reach the purpose (Wong, 2005). From these evidences, we hypothesize that:

    H1: *Rule & Code (RC)* climate will significantly and positively influence EPC project members' Cooperative Behavior (CB).

    H2: *Social Responsibility (SR)* climate will significantly and positively influence EPC project members' Cooperative Behavior (CB).

    Self-Interest & Instrumental: As members span boundary to collaborate with each other, they look out for their own benefits instead of taking additional people and groups' interests into account. In organizations in which employees are expected to act in individually self-serving ways (that is, to look out only for themselves), an employee in a self-serving climate will likely act unethically (Flannery, 2000) so as to protect his or her own interests, and Ruppel and Harrington (2000) found that a *self-interest* climate had a negative influence on open communications. Also, previous empirical studies have shown that Instrumental climate combine egoistic/individual climate and egoistic/local climate together (Martin, 2006), which means the dimension called *self-interest* and company profit conflate together. In such

organizational contexts, team members may be unwilling to assist each other or openly share information (Zhang, 2011), or ethical intension and behaviors (Flannery, 2000). Although the effect of Instrumental climate on cooperative behaviors still less clear, we believe that these two dimensions have the same impact on collaboration. From these evidence, we hypothesize that:

      H3: *Self Interest (SI)* climate will significantly and negatively influence EPC project members' Cooperative Behavior (CB).

      H4: *Instrumental (IM)* climate will significantly and negatively influence EPC project members' Cooperative Behavior (CB).

Research method

      The ethical climate dimensions of EPC project team general contractor were measured with 28 items, each scored on a 7-point likert scale (1= strongly disagree to 7 = strongly agree). *Team Spirit (TS)* climate indicate that team members joint together for decision making or problem solving, example is "The most important concern is the good of all the people in the project team". *Rule & Code (RC)* climate reflects procedures and regulation whether followed or not, example is "The first consideration is whether a decision violates any law". *Social Responsibility (SR)* reflects the common goal which concern public's interest, example is "It is expected that you will always do what is right for the client and public". *Efficiency (EF)* climate in a workgroup context implies individuals' contributions to the workgroup performance by their efficient work, example is "The major responsibility for people in this project team is to consider efficiency first". *Self-Interest (SI)* climate means team work environment is dominated by egoistic phenomena, example is "In this project team, people are mostly out for themselves". *Personal Morality (PM)* climate refers to those team members should judge right or wrong by their own ethics, example is "In this project team, people are expected to follow their own personal and moral beliefs". *Instrumental (IM)* climate means everyone in this team should do their best to benefit the team, example is "People are expected to do anything to further the project team's interests". Adapted to our study, all of the word "organization" have been changed into "EPC project team".

      The four dimensions (*in-role, extrarole, compliance,* and *deference*) of individuals' Cooperative Behaviors (CB) with their workgroups are measured by 14 items which based on Anvuur and Kumaraswamy (2012) and are scored on a 7-point likert scale (1 = never to 7 = very often). *In-role* behavior is measured using four items which describes members of team follow their job duty, example is "How often have you fulfilled the responsibilities specified in your job description?" *Extrarole* behavior, which means whether employees are willing to help their colleagues with their work-related problems or not, is assessed with four items, example is "How often have you volunteered to do things that are not required in order to help your workgroup?" *Compliance* behavior indicate that workers loyalty to work-related rules and procedures, which is measured with three items, example is "How often have you complied with work-related rules and regulations?" *Deference* behavior refer to follow relevant authorities or best practice standards despite rules or norms are not very clear, is

assessed with three items, example is "How often have you willingly followed your project team's policies?"

Data analysis:

The sample consisted of 192 individuals who were team members in which have EPC project experience. These individuals included design (39.18%), procurement (6.19%), construction (24.74%), supervision (7.22%) and other (22.68%) department of EPC project general contractor. Table 1 shows some detailed messages of our respondents.

The respondents were asked to answer the questions in the questionnaire within the context of their EPC project team (the project in which the members were employed and latest employed).We utilized the Partial Least Squares (PLS) technique to analyze the data.

Table 1 Sample profile

| Respondent type	%
Male	58.76
Female	41.24
Working experience for EPC (year)	%
0~1	19.59
1~3	46.39
4~6	13.4
7~9	10.31
10~12	6.19
13~more	4.12

The statistically significant path coefficients are 0.331 for *Rule & Code (RC)*, 0.245 for *Efficiency (EF)* and 0.270 for *Instrumental (IM)*，which show significant impact on cooperative behaviors. While the other four dimensions, *Social Responsibility (SR), Self Interest (SI), Team Spirits (TS), Personal Morality (PM)*, show no significant effect. Construct reliability and square root of AVEs has been proved in previous research (Smith, 2009). Figure 1 shows the effects for each hypothesized path, and each statistically significant path coefficients are showed on it.

Result and Discussion

The statistically significant path coefficients are 0.331 for *Rule & Code (RC)*, 0.245 for *Efficiency (EF)* and 0.270 for *Instrumental (IM)*. These results indicate that members who perceived themselves involved in a project team dominated by RC, EF and IM climate tend to collaborate with each other more willingly, while other environment seems not associated with CB.

The finding that those who perceive their work environment to be dominated by *Rules & Codes (RC)* tend to collaborate with each other consistent with the majority of previous studies relating this dimension of ethical climate to ethical behaviors (Wimbush, 1997; Wimbush, 1997).To our surprise, the *Social Responsibility (SR)* climate is not associated (at a

statistically significant level) with Cooperative Behaviors (CB). Considering (Wong, 2005) study has different background (partners vs. team members) from this paper, we believe that there may exist some type of mediating or moderating influence that we failed to detect.
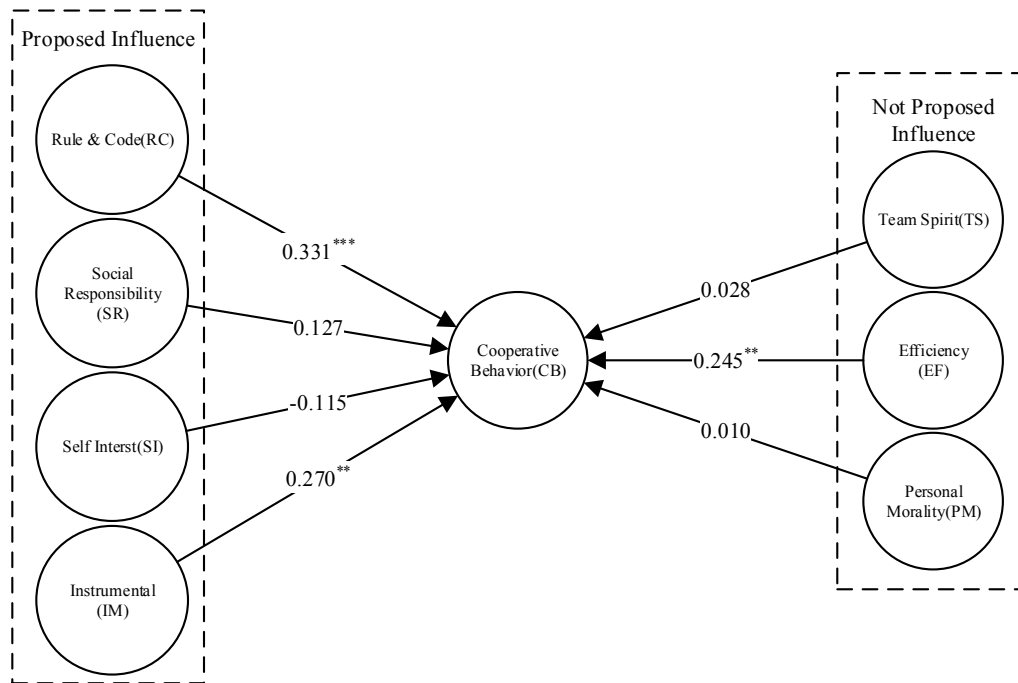
Figure 1. Structural model results [note: ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$]

We found no statistical evidence relate *Self Interest (SI)* climate to Cooperative Behaviors (CB). In previous research, *Self Interest (SI)* climate has been proved to influence several unethical behaviors (Flannery, 2000) and may decrease some type of collaborative behaviors (Ruppel, 2000). Different background may be one of the possible reasons result in this situation. But another dimension, *Instrumental (IM)* climate which combine egoistic/individual climate and egoistic/local climate, has been proved to be significantly and positively influence members' Cooperative Behaviors (CB). Although in previous research, the relationship between *Instrumental (IM)* environment and Cooperative Behavior (CB) are less clear. In this study, we find out that if the project team environment is associated with *Instrumental (IM)* climate, members are willing to span their boundaries to collaborate with each other.

Additionally, we find out that members work in a project team which environment is dominated by *Efficiency (EF)* climate are willing to collaborate with each other. But in previous research, efficiency climate shows a weak positively influence on unethical behaviors (Fritzsche, 2000), just in an inverse way from the *Team Spirit (TS)* climate, so we didn't take these two dimensions into account. Considering the sample and the background, future research need to focus on this dimension. At last, there is no evidence show that the rest dimensions of EPC project teams' ethical climate have any relationship with Cooperative Behaviors (CB) in our study.

Limitation

We wish to note a few limitations that may impact the quality of our results. First, the sample are collected from EPC project team or once have EPC experience only in china, for the ability of our team we cannot get enough range of data to test. And this may explain some of our unexpected findings.

Second, the amount of variance explained in cooperative behavior was somewhat modest. Although the statistical significance of the path coefficients indicate an influence of three dimensions of ethical climate, it is obvious that other factors also play an important role. Just as we concluded in literature review, some of the dimensions still need to be further tested.

Contribution

The result we obtained in this paper provide some contribution for our further research. First, we find out empirical evidence to strongly support some dimensions of ethical climate have impact on cooperative behaviors among EPC project team. And this can lead us to further investigate the effect of ethical climate in construction project or industry.

Second, as noted in the limitation part, some of the dimensions which has been proved to influence several unethical behaviors in previous researches, show weak statistical linkage with cooperative behavior, such as Self Interest (SI). In case to understand the mechanism, we may need further research.

Finally, we broaden the implication of ethics in EPC project team. As we know, ethical problems exist in construction industry for a long time, but the solutions remain unclear. In this paper, we attempt to get some empirical evidence to investigate the use of ethical climate in EPC project team, and obtain some results.

Conclusion

This paper use 28-items Ethical Climate Questionnaire (ECQ) to identify the ethical climate type of EPC project team, and found relationship between ethical climate and cooperative behaviors. Our work give strong evidence to support the linkage between three dimensions of EPC project team's ethical climate and members' cooperative behaviors. Since cooperation between multi-participations among EPC project general contractor has a positive significant effect on the EPC project performance (Hong Ke, 2015), we hope our investigation can broaden the understanding of ethical climate in EPC project management.

For each dimension which has been proved to significantly influence members' cooperative behaviors, measures should be taken into account to promote this situation. For example, since we know from this study that environment dominated by *Rule & Code (RC)* climate can increase the collaboration, project managers could hold ethics training workshops and punish the unethical behavior or individuals heavily.

In this study, the sample are not average for each departments, and we only collect data from Chinese EPC project team. Future researches can involve more sample from other country. Also some of the statistical results need further theoretical investigation. Knowing the importance of cooperation in EPC project team, we hope our study could make a small improvement in project management, for both the managers and the researchers.

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