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Investigating the Impact of Institutional Pressures on Organizational Citizenship Behaviors for the Environment: Evidence from Megaprojects

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Abstract

A brisk building boom of megaprojects leads to a wide range of environmental problems, particularly in developing countries such as China. To prevent environmental problems effectively, megaprojects require proactive environmental initiatives that are based on individual, voluntary, and discretionary behaviors—also known as organizational citizenship behaviors for the environment (OCBEs). OCBEs (e.g., sharing knowledge to prevent pollution and making suggestions to minimize waste) play an important role in improving megaproject environmental performance. However, this line of research is still in its infancy and the institutional-psychological mechanism leading megaproject practitioners to engage in OCBEs is largely unexplored. To fill this gap, this paper presents an individual-level analysis that investigates how institutional pressures impact project practitioners' OCBEs according to

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the survey data collected from China’s megaprojects. The results obtained by partial least squares analysis indicate that both mimetic and normative pressures have significant impacts on OCBEs; and such relationships are partially mediated by organizational support. Nevertheless, this paper did not find the evidence for a significant impact from coercive pressures. These findings provide a new insight into making use of institutional forces to stimulate the emergence of OCBEs, thereby improving the environmental performance in megaprojects.

Keywords*:* Megaprojects; Institutional pressures; Organizational citizenship behaviors for the environment

Introduction

Megaprojects are temporary endeavors with large investment commitments and vast complexities (Brookes and Locatelli 2015; Wang et al. 2017a). In the construction industry, megaprojects refer to large-scale infrastructure projects that provide public services for the social production, economic development, and people's life, such as long-span bridges, high speed railways, urban metro systems, integrated transport hubs, and energy source bases (Zeng et al. 2015). Over the course of the 21st century, it is notable that the world population is expected to rise by 50% and reach around 11 billion by 2100 (Roser and Ortiz-Ospina 2018). Accompanying this growth will be a sharp increase in demand for megaprojects across a wide range of sectors, such as transportation, mining, water, energy, supply chains, healthcare, and urban regeneration (Flyvbjerg 2014; Hu et al. 2013; Locatelli et al. 2017a; Almohsen and Ruwanpura 2016).

Megaprojects are typically commissioned by the government and characterized by "*enormous resource consumptions and significant environmental impacts*" (Luo et al. 2017; Van Marrewijk et al. 2008; Wang et al. 2017a). The rapid growth of megaprojects yields substantial economic-social benefits, but meanwhile leads to serious environmental problems (Shen et al. 2011; Zeng et al. 2015). Stone (2011) reported in *Science* that the Three Gorges Dam, the world's largest hydropower project, is an "environmental bane" that will cost USD 26.45 billion over the next decade to mitigate its environmental impacts. Environmental problems arising from construction activities trigger increasing attention globally, pressing megaprojects to advance environmental management in an effective and responsive manner.

The improvement of the environmental performance in megaprojects not only hinges on formal environmental management systems, programs or technologies, but also requires informal and proactive behaviors taken by project practitioners, such as sharing suggestions on on-site pollution prevention, openly questioning of construction activities likely to harm the environment, and collaborating with the project environmental department to promote green initiatives (Fuertes et al. 2013; Wang et al. 2017a; Yusof et al. 2016). These behaviors involve a "*sense of citizenship*" that is optional or supererogatory and reflects individuals' willingness to make extra efforts that contribute to an organization's environmental performance (Boiral 2009). Boiral and Paillé (2012) defined organizational citizenship behaviors for the environment (OCBEs) as "*individual and discretionary behaviors that are not explicitly recognized by formal work requirements and that contribute to a more effective environmental management by organizations.*" As megaprojects apply massive efforts to improve the environmental performance, one of the key challenges is to increase the willingness of project practitioners to support continuous changes and take responsibility against environmental issues on a voluntary and discretionary basis (Hu et al. 2014; Wang et al. 2017b; Zhang et al. 2015a). Otherwise, environmental management system will be inefficient, programs will be poorly implemented, and technologies will be underutilized (He et al. 2015; Raineri and Paillé 2015).

To nurture the willingness of people to adopt responsible environmental behaviors, recent research has linked organizational support with OCBEs (Raineri and Paillé 2015; Paillé and Raineri 2015). Unfortunately, existing OCBEs research has been too fragmented or focused merely on the internal organizational support (e.g., environmental policies and activities), while ignoring the external institutional context. Wang et al. (2017a) examined the extent to which project practitioners' OCBEs are influenced by four types of megaproject environmental responsibility practices, and revealed the *internal* driving mechanism leading megaproject practitioners to engage in OCBEs; however, how *external* institutional factors shape the megaproject context and influence project practitioners' OCBEs are largely unexplored. According to DiMaggio and Powell (1983), institutional context is characterized by three main types of pressures (i.e., normative, coercive, and mimetic pressures) and has a far-reaching impact on the way people behave. More specifically, institutional pressures play a crucial role in promoting proactive environmental initiatives and in encouraging "green" behaviors (Liu et al. 2010; Testa et al. 2015). Nevertheless, it remains unclear to which extent OCBEs could be affected by three types of institutional pressures. As highlighted by Boiral et al. (2015), external pressures can indeed reinforce the internal organizational support on environmental management, which, in turn, may foster OCBEs; and there is a "*gap between* *the emergent research on OCBEs and the more established literature based on institutional theory and environmental management.*" For these reasons, this study is guided by the following research question:

How do three types of institutional pressures (i.e., coercive, mimetic, and normative pressures) influence the OCBEs of megaproject practitioners, considering the mediating effect of organizational support?

To summarize, this paper contributes to a new area of megaprojects by exploring the external driving mechanism of OCBEs. The findings will serve as a guideline to harness institutional forces for the improvement of environmental performance and to promote the realization of the broader goal of sustainability in megaprojects. The remainder of this paper is structured as follows. In the next section, the theoretical foundation is provided and research hypotheses are developed. Thereafter, the research method, analytical procedures, and analysis results are illustrated. Finally, the findings and managerial implications on megaproject environmental practices are discussed.

Theoretical Foundation and Hypotheses Development

Improving Environmental Performance through OCBEs in Megaprojects

To minimize the adverse impact on environment during the construction stage, megaprojects not only establish rigorous environmental management systems (e.g., ISO 14000), but also introduce a number of green tools (e.g., environmental impact assessment and eco-labeling). However, the effectiveness of environmental management in megaprojects is barely satisfactory (Flyvbjerg et al. 2003). An increasing number of megaproject managers, therefore, begin to realize the diversity and complexity of environmental issues (Molle and Floch 2008), as well as the limitation of formal management systems with fixed and rigid rules (He et al. 2015; Hu et al. 2014; Luo et al. 2017).

As a kind of non-routine and complex projects, megaprojects depend, to a large extent, on innovative contributions from multiple individuals to attain the expected goal (Locatelli et al. 2017a; Maier and Branzei 2014). As a form of innovative and spontaneous pro-environmental behaviors, OCBEs have been highlighted in megaproject environmental practices. A recent example is Shanghai Disney project (completed by 2016), which adopted a series of incentive measures to encourage the environmentally conscious behaviors of project practitioners, such as early-warning to prevent pollution, suggesting solutions aimed at reducing waste, and collaborating with the project environmental department to implement green technologies (Yang 2016).

Institutional Perspectives on OCBEs

Boiral (2009) indicated that institutional pressures from government agencies or other stakeholders, as conveyed by external motivations and contextual variables, help create a social context that encourages the integration of ecological issues into daily activities. Through the lens of the institutional theory (DiMaggio and Powell 1983), OCBEs may be influenced by three types of pressures.

Coercive Pressures

Coercive pressures are related to the compulsory pressure exerted by governmental agencies (Zhang et al. 2015b). As megaprojects have been heavily criticized for air, water, noise, and land pollutions, their environmental issues have come under scrutiny by environmental agencies (Zeng et al. 2015). For example, the Three Gorges project has been placed on the "blacklist" of the Ministry of Environmental Protection in China. Drawing on the value-belief-norm theory (Stern et al. 1999), megaproject practitioners often experience changes in "mind-set" in response to strict environmental audits and regulations—the emotional attachment and responsibility to environmental concerns (Wang et al. 2015; Wang et al. 2017b; Yusof et al. 2016). The coercive pressures provide constraints and guidances that promote managers' investments on environmental protection (Testa et al. 2015) and spark individuals' involvements in informal and voluntary behaviors (Lo et al. 2012). Thus, the following hypotheses are presented.

*H1a***.** The level of coercive pressures is positively related to the level of organizational support on environmental protection.

H1b. The level of coercive pressures is positively related to the OCBEs of megaproject practitioners.

Mimetic Pressures

Mimetic pressures refer to the pressures on an organization to imitate others' successful initiatives (DiMaggio and Powell 1983). As noted by Zhang et al. (2015b), it is reasonable for organizations to benchmark, or even imitate, industrial best-practices to stay competitive in a dynamic and uncertain environment. Due to the complexity and diversity of environmental issues, formal management systems (e.g., ISO 14000) cannot consider all possible initiatives to mitigate environmental impacts (Boiral 2009). In the absence of documented, prescribed, and procedural requirements, there is a real need for a megaproject to learn from others' experiences in dealing with environmental issues. Since megaprojects are characterized by high uncertainties and complexities in nature, their environmental practices face a number of unexpected difficulties and risks. There is no universal environmental practices guide for all megaprojects. Moreover, the effectiveness of environmental practices is largely affected by project characteristics and institutional environments. Therefore, the environmental practices of peer-projects become living examples and important references; and megaproject practitioners are easy to be affected by the practices of those projects with similar institutional environments and project characteristics as their own project (Cao et al. 2014; Locatelli et al. 2017b). As megaprojects are criticized for poor environmental performance, project managers need to expand support for keeping abreast of successful practices in peer-projects. As suggested by Boiral et al. (2015), "leading by example" is crucial for individuals to reinforce concerns and commitments towards the environment, thereby motivating their engagements in voluntary environmental behaviors. That is to say, the successful environmental practices of peer-projects will serve as a model to facilitate the emergence of OCBEs among project practitioners. Thus, the following hypotheses are proposed.

H2a. The level of mimetic pressures is positively related to the level of organizational support on environmental protection.

H2b. The level of mimetic pressures is positively related to the OCBEs of megaproject practitioners.

Normative Pressures

Normative pressures stem from the professionalization, which is viewed as a form of rules-of-thumb, standards, and norms (Phan and Baird 2015). Professional bodies in the environmental protection field often shape shared values, norms, and standards of what desirable behaviors would be (Cao et al. 2014). These norms and collective expectations are proliferated and developed within the professional field via information exchange activities, including industrial conferences, professional consultations, and vocational educations (He et al. 2016). In the process of megaproject implementations, the normative pressures can be imposed by industry experts, consultant firms, and education institutions accordingly.

Compared with coercive pressures, normative pressures have a less mandatory effect on organizational attitudes and behaviors (Cao et al. 2014). Since the environmental impact of megaprojects is tremendous and far-reaching, expert evaluations become a necessary step in project decision-making processes. Additionally, consultant firms and education institutions also exert normative pressures to promote megaprojects to increase investments in environmental issues. Project managers are inclined to show a strong sense of attachment and responsibility to environmental concerns when they have in-depth understandings of the significance and industry expectations regarding environmental issues, thereby enhancing the support on environmental protection. Through systematic training programs, megaproject practitioners accumulate professional knowledge, build a sense of responsibility towards the environment, and demonstrate their willingness to engage in pro-environmental behaviors (Dubey et al. 2015; Paillé and Raineri 2015; Wang et al. 2017b). All of the above discussions lead to the following hypotheses.

H3a. The level of normative pressures is positively related to the level of organizational support on environmental protection.

H3b. The level of normative pressures is positively related to the OCBEs of megaproject practitioners.

Role of Organizational Support

Organizational support reflects the degree to which an organization is committed to protecting the environment, and stems from its willingness to recognize and integrate environmental concerns into business strategies (Banerjee et al. 2003). More specifically, the internal organizational support demonstrates the level of megaprojects in defining a clear policy statement, shaping values about the importance of environmental protection, and making efforts to support environmental practices (Paillé et al. 2014). When megaproject practitioners feel encouraged and supported by environmental strategies and policies, they are willing to engage in pro-environmental behaviors so as to help their project to accomplish environmental goals (Hu et al. 2011; Paillé and Raineri 2015).

Schaninger and Turnipseed (2005) contended that social exchange has been built on the basis of the norm of reciprocity and occurs when people respond positively to a donor (e.g., an organization) who provides something that is deemed to be valuable. Give and take forms the foundation of exchange relationships. Paillé et al. (2013) empirically validated the positive relationships between organizational support and OCBEs by referring to the social exchange perspective (SEP). Thus, based on the SEP, it can also be inferred that when megaproject managers aim to improve environmental performance and take measures to support their subordinates, the latter would be more likely to "repay" the former by engaging in OCBEs. Considering the role of organizational support in combination with the insights from institutional perspectives, the following hypotheses are developed as follows:

H4a. The level of organizational support is positively related to the OCBEs of megaproject practitioners.

H4b. The level of organizational support mediates the positive relationship between coercive pressures and the OCBEs of megaproject practitioners.

H4c. The level of organizational support mediates the positive relationship between mimetic pressures and the OCBEs of megaproject practitioners.

H4d. The level of organizational support mediates the positive relationship between normative pressures and the OCBEs of megaproject practitioners.

The proposed theoretical research model is shown in Fig. 1.

<Insert Fig. 1>

Research Method

Questionnaire Design

The importance of the questionnaire as an instrument for data collection in behavioral studies is widely recognized (Baruch 1999). Following Elmes et al.'s (2011) suggestions, this study adopts the following steps to ensure the reliability and validity of questionnaires (Fig.2). To begin with, an interview outline, comprising research backgrounds and questions, was designed based on the findings from the literature review of the studies on OCBEs and megaprojects. Six semi-structured interviews were subsequently conducted to refine the research scope and to improve the questionnaire design.

To ensure the quality and effectiveness of interviews, a purposive approach was employed to select the targeted interviewees. This approach is suggested by Le et al. (2014a). All the interviewees have at least five years of experience in megaproject management. The main consideration of selecting interviewees is the diversity of professional backgrounds. The interviewees includes both academics and practitioners and involves various project roles, with the aim to increase the heterogeneity of the interview group and thus to expand the depth and width of interview information. OCBEs are considered as a kind of behavioral phenomena. As for phenomenological studies, the recommended number of interviewees is approximately six (Denzin and Lincoln 2008; Marshall et al. 2013). Table 1 shows the backgrounds of six selected interviewees in the current study.

<Insert Table 1>

The semi-structured interview has been divided into two stages. The first stage is to ask the interviewees to provide some OCBEs cases in their own projects. On this basis, the common forms of OCBEs are identified, which provides the basis for the development of OCBEs measurement items. For example, voice behaviors (making suggestions) were highlighted by interviewees and then a total of two items were used to specifically reflect voice behaviors.

The second stage mainly focuses on "*what drives megaproject practitioners to engage in OCBEs and how they will be affected by institutional factors*." Then，the sources of three types of institutional pressures are identified. For example, according to the interview, coercive pressures does not merely come from the government, but also relate to the semi-official industry associations in China. Finally, the initial questionnaire was formulated based on the feedbacks of six interviewees.

<Insert Fig.2>

As for institutional pressures, the measurement items of coercive pressures (CPs) were adapted from Cao et al. (2014) and Zhang et al. (2015b), which captured the three authoritative bodies in megaprojects, including regulatory agencies, industry associations, and third-party environmental supervisions. Mimetic pressures (MPs) were measured in view of the perceived effectiveness of environmental protection by peer-projects. Similar items have been employed by He et al. (2016) in construction projects. According to Cao et al. (2014) and Dubey et al. (2015), normative pressures (NPs) reflect the way professional bodies form the norms of environmental protection in megaprojects. A total of three items were adopted to measure the normative influences of consultant firms, industry experts, and academic communities.

The construct of organizational support (OS) was operationalized to reflect the project practitioners' feeling of being supported by their project managers. A total of four items were used to reflect OS based on Raineri and Paillé (2015). According to Wang et al. (2017a), the measurement items of OCBEs were developed from five aspects, including helping, sportsmanship, individual initiative, organizational loyalty, and self-development.

All selected measures (as shown in Appendix S1.) were assessed using five-point scales from 1 (*strongly disagree*) to 5 (*strongly agree*). And these measurement items were translated into Chinese to facilitate the respondent's understanding. This study applied the back-translation technique to ensure the linguistic equivalence of two versions prior to the formal survey (Paillé et al., 2014).

Participants and Procedures

A pre-test involving 23 megaproject professionals (with over 5 years of experience) was performed to evaluate the scope of the questionnaire, to identify the vague expressions of measurement items, and to verify the rationality of related constructs. According to the feedback from pre-test respondents, some measurement items in the initial questionnaire were further revised and then the final version was formed. For example, the CPs item "*third-party environmental supervision attaches importance to project environmental protection*" was added to the coercive pressures part of the questionnaire. This was because China had issued nationwide regulations mandating the environmental supervision in megaprojects; and hence third-party environmental supervisors play a similar role to that of regulatory agencies in environmental protection.

The formal questionnaire survey was conducted between November 2015 and March 2016 in China. As China is experiencing the "biggest infrastructure investment boom" in recent years (Ansar et al. 2016), a large number of megaprojects provide the first-hand data for empirical surveys. In the current study, many of the survey respondents come from international megaprojects (e.g., Shanghai Expo and Shanghai Disney) and their experiences are representative even in a global context. Noteworthy, only the megaproject professionals who were directly involved in project environmental practices were considered as the targeted respondents for the formal survey. These professionals should be familiar with environmental laws, regulations, and policies; and have previous experiences in environmental activities (e.g., green design and planning, environmental training and supervision, and eco-friendly construction and materials supply).

The scale of the project investment is the most common criterion to distinguish megaprojects from small or medium-sized projects. According to Flyvbjerg (2014), megaprojects refer to large-scale, complex ventures that usually cost more than USD 1 billion. Locatelli et al. (2014) defined megaprojects as "large-scale investment projects typically costing EUR 0.5 billion or more. The investment scale of megaprojects varies by countries. In the current study, the criterion is set as "*CNY 1 billion*" according to the Chinese context. For example, Shanghai is one of the megaproject centers in China. In 2016, Shanghai Pudong Megaprojects Management Office (i.e., a government agency) has implemented 109 megaprojects, with total investment of CNY 121 billion (Xinhua 2017). The average investment of each megaproject is CNY 1.1 billion. Thus, "*CNY 1 billion*" is a reasonable criterion for selecting megaprojects. A wide range of megaprojects and potential respondents were identified by a series of approaches, including contacting leading enterprises in megaproject management and consulting, interviewing professionals participating in two megaproject seminars sponsored by the National Natural Science Foundation of China, requesting information from architecture and construction associations, and searching through on-line industry forums and publications. A snowball-sampling approach was employed to expand the sample size (Cao et al. 2014), with the initial respondents being asked to recommend three knowledgeable participants from other megaprojects. A diverse array of megaprojects with different geographic locations and project characteristics was chosen to improve the representativeness of the overall sample, thereby providing a broader vision of industry practices.

To enhance the quality of responses, all the respondents were informed of the aim of this study and assured of the confidentiality of their answers for completing the questionnaire. Each of the respondents was given a set of souvenirs (i.e., notepad, gel pen, and bookmark) with the Tongji logo or a cash gift through WeChat. During the formal survey, the respondents were asked to complete the questionnaire according to their most recently experienced megaproject. In addition, the formal survey also included a question "*Are you familiar with the project's environmental policies and measures?*" to further determine whether the respondent can perceive the project's environmental practices, with the options of "*Yes*," "*No*" or "*Unsure*." The inclusion of an "*Unsure*" option was used by Norton et al. (2014), with the aim of preventing respondents from making a forced-choice response. Finally, only the respondents who provided a definite answer of "*Yes*" were retained, while the "*No*" or "*Unsure*" answers were considered as invalid responses.

There are 241 responses in total. After the omission of invalid responses and deletion of outliers, 198 responses were included in the subsequent analysis. Of the 198 valid responses, 80 (40.40%) responses were collected via on-site visits, whereas the remaining 73 (36.87%) and 45 (22.73%) responses were collected through a survey system (http://www.sojump.com) and e-mails, respectively. Similarly, the answers from on-site visits, the survey system, and e-mails have no significant difference; the p-values for CPs, MPs, NPs, OS, and OCBEs are 0.922, 0.282, 0.663, 0.482, and 0.415, respectively.

Demographic characteristics of the surveyed projects and respondents are shown in Table 2. The surveyed respondents are well-informed senior and professional individuals from all across China. Among the 198 valid responses, 72 were from owners, 61 from contractors, 39 from consultants, and 26 from designers and suppliers. An analysis of variance (ANOVA) was performed to make a comparison of the answers from owners, contractors, consultants, as well as designers and suppliers; the p-values for CPs, MPs, NPs, OS, and OCBEs are 0.485, 0.644, 0.281, 0.650, and 0.936, respectively. This result suggests that the answers from the four groups of responses have no significant difference (p-values are all above 0.05).

<Insert Table 2>

Tools for Data Analysis

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to examine the reliability and validity of the measurement model. EFA along with the principal component analysis (PCA) was performed to identify the factor structure and to refine the measurement items, whereas CFA was conducted to further verify the results of EFA (Cao et al. 2017).

Partial least square (PLS) analysis was applied to test the research hypotheses. The main reason for using PLS is that it has minimal requirements on the sample size and residual distribution to achieve the expected statistical power and robustness (Hair et al. 2013). More specifically, it is most applicable to the early-stage theory development and testing without requiring a large sample size (normally more than 200), which fits well with the exploratory nature of this study. PLS is also distribution-free and thus appropriate for the data from the perception-based measurement items that are of unknown distributions (Aibinu and Al-Lawati 2010).

Data Analysis and Results

Factor Analysis

EFA was first conducted for the 10 items of institutional pressures. The Kaiser–Meyer–Olkin (KMO) value is 0.812 > 0.6, suggesting satisfactory sample adequacy (Field 2009). The Bartlett's Test of Sphericity (BTS) produces an approximation of $\chi^2 = 640.859$ ($df = 45$, $p = 0.000 < 0.001$), which indicates that the variable correlation is sufficiently strong for PCA (George 2003). Hair et al. (2010) noted that the loading of each measurement item on its corresponding construct should be greater than 0.5. Thus, MP4 (0.365) was deleted from the list of measurement items.

A follow-up PCA was conducted for the 9 remaining items. The KMO value is 0.795, thereby exceeding the 0.6 threshold; BTS reaches statistical significance ($\chi^2 = 588.820$, $df = 36$, $p = 0.000 < 0.001$). As consequence, three different factors were extracted to reflect the CPs, MPs, and NPs constructs. Table 3 shows that the rotated loadings of the manifest items on their intended constructs all exceed 0.5 and are greater than the loadings on other constructs. These results validate the appropriateness of using the 9 listed institutional pressures items to reflect CPs, MPs, and NPs constructs.

<Insert Table 3>

CFA was subsequently performed to further verify the three-factor structure of institutional pressures. Table 4 indicates that the factor structure of institutional pressures has acceptable fit level as judged by goodness-of-fit indicators (Fang et al. 2015).

<Insert Table 4>

Evaluation of the Measurement Model

The validity of all the measurements was further assessed from the following three aspects. Firstly, internal consistency was assessed in terms of the composite reliability (CR) and

Cronbach's α. Table 5 shows that the values of CR and Cronbach's α are all greater than 0.7, indicating a satisfactory reliability of the (Hair et al. 2011). Secondly, convergent validity is assessed by the values of the average variance extracted (AVE). The AVE values are all greater than 0.5 (Table 5), suggesting that these constructs have a satisfactory convergent validity (Hair et al. 2011). In addition, the convergent validity is also evaluated by the factor loadings of each measurement item. As shown in Table 6, the factor loadings of each item on its respective construct are all greater than the 0.7 threshold; and no cross-loading problem exists (Hair et al. 2011). Thirdly, Table 5 also shows that the square roots of AVE (diagonal values in the correlation matrix) are all above the absolute value of inter-construct correlations (off-diagonal values), indicating a satisfactory discriminant validity of the constructs (Hair et al. 2011).

<Insert Table 5>

<Insert Table 6>

As the quantitative data were collected from a single source (i.e., questionnaires), there is a possibility that common-method bias may arise (Podsakoff et al. 2003). Harman's single-factor test was used to further analyze the possibility of common method bias. The test results show that there is no single leading factor; and the most prominent one merely accounts for 21.886% of the total variances in measurements, indicating that the common method bias is limited in this study.

Hypothesis Testing and Results Analysis

A bootstrapping approach with 5,000 resamples was employed for the hypothesis testing. The results of the bootstrap-based analysis are shown in Fig. 3 and Table 7. The R^2 value of the dependent variable (i.e., OCBEs) is 0.446, indicating that most of the variances in the construct can be explained by the research model. The MPs–OS link ($\beta = 0.340, p < 0.001$) and NPs–OS link ($\beta = 0.296, p < 0.001$) are all significant, thus both Hypotheses 2a and 3a are supported. Whereas, the CPs–OS link is non-significant ($\beta = 0.093, p > 0.05$), therefore Hypothesis 1a is not supported. In addition, the influence of OS on OCBEs is significant ($\beta = 0.239, p < 0.001$), thus Hypothesis 4a is supported.

<Insert Table 7>

Regarding the relationships between institutional pressures and OCBEs, only the influence of CPs is non-significant when the effect of OS is included ($\beta=0.056,\ p > 0.05$), thus Hypothesis 1b is not supported. Meanwhile, the MPs–OCBEs link ($\beta = 0.297,\ p < 0.001$) and NPs–OCBEs link ($\beta = 0.264,\ p < 0.001$) are all significant, hence both Hypotheses 2b and 3b are supported. Considering the significant links between MPs and OS and between OS and OCBEs, it can be inferred that the influence of MPs on OCBEs is partially mediated by OS. Similar conclusion is also reached for NPs, therefore Hypotheses 4c and 4d are supported. However, in view of the non-significant links between CPs and OS and between CPs and OCBEs, Hypothesis 4b is not supported.

<Insert Fig.3>

To further investigate the effects of CPs, MPs, and NPs on OCBEs, an alternative model without the mediator was tested (Fig. 4). Although the mediating effect of OS is excluded, the direct impact of CPs on OCBEs is still non-significant. Thus, Hypothesis 1b is not supported.

<Insert Fig.4>

Discussions, Implications and Future Research

Discussions

The main objective of the current study is to obtain a better understanding of the institutional–psychological mechanism underlying innovative and spontaneous behaviors directed at environmental improvement in megaprojects. Overall, the results provide the evidence that the internal organizational support plays an important role in the connection between external institutional pressures and OCBEs; and institutional pressures exert a significant impact on the emergence of OBCEs in general. It is notable, however, that organizational support is not simply to introduce the environmental management system (EMS) or green technologies, and different types of institutional pressures affect OCBEs differently.

Understanding the drivers of OCBEs by focusing on the internal organizational support only sees the one side of the coin. Given rising concerns regarding the environmental sustainability, megaprojects are challenged with growing external pressures by a wide range of stakeholders (e.g., regulatory agencies, industry associations, and benchmark projects) to become environmentally friendly in their implementation process (Wang et al. 2017b; Zeng et al.2015). And the institutional conditions in which project implements (Hayes and Karamichas 2011) are important enablers that shape the project context and affect project practitioners' environmental behaviors (Yusof et al. 2016). Boiral et al. (2015) posited that institutional pressures in the form of environmental regulations or stakeholders' expectations have positive influences on the emergence of OCBEs. Interestingly, the findings confirm the crucial role of mimetic and normative pressures in promoting OCBEs; however, coercive pressures only have a non-significant or marginally significant effect on OCBEs.

Managerial Implications

The findings of this study provide four main implications for megaproject managers seeking to improve the effectiveness of environmental practices and to achieve the goal of project greening.

Firstly, the adoption of EMS is increasingly advocated as an effective approach for supporting the "greening process" in project-based organizations (Chong et al. 2009; Zhang et al. 2015a). However, if the involvement of project practitioners is insufficient, EMS tends to be disconnected from daily construction activities and to be deployed symbolically rather than substantially (Boiral et al. 2016; Robichaud and Anantatmula 2010; Wang et al. 2017a; Yusof et al. 2016). For example, an interviewee with more than 15 years of megaproject management experience noted that "*EMS became an expensive gimmick to please the government in some megaprojects; a lot of organizational support measures towards environmental protection only remained on the document*." This study provides a novel perspective that may explain why there is a poor environmental performance for some megaprojects that seem to have made great efforts to implement EMS. For these megaprojects, the implementation of EMS often becomes an "effective" way of increasing the external social reputations, rather than improving the internal environmental management practices—also known as "*green-washing*" (De Roeck and Delobbe 2012). When project practitioners are confused about the real intentions of their megaproject to adopt EMS, they are less willing to engage in OCBEs. This study provides the evidence that the most effective way to foster project practitioners' OCBEs is to establish the priority of environmental goals in project contracts. Furthermore, the establishment of environmental orientation also needs to combine with concrete supportive actions (e.g., training and communication opportunities), thereby sending a clear signal to all the practitioners about the values and priorities of their project. Moreover, managers can nurture and support the willingness of megaproject practitioners to engage in OCBEs, especially through enhancing psychological empowerment (Tuuli et al. 2013) and relationship quality (Zheng et al. 2018).

Secondly, megaprojects are "large unique projects" where public sectors often act as clients/owners, and hence are very likely to be in a regulatory "gap" (Hosseini et al. 2017; Locatelli et al. 2017a). In China, megaprojects are usually launched by the central government and/or local government, and even the government's supervisory departments are also involved. For example, the construction committee of Three Gorges Dam includes the vice prime minister of the state council of China, the mayor of Chongqing City, the vice-minister of the Ministry of Environmental Protection, and etc. The government plays a double role as both "*athlete and referee*." This pattern (i.e., completely government-dominated) contributes greatly to the efficiency of megaproject implementation process; however, it also brings hidden dangers (e.g., corruptions) that may weaken the mechanism of regulations (Le et al. 2014b). In the context of strong governments and weak regulations (Zeng et al. 2015), coercive pressures are inefficient to increase megaproject practitioners' willingness to make efforts for environmental practices. In this case, independent third-party environmental supervisors and auditors can fill the regulatory "gap," and more importantly provide guidances and encouragements for megaproject practitioners to adopt environmentally responsible behaviors.

Thirdly, with the exception of coercive pressures, both mimetic and normative pressures have significant impacts on OCBEs. It is noteworthy that mimetic pressures are the most influential external driver of OCBEs, which further confirms the key role of "leading by example" in promoting OCBEs (Boiral et al. 2015). The benchmark practice of peer-projects tends to speak much louder than words (e.g., project documents and industry standards). Therefore, in order to increase the willingness of megaproject practitioners to support environmental practices on a voluntary and discretionary basis, one effective approach is to organize regular communication activities with peer-projects and thus to facilitate knowledge exchanges and mutual learning. In particular, megaproject practitioners need regularly get access to the best environmental practices within benchmark projects and develop a learning routine for the external knowledge exploration (Manley and Chen 2017). For example, Shanghai Housing and Urban-Rural Construction Committee launched a competition of "pioneer megaprojects" in 2016 to mobilize the resources of people in spontaneous cooperation as well as innovative and volunteering behaviors.

Finally, another external determinant of OCBEs is normative pressures, whose effect is evidently weaker than mimetic pressures. During the megaproject implementation process, industry professional bodies play a crucial role in disseminating information on innovative environmental measures and in advocating cutting-edge green technologies. However, an interviewee in this study has noted that "*the actual level of involvement of professional communities is not high in China's megaprojects,*" which partly explains why the impact of normative pressures on OCBEs is moderate. To address this issue, one possible way is to introduce external facilitators or behavioral consultants from industry associations (e.g., LEED accredited professionals) to guide the improvement of megaproject environmental practices and to promote the sharing of environmental knowledge (Love et al. 2015).

Limitations and Future Research Directions

This study extends the recent research on environmental behaviors in the construction industry (Wang et al. 2017a; Wu et al. 2017; Yusof et al. 2016) by providing further insights into the *external* mechanism underlying project practitioners' willingness to sustain the environmental efforts of megaprojects. Notwithstanding its contributions, the current study has several limitations that call for future research. Firstly, this study is based on a specific institutional context (i.e., China), which might affect the generalizability of the empirical findings to other institutional contexts. The next stage of OCBEs research can compare the impacts of institutional pressures between different countries (e.g., US and China). Secondly, although a series of methodological measures were employed to minimize the effects of common method bias and social desirability, it is essential to recognize that this study was cross-sectional and all the data was collected from self-report questionnaires. A future study may be conducted by using the longitudinal data to validate the reliability of observed correlations and by introducing objective measures (e.g., third-party evaluations) to assess the behavioral performance. Thirdly, this study focused on the individual-level OCBEs, hence future research may explore the drivers that enable the manifestation of OCBEs at the project-level.

Conclusions

Under the enormous pressures of environmental protection, the construction process of megaprojects shows a shift from the emphasis on "iron triangles" (i.e., cost, quality, and time) to sustainability. Most megaproject sustainable research tends to neglect the key role of OCBEs in improving the environmental performance and little is known regarding the institutional-psychological mechanism leading megaproject practitioners to engage in OCBEs. To address this research gap, this paper investigates the external determinants of OCBEs in megaprojects at the individual-level. The findings provide new insights into the use of institutional forces to facilitate the improvement of the environmental performance in megaprojects, especially for some developing countries (e.g., China, India, and Brazil) that are undergoing a massive infrastructure construction. All these rapidly emerging major economies are in a similar institutional environment and face common problems, such as unpredictable or inconsistent government regulations, insufficient or limited industry information, and lack of status and respect for markets (Gupta et al. 2014).

Although extant research contends that institutional pressures are essential determinants of OCBEs (Boiral et al. 2015; Lülfs and Hahn 2013), this exploratory study indicates that the nature and implications of these pressures are not monolithic in megaprojects. Mimetic pressures are the most significant external determinant of OCBEs, followed by normative pressures. Interestingly, coercive pressures from government bodies and agencies exert a non-significant impact on OCBEs. Future studies on the external determinants of OCBEs should not use one latent variable to represent different pressures from various institutional constituents. This approach may mix the different impacts of institutional pressures and weaken the explanatory power of institutional perspectives.

Additionally, this paper also shows that mimetic and normative pressures have both direct and indirect effects on OCBEs, leading to the conclusion that these relationships are partially mediated by organizational support. The findings suggest the usefulness of combining the social exchange process (e.g., reciprocity between organizations and their members) with the institutionalization process (e.g., search for social legitimacy) to enhance megaproject practitioners' motivation to engage in OCBEs.

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Supplemental Data

Appendix S1 is available online in the ASCE Library (www.ascelibrary.org).

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Fig.1. Research framework

Fig.2. Flowchart of questionnaire development

Fig. 3. Results of PLS analysis for the original research model

Fig. 4. Results of PLS analysis for the alternative research model

Table 1. Backgrounds of Interviewees

No.	Employer	Position	Years of megaproject experience	Involved megaprojects
1	Owner	Project manager	8	Shanghai West Bank Media Port
2	Consultant	Project manager	15	Suzhou–Nantong Bridge and Shanghai Disney
3	Government	Project manager	5	Shanghai Expo
4	Contractor	Project manager	6	Tianjin Heat Supply and Grid Connection
5	Academic	Professor	16	Shanghai Expo and Shanghai Disney
6	Academic	Professor	23	Shanghai Expo and Shanghai Disney

Table 2. Demographic Information of Respondents.

Variable	Category	Number of respondents	Percentage
Project role	Owner/Government	72	36.36
	Contractor	61	30.81
	Consultant	39	19.70
	Designer	14	7.07
	Supplier	12	6.06
Project type	Large-scale exhibition facility/ industry zone	63	31.82
	Urban metro system	41	20.71
	Integrated transport hubs	37	18.69
	Energy source bases	25	12.62
	High speed railways	18	9.09
	Long-span bridge	14	7.07
Location[a]	East China	95	47.98
	South China	36	18.18
	North China	32	16.16
	West China	21	10.61
	Central China	14	7.07
Position	Project manager	58	29.29
	Department manager	31	15.66
	Professional executive	45	22.73
	Project engineer	64	32.32
Years of experience	⩽5 year	55	27.78
	6-10 year	61	30.81
	11-15year	48	24.24
	16-20 year	19	9.59
	＞20 year	15	7.58

Note: Location [a] refers to the project site.

Table 3. Component List of Institutional Pressures.

Measurement items	Factor loadings		
	Factor 1	Factor 2	Factor 3
NPs2	**.851**	.199	.082
NPs1	**.829**	.094	.178
NPs3	**.755**	.045	.303
CPs2	.126	**.829**	-.007
CPs1	.170	**.810**	.120
CPs3	.008	**.788**	.268
MPs1	.067	.181	**.856**
MPs2	.204	.141	**.778**
MPs3	.424	.031	**.726**
Variance explained (%)	24.432	23.016	22.917
Variance cumulatively explained (%)	24.432	47.448	70.365

Table 4. Overall Goodness-of-Fit of Confirmatory Factor Analysis

Categories of indicators	Indicators	Fitness criteria	Institutional Pressures	
			Values	Fitness judgment
Absolute fit indicators	RMR	<0.05	0.018	Yes
	RMSEA	<0.08	0.064	Yes
	GFI	>0.90	0.953	Yes
	AGFI	>0.90	0.913	Yes
Incremental fit indicators	NFI	>0.90	0.927	Yes
	IFI	>0.90	0.966	Yes
	TLI	>0.90	0.948	Yes
	CFI	>0.90	0.965	Yes
Parsimonious fit indicators	PGFI	>0.50	0.508	Yes
	PNFI	>0.50	0.618	Yes
	PCFI	>0.50	0.643	Yes
	χ^2/DF	<2.00	1.818	Yes
	AIC	Values of default model are lower than those of independent and saturated models	85.624<90.000 85.624<618.505	Yes
	CAIC	Values of default model are lower than those of independent and saturated models	175.678<282.972 175.678<657.099	Yes

Table 5. Measurement Validity and Construct Correlations.

Constructs	CR	Cronbach's α	AVE	Correlation matrix				
				CPs	MPs	NPs	OS	OCBEs
CPs	0.866	0.771	0.683	**0.826**				
MPs	0.865	0.766	0.681	0.330	**0.825**			
NPs	0.880	0.795	0.710	0.296	0.442	**0.843**		
OS	0.842	0.750	0.571	0.293	0.501	0.473	**0.756**	
OCBEs	0.927	0.908	0.646	0.302	0.552	0.525	0.529	**0.804**

Table 6. Cross Loadings for Measurement Items

Code	Item loadings				
	CPs	MPs	NPs	OS	OCBEs
CPs1	**0.872**	0.292	0.302	0.270	0.305
CPs2	**0.791**	0.194	0.213	0.212	0.196
CPs3	**0.816**	0.322	0.206	0.239	0.226
MPs1	0.314	**0.835**	0.277	0.384	0.431
MPs2	0.272	**0.833**	0.343	0.469	0.457
MPs3	0.233	**0.808**	0.469	0.383	0.476
NPs1	0.245	0.376	**0.854**	0.421	0.430
NPs2	0.291	0.314	**0.862**	0.399	0.465
NPs3	0.210	0.430	**0.811**	0.375	0.430
OS1	0.264	0.348	0.342	**0.735**	0.458
OS2	0.157	0.378	0.369	**0.767**	0.417
OS3	0.210	0.404	0.307	**0.771**	0.410
OS4	0.256	0.388	0.417	**0.732**	0.302
OCBEs1	0.172	0.383	0.362	0.413	**0.774**
OCBEs2	0.255	0.523	0.459	0.458	**0.867**
OCBEs3	0.301	0.416	0.407	0.484	**0.761**
OCBEs4	0.110	0.372	0.385	0.362	**0.756**
OCBEs5	0.264	0.484	0.418	0.379	**0.814**
OCBEs6	0.314	0.487	0.460	0.473	**0.838**
OCBEs7	0.250	0.417	0.449	0.392	**0.808**

Table 7. Results of Hypotheses Testing

Path	Standardized path coefficient (β)	T-value	Inference
H1a: CPs→OS	0.093	1.483	Not supported
H1b: CPs→OCBEs	0.056	1.074	Not supported
H2a: MPs→OS	0.340	5.190	Supported
H2b: MPs→OCBEs	0.297	4.393	Supported
H3a: NPs→OS	0.296	5.147	Supported
H3b: NPs→OCBEs	0.264	4.925	Supported
H4a: OS→OCBEs	0.239	4.178	Supported

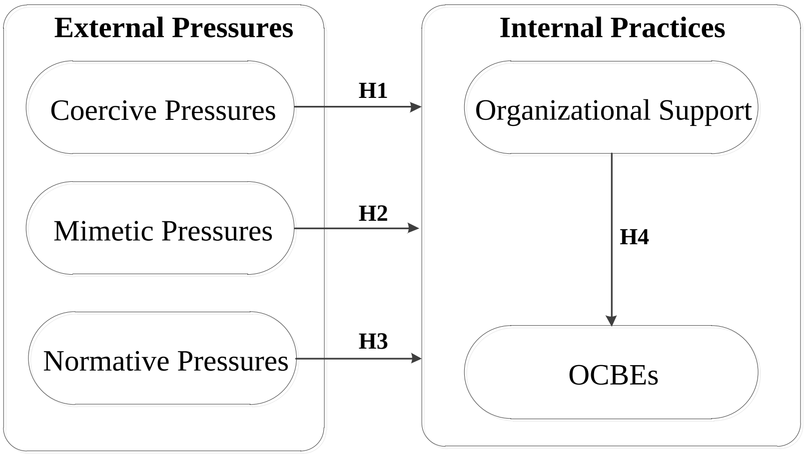

Fig.1. Research framework

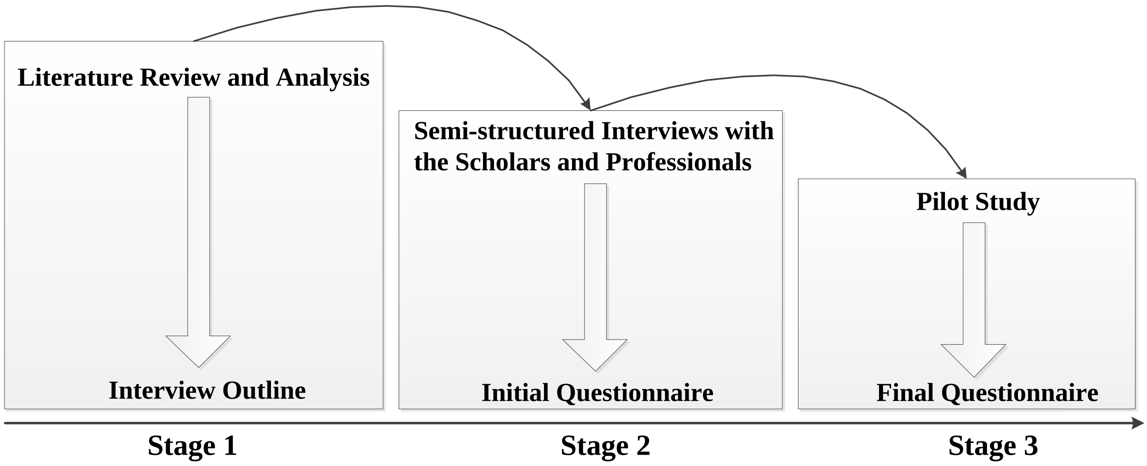

Fig.2. Flowchart of questionnaire development

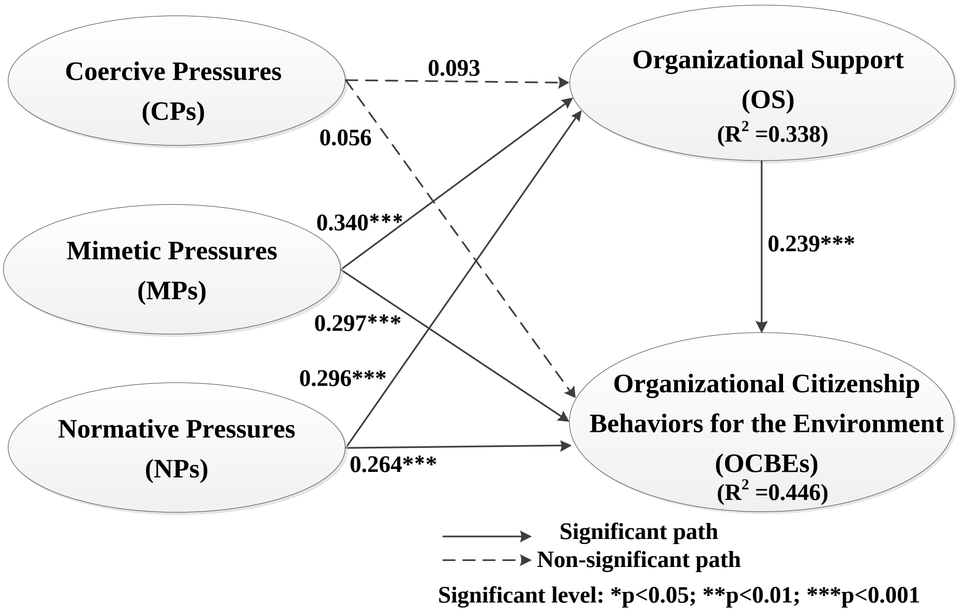

Fig. 3. Results of PLS analysis for the original research model

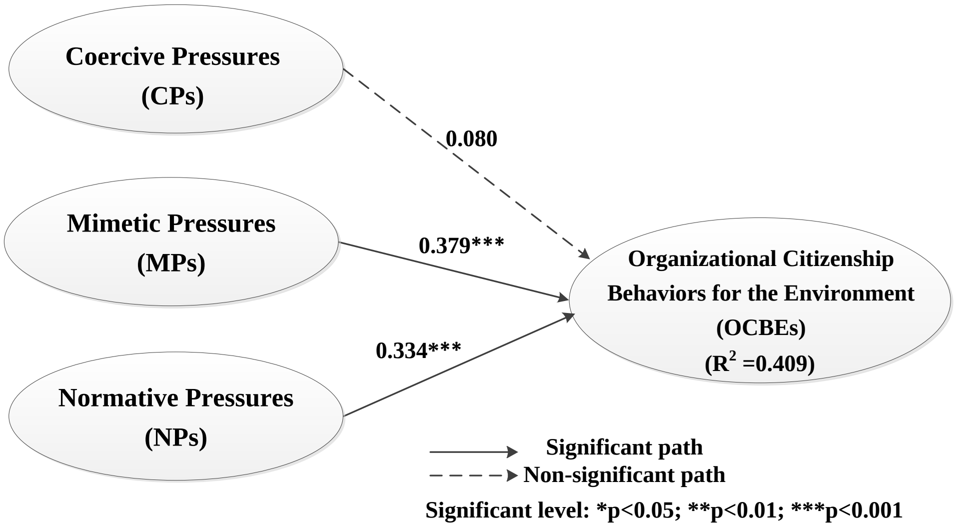

Fig. 4. Results of PLS analysis for the alternative research model

Appendix S1. Measurement items in the questionnaire

1. Coercive pressures (CPs)

CPs1: Government attaches importance to project environmental protection;

CPs2: Industry association attaches importance to project environmental protection;

CPs3: Third-party environmental supervision attaches importance to project environmental protection.

2. Mimetic pressures (MPs)

MPs1: Many similar projects earn a reputation by effective environmental management;

MPs2: Many similar projects achieve favorable effects in environmental practices;

MPs3: Peer project participants receive good recognition in environmental protection;

MPs4: Peer project participants all attach importance on environmental issues.

3. Normative pressures (NPs)

NPs1: Industry experts advise my project to attach importance on environmental issues;

NPs2: Consultant firms advise my project to attach importance on environmental issues;

NPs3: Academic communities advise my project to attach importance on environmental issues.

4. Organizational support (OS)

OS1: My project (manager) encourages environmental initiatives;

OS2: My project (manager) values inputs on environmental issues;

OS3: My project (manager) gives complete and accurate information regarding environmental issues;

OS4: My project (manager) provides a lot of opportunities to develop environmental skills.

5. Organizational citizenship behaviors for the environment (OCBEs)

OCBEs1: I suggest new practices that could improve the environmental performance of my project;

OCBEs2: I encourage my colleagues to adopt more environmentally conscious behaviors;

OCBEs3: I stay informed of my project's environmental initiatives;

OCBEs4: I make suggestions about ways to protect the environment more effectively in my project;

OCBEs5: I volunteer for programs or activities that address environmental issues in my project;

OCBEs6: Even when I am busy, I spontaneously give my time to help my colleagues take the environment into account;

OCBE7: I undertake environmental actions that contribute positively to my project's image and interest.