

Organizational citizenship behavior in construction megaprojects

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Abstract

In construction megaprojects, contractors and other participating entities sometimes go beyond what is stipulated in their contract and take initiatives that are irrational in pursuit of short-term economic benefit. This type of citizenship behavior is often observed in many construction megaprojects. However it has not been widely researched, and little is known about organizational citizenship behavior (OCB) and its characteristics in this field. This paper presents an overview of participating entities' OCB practice in construction megaproject (MOCB) utilizing a quantitative cross-case study. Industrial and academic experts' interviews were conducted to verify the reliability of the study results. As a result, a framework of MOCB was proposed and consisted of five behavior types in construction megaprojects, namely compliance, contingent collaboration, harmonious "*guanxi*" maintenance, conscientiousness, and initiative. Influenced by major contextual factors in construction megaprojects, MOCB

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presented special behavioral characteristics: (a) extends beyond considerations for project organization scope and directed toward a network of overall stakeholders; (b) happens at inter-organizational level with more flexibility and continuous contingency; (c) indicates concern for harmonious inter-organizational network relationships. The limitation and future directions of the findings are discussed.

Keywords: organizational behavior, organizational citizenship behavior, megaprojects, contextual factors, project organization, MOCB, case study

Introduction

The assumption that rational organizational behavior, contract compliance, and individual accomplishment benefit optimization has always been the highest priority in every construction megaproject. In practice, however, contractors and other participating entities sometimes go beyond their contract and take initiatives that are not in pursuit of rational economic benefit, e.g., deliver significantly higher performance over expectation, continue working under dangerous conditions (extreme weather,) and invest more time and resources to benefit others or the overall megaproject community. These types of actions, known as organizational citizenship behavior (OCB) in organizational theory, cannot be clearly arranged in a formal reward system, and duty role in advance but the aggregate contribute to organizational effectiveness ([Organ 1997](#); [Podsakoff et al. 2014](#)). Even so, the literature of OCB analysis in construction megaprojects remains relatively scarce.

This type of non-rational behavior has been observed at many construction megaprojects. For instance, in January 2008, the PCCP pipeline installation task for emergency water supply, in Beijing-Shijiazhuang section of South-to-North Water Transfers project in China, got stuck in a great obstacle for water pipeline change, and the schedule is quite tense. The PCCP department

asked the Hydropower Five Division (HFD) installation department for help. Although this was not HFD's duty and task, they immediately organized a team "Hydropower Five Division youth commando" to help complete the crushing work and finally help PCCP cope with their schedule difficulty after 40 hours of struggling in cold weather. The HFD installation department attached great importance to the pipe fittings production task, carefully examining each step and detail in the process. The quality test was conducted strictly according to standards until their product qualified rate was 100% (PCCP 2008). Another example can be found in offshore bridge and tunnel engineering at The Hong Kong-Zhuhai-Macao Bridge. The CB05 section usually shares expert resources to assist the CB04 section. This can range from a discussion of installation plans and schedule to physical support and free lifting equipment. They established a friendly relationship, and communicated construction technology and method together at this project, although they were competitors before bidding (OBTEM 2015). Similar cases can be found in the United States. The I-495 and I-95 Express Lanes in the Washington, D.C. were maintained by Transurban through the public-private partnership contract. Occasionally, Transurban arranged for maintenance staff to repair sinkholes in the contiguous I-395 Express Lanes that were not included in the public-private partnership contract; they also voluntarily organized safety champion program around distracted driving (reported by Group General Manager North America for Transurban).

MOCB is vital for management effectiveness once contracts are signed and the project moves into the implementation stage (Maier and Branzei 2014; Patanakul et al. 2015). Many construction megaprojects in China hold a labor contest, or a creative, competitive labor activity, to motivate participating entities' OCB engagement, e.g. The Hong Kong-Zhuhai-Macao Bridge, South-to-North Water Transfers project, 2010 Shanghai Expo, 2008 Beijing Olympic venues.

The host government acts as a promoter, advised and supported by All-China Federation of Trade Unions, the relative local governmental sector and trade unions. Participating entities voluntarily take the competitive effort to support safety, quality, schedule, technology innovation, environmental protection and energy saving, honest and law-abiding, harmony and civilization, service support, unity and collaboration ([SHFTU and BSHEXCOR 2012](#); [HKZMB 2011](#)) . If participating entities want to win, they need to deliver competitive results beyond the ordinary level and get breakthroughs ([Deng 2011](#)). Finally, the winners could get too much moral encouragement, e.g. the winner in South-to-North Water Transfers project could obtain fame trophy, medals, public media propaganda, and even praised by South-to-North Water Transfers commission office of state council (ministerial level in China) ([Tang et al. 2013](#)).

It is obvious that this kind of behavior was quite helpful to improve related parties' task efficiency and finally benefit megaproject, while actors need to bear the cost and time or other resource investment without payment. They are not in pursuit of maximizing their own economic benefits as a rationally economic man, but as an altruistic one. Theoretically, [Müller et al. \(2014\)](#) argued that participating entities do not comply with rationally economic principles, sometimes they tend to prioritize enhancing outcomes for others in need rather than enhancing the outcomes for themselves. Traditional agency theorists would relate this behavior to the utility maximization intents of the economic man ([Jensen and Meckling 1994](#)), e.g. to achieve on-time delivery and maximize profit, participating entities may not make every effort to offer an error-free outcome ([Li and Taylor 2014](#)), and generally, many of these stakeholders are not motivated solely by the knowledge that their decisions would benefit others. ([Xue et al. 2010](#)). As a result, there is always a lack of trust and investigation on this positive, altruistic behavior in this field.

There is limited research on behavior relative to OCB in project management, for example, collaboration (Xue et al. 2010; Alojairi and Safayeni 2012) , individual OCB in project-based organization (Braun et al. 2013) , general projectization team OCB (Aronson et al. 2013). The generalization of their results is limited to project management as a practice that encompasses a wide range of highly distinct and differentiated settings (Morris 1997). Even though OCB is a key area in current economic development and construction industry, although participating entities inter-organizational OCB in construction megaprojects is more important than individuals and is observed in more than one megaproject, no study was found on this phenomenon from an organizational behavior perspective. Consequently, the understanding of MOCB remains limited and highlights the need for careful assessment of OCB. Based on this background, as the first step of an explosive emerging research, this study focuses on:

- (1) What is the state of practices of participating entities OCB in construction megaprojects?
- (2) What are the characteristics of MOCB in this context?

By answering these two questions, this study aims to identify main types of MOCB, their objectives and influence of construction megaproject contextual factors on this behavior.

Organizational citizenship behavior

There is much research on OCB in organizational behavior science. The concept focuses on behavior that benefits others or organizational well-being, and thus is used to depict altruistic actions relative to positive affiliate in the organization in many fields (Organ 1988). Accordingly, the OCB concept could be adopted to capture the non-rational altruism in construction megaprojects. Although OCB has many different presentation formats and dimensions in different fields, its contextual dimensions in a new context must be developed based on the current theoretical results.

Citizenship behavior originated from “willingness to cooperate” and “innovative and cooperative behavior beyond the requirements of role but in the service of organizational objectives” (Barnard 1938; Katz and Kahn 1978). Organ (1988) defined organizational citizenship behavior as “individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organization.” Another way of describing OCB is altruistic behavior, meaning an individual performs cooperative behaviors to benefit others or the collective’s welfare (Li et al. 2014). As two properties, “discretionary” and “unrewarded by formal system,” and ambiguity of role boundaries were disputed by many researchers (Morrison 1994; Podaskoff and MacKenzie 1994), Organ’s definition was revised as “non-task that it contribute to the maintenance and/or enhancement of the context of work”(Organ 1997). OCB is not necessarily lacking in any tangible return to the individual absolutely (Organ 1988). The returns are more voluntary and invite some future reward or recompense that are at best uncertain and indirect, with higher risk and not contractually guaranteed as compared to formal work with a greater likelihood of being clearly connected to the formal incentive system (Organ 1997; Li et al. 2014).

Several related types of OCB have been proposed and examined by researchers in the business field. At first, the connotation of OCB only included two behaviors: help and general compliance (Smith et al. 1983). Then, Organ (1988) extended the concept of OCB given by Smith et al. (1983) and proposed five dimension taxonomy also known as the Five Factors Model, which encompassed altruism, conscientiousness, sportsmanship, civic virtue and courtesy. Van Dyne et al. (1994) and Graham (2000) extended a political philosophy view on civic citizenship and applied the political categories of loyalty, obedience, reputation diffusion and participation to OCB. Many others studied OCB from different perspectives grounded on the above research. For

example, [George and Brief \(1992\)](#) argued that OCB should include voice and self-development, which originated from Organ's individual initiative and initial construct respectively. [Farh et al. \(2004\)](#) found new connotations keep harmonious from a culture perspective.

From the literature review, we identify six major OCB types at the individual level, summarized in Table 1. The alternative perspectives yielded by different sources have afforded overlapping but far from identical formats and measurements of OCB. The first type includes interpersonal help ([Organ 1988; Farh et.al. 2004](#)), spontaneous cooperation behavior ([Barbard 1938](#)) and courtesy ([Organ 1988](#)). This type of OCB commonly focus on altruistic helping and was combined into *helping behavior* ([Rubin et al. 2013; Podsakoff et al. 2014](#)) . The type regarding obedience yielded organizational compliance and project compliance, a general label for adherence to the rules and policies regarding punctuality, attendance, workplace regulation, and use of time on the job or task ([Graham 1991; Braun et al. 2013](#)).The object of compliance differs solely, so it is generally labeled as *compliance*. Organizational loyalty, conscientiousness and sportsmanship mainly point out that working over time, taking extra efforts with higher requirement and without any monitor, and tolerating in good spirit with the occasional hardships and deprivations ([Organ 1988; Graham 1991; Farh et.al. 2004; Podskaoff et al. 2014](#)) , they collectively meant willingness to work best to deliver the job at the highest degree, accordingly are named *conscientiousness*. Both *keep harmonious* and *relationship maintenance* meant constructing and keeping a good relationship ([Farh et.al. 2004; Braun et al. 2013](#)), and *civic virtue* captured keeping organizational climate well ([Organ 1988](#)). Thus these three dimensions were together named *keep a harmonious relationship*. Both voice and self-development were derived from *individual initiative*, which referred to voluntary acts or ideas of creativity, innovation, and better skills designed to improve one's task or job performance ([Organ 1988; Van](#)

Dyne et al. 1994; Farh et.al. 2004; George and Jones 1997; Podsakoff et al. 2000) . *Dedication* mainly referred to job dedication (Van Scotter and Motowidlo 1996) . Among above types, positive cooperation and spontaneous altruism were still the core of OCB(Katz 1964; Rubin et al. 2013). This concept had been used to study altruistic behavior in more than one field (e.g. Ehrhart et al. 2015; Guenzi and Panzeri 2015) and had different types in a different context (Podsakoff et al. 2014).

OCB research in project management is still in the preliminary stage. A few fragmented studies have focused on general projects or introduced individual behavior formats directly from a business context. A core part of project management is the participating entities' willingness to accept responsibility and collaborate for the good of the project as a whole, only through doing this would they engage pro-social behavior's (OCB) flexibility in responses to changing circumstance (Müller et al. 2014; Müller et al. 2015). Such behavior is as important as task and technical aspects of project management (Ahadzie et al. 2008). A few concepts investigated in past project management studies were relative to OCB including extra-role behavior and compliance(Anvuur and Kumaraswamy 2015), collaboration(Dietrich et al. 2010), relationship maintenance (Wang and Huang 2006 ; Mazur and Pisarski 2015), dedication and conscientiousness (Xing and Chalip 2009). Some researchers recently pulled the concept of OCB from other fields (e.g. Aronson et al. 2013) and went so far as to identify individual OCB types in the project-based organization (e.g. Braun et al. 2013).

The above research results cannot directly apply for construction megaprojects. Researchers in these studies solely focused on general project context or individual behavior. Project management as a practice embraces a wide range of highly distinct and differentiated settings (Morris 1997). Many of these domains of practice are not only quite distinct in terms of their

fundamental tasks and goals, but they also often have their own distinct context features and practice knowledge that shape and influence organizational action and behavior (Bresnen 2016). Construction megaprojects normally were of expected importance in their political and economic development, and unique and distinct from general projects (Shi and Shen 2014). In particular participating entities, rather than individuals, are the core of project management objectives. In all, the current concept of OCB and its related types have been developed in a permanent or general project organizational context, and can not necessarily and validly be formulated and instructed for large, complex construction megaprojects (Morris 2013). Regarding this settings, there is good reason to look at participating entities' OCB practice in construction megaproject in term of organizational behavior science because of its important influence on management effectiveness and unique characteristics.

Table1 OCB types summary in literature

	OCB types	Description	Reference
Helping	Interpersonal helping	Voluntarily helping others with problems.	Organ 1988; Farh et al. 2004; Graham 2000
	Spontaneous cooperation	Cooperate with others in works on one's own.	Barbard 1938
Compliance	Courtesy	Preventing the occurrence of problems.	Organ 1988; Podsakoff et al. 2014
	Organizational compliance	Internalization and acceptance of the organization's rules, regulations, even without supervisors.	Graham 1991;
Conscientiousness	Projects compliance		Braun et al. 2013
	Organizational loyalty	Persisting with enthusiasm and volunteering to carry out task activities.	Graham 1991;
Keeping harmonious relationship	Conscientiousness	Work at best and overtime willingly.	Organ 1988; Farh et al. 2004; Podskaoff et al. 2014
	Sportsmanship	A willingness to tolerate the inevitable inconveniences and impositions of work without complaining and maintain a positive attitude.	
	Keep harmonious Relationship maintenance	Facilitating and preserving harmonious relations in the workplace.	Farh et al. 2004 Braun et al. 2013
Initiative behavior	Civic virtue	A willingness to participate actively in its governance and keep organizational climate well.	Organ 1988; George and Brief (1992).
	Individual initiative	Include voluntary acts of creativity and innovation designed to improve one's task or the organization's performance beyond their duty.	Organ 1988
	Voice	Making constructive suggestions rather than merely criticize.	Van Dyne and Graham 1992; George and Jones 1997
Dedication	Self-development	Voluntary behaviors to improve their knowledge, skills, and abilities.	Farh et al. 2004; Podskaoff et al. 2000
	Job dedication	Working hard, and taking the initiative to promote the	Van Scotter and Motowidlo 1996

organization's best interest deliberately.

Contextual factors of construction megaprojects and OCB

George and Jones (1997) note the importance of contextual factors as shapers of OCB. Contextual elements of construction megaprojects would shape participating entities' OCB connotation and presenting formats different from the general project and permanent organization context. These contextual factors mainly include diverse stakeholders and their inter-organizational social network, government's key role and high uncertainty.

Diverse stakeholders roles: the organizational field of construction megaprojects is constituted of all the participating entities encompassing government, owners, constructors, designers, supervisors, consultants, survey institutes, suppliers, relocation householders, monetary institutes, operators, the social public, and other organizations involved in projects life-cycle implementation (Shao 2010; Eweje et al. 2012; Flyvbjerg 2014; Hu et al. 2015). It is a critical management factor to develop brother/sister relationship/guanxi and long-term cooperation among different entities (Wang and Huang 2006; Mazur and Pisarski 2015). Participating entities come from different firms or organization and engage their behavior with heterogeneity (Hanisch and Wald 2014). These entities' value appeal always differs from their role and goes beyond the project scope.

Inter-organizational social network: Construction megaproject is an open and highly complex multi-organizational social network consisting of not only internal and external stakeholders but also the complicated relationships among them (Provan et al. 2014). This social network causes MOCB to happen at the inter-organizations level and beyond the traditional project organizational scope. Different from permanent business organizations, megaproject *per se*, rather than the project organization, is the core agent of inter-organizations network and responsible for providing society with public goods or services (Flyvbjerg 2014). The visibility of a particular future value introduced by megaprojects may be more attractive than project organization to stimulate participating

entities' behavior (Chi et al. 2011) . The prerequisite to the future value accomplishment is megaproject success. As construction megaprojects' organizational social network has open boundaries and high complexity caused by embeddedness in the wider exterior context, ambiguous hierarchies and role boundary, much of inter-organizational collaboration is intended to be grounded more on informal and less on formal channels, however generally it was multiple and unpredictable (Bakker 2010; Hanisch and Wald 2014) .

Government's leading role: Government always plays an important and even dominant role in construction megaproject. Megaprojects are always initiated by a government and the tools of strategy realization for the government or social organizations (Eweje et al. 2012). Host governments always proposed challenging project requirement and hold the power on goal setting. Administrative power and political element can also influence participating entities' behavior (Boateng et al. 2015). The decision mechanisms of host governments often can lead to significant complications (McKenna et al. 2006). Owners are special purpose vehicle (SPV) organized by host government (Hu et al. 2015), many of the other participating entities were either stated owned entrepreneur (SOE) or have too much connection with the government (Chi et al. 2011; Hu et al. 2015). Multiple governmental parties often are involved in megaprojects, including authorities, agencies, lobbyists, and administrative personnel. Furthermore, project progress is dictated by not only alignment under political agendas but also formalized communication and collaboration mechanisms among them (Patanakul et al. 2016). Consequently, government relations management is one of greatest challenges on megaprojects (Eweje et al. 2012).

High uncertainty: the megaprojects in question were subject to a great deal of uncertainties. Project scope and ambition level typically change notably over time, and statistical findings show that unplanned incidents are often creating improper time and budget contingencies (Flyvbjerg 2014). Megaprojects are generally filled with political, social,

economic, technical and environmental challenges to project management, with over occurrence of so called “black swans” (Boateng et al. 2015; Flyvbjerg 2014); Entrusted by internal and external stakeholders, project managers work as an agency for managing uncertainty, do not limit the project organization within the boundaries of his/her own entity organization, but also includes other key stakeholders as part of the whole (Wang and Huang 2006) . Their preoccupation must focus not on project organizational longevity but on the need to reduce uncertainty about the external environment to accomplish the whole project benefit (Turner and Muller 2003; Ferreira et al. 2014) . Tasks are unique or non-routine, highly uncertain and unrepeated (Engwall 2003; Flyvbjerg 2014), project management has to be considered as being contextually dependent and continuously contingent on environmental relations (Söderholm 2008) . Under considerable uncertainty, mutual support and collaboration is the key of cooperation quality (Dietrichl et al. 2010) ;collaboration derives mainly from a network of social interactions and interdependence (Alojaiiri and Safayeni 2012), and are contingent on the circumstance (vom Brocke and Lippe 2015) .

Such contextual elements might pervasively condition the meaning and types of MOCB different from those described in the existing OCB literature. We expect to find MOCB that (a) extends beyond considerations for project organization scope and directed toward a network of overall stakeholders; (b) happens at inter-organizational level with more flexibility and continuous contingency; (c) indicates concern for harmonious inter-organizational network relationships. As a result, MOCB is more complexity led by above context characteristic and could not be explained directly by theory result in firm organizational context (Blatt 2008) .

Research Methods and Process

This study is part of an industrial investigation on the state of MOCB and engagement practices in the construction megaprojects field. Deriving from [Organ \(1988\)](#) OCB definition at the individual level, participating entities' positive behavior that is discretionary, not directly or explicitly recognized by the formal contracts and project management institution, and that in the aggregate facilitates achievement of construction goal effectively was employed to describe MOCB in this study. MOCB is still not embraced in traditional project management but is actually found in practice, to identify the major MOCB formats, we used an inductive approach, which called for collecting descriptions of behavioral events gathered from open resource and then dividing them into a number of types by content analysis with an agreement index constructed using multiple judges ([Kerlinger 1986](#); [Hinkin 1998](#)). This approach is appropriate because there is a little theory to guide a priori notions about specific forms of MOCB (*cf.* [Hinkin 1998](#)). MOCB is a new and abstract concept in construction megaprojects, a complete random sampling method could not be utilized to extract enough MOCB cases reported by practice documents or provided industrial practitioners observation (*cf.* [Farh et al. 2004](#)). The introduction shows the labor contest is a good resource to observe MOCB, we sampled a diverse group of Chinese typical construction megaprojects where a labor contest was held to motivate participating entities positive action related to OCB. We then presented two PhD students with a list of types in Table 1 and a broad definition of OCB based on [Organ \(1988\)](#), and then asked them to gather examples of MOCB that they observed in practice by open resource. We then conducted face-to-face expert interviews to investigate their opinions on MOCB phenomenon and require that they give MOCB examples in their ongoing or completed megaprojects. We went on with a classification work and item selection based on events content analysis and literature review, which culminated in 6 OCB types. We also used industrial and academic experts' interview to examine the inductive study

reliability with an agreement index. According to similar research by (Farh et al. 2004; Braun et al. 2012; Wong et al. 2011) , this study was divided into two stages as follows.

Stage I: A MOCB framework in construction megaprojects

To identify the major representative types of MOCB, we firstly collected descriptions of behavioral events from open resource and proceeded with classifying them into a series of categories by content analysis (Hinkin 1998; Kerlinger 1986). Expert interviews were conducted to cover gaps between the literature and industrial context. Based on a literature review about the dimensions definition and relationship analysis, the six types of OCB were identified in Table 1 as theories foundation to support following expert interviews and events collection in stage I.

Step 1 includes semi-structured industrial experts' interviews in construction megaprojects. To fit better in with industrial practice, a number of semi-structured interviews were conducted in person between November 2014 and June 2015. Twenty-six experts, with more than 8 years of megaproject management experience, participated in the interview. They were requested to provide opinions on the constructs and study topics listed, and propose MOCB examples they have encountered in their megaproject practice. The interviewees were selected by a purposive method and limited to organizational middle and top managers. The interviewees consisted of 3 officials in host governments, 7 owners, 3 contractors, 1 designer, 3 supervisors and 9 consultants. They occupied different roles, which could augment the heterogeneity of the interview profiles and thus enhanced the validity of interviews. Finally, the results consisted of a 210,000 word interview record and 40 MOCB events. Most of the experts pointed out that MOCB was meaningful but did not belong to traditional project management. Additionally, they stated that our investigation really shouldn't neglect labor contest held by many megaprojects to motivate participating entities' passion for a task; this activity could help us better understand the nature of MOCB in this certain context and gather

examples.

Step 2 includes MOCB event collection in construction megaprojects. During seven months between February and September 2015, two PhD students completed MOCB events collection by open resource including megaproject website, reports, books, newspapers and internal project publishing according to the behavior definitions included in Table 1. Based on expert opinions, our target projects firstly focus on these megaprojects that hold labor contests, e.g.2010 Shanghai Expo and Hong Kong-Zhuhai-Macau Bridge. Finally, 612 MOCB events were obtained from 18 construction megaprojects/ portfolios as shown in appendix A, including 4 transportation projects, 3 long and large scale bridges, 4 water projects, 3 large contests and exhibitions projects, 2 skyscraper buildings. Ten among them held labor contests. Their roles covered owners, general contractors, subcontractors, designers and supervisors.

Step3 involved forming six types of MOCB. A total of 652 MOCB events were generated by step1 and step2. A screening panel of Two-PhD students coded these events and then classified the 652 items into categories based on similarity of item content and definitions in Table1. These events that were difficult to classify would be left alone. The two authors screened all items based on two criteria (Farh et al. 2004): (a) the item statement must have distinct meaning; and (b) the item must refer to participating entities' behavior. 57 incidents (8.7%) were considered “non-usable” (ambiguous meaning or did not refer to a behavior) and were discarded, resulting in 595 usable events. After several rounds, they agreed on a 25-category system, which could divide all 595 usable events into five mutually exclusive types. Taking consideration that open resource channel limitation possibly could lead to missing certain behavior types, these two Chinese authors compared 25-category system with items pool in literature mentioned in Table 1, added item “taking steps to prevent the creation of problems for other participating entities” (coded as CCL6) and item “never backbite other

participating entities or the project” (coded as HGM5), resulting in 27 items pool as preliminary measurement items of MOCB as shown in Table 2.

Table 2 MOCB Categories and Dimensions

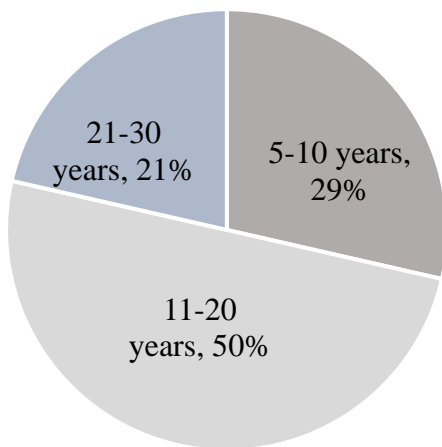
	Code	Categories for incidents	Incidents' frequency	Percent	Experts agreement	Percent	
<i>MOCB</i>	<i>Compliance behavior (PC)</i>	PC1	Compliance with task schedule	33	6%	9	64%
		PC2	Compliance with managerial requirement	15	3%	12	86%
		PC3	Compliance with project objective	68	13%	11	79%
		PC4	Obedience with governmental task-related requirement	24	5%	11	79%
	<i>Contingent collaboration behavior (CCL)</i>	CCL2	Giving flexible convenience at interface and between construct process	20	4%	11	79%
		CCL3	Contingent assistance to solve difficulty for other participating entities	29	5%	8	57%
		CCL4	Sharing useful information and experience	21	4%	8	57%
		*CCL5	Help settle conflicts among participating entities	1	0%	12	86%
	<i>Conscientiousness behavior (CB)</i>	*CCL6	Taking steps to prevent the creation of problems for other entities	0	0%	7	50%
		CB1	Willing to accelerate the completion of tasks without extra payment	40	7%	10	71%
		CB2	Voluntary effort to perform in accordance with higher requirement without supervisors	22	4%	7	50%
		CB3	Investing more resource to support task accomplishment	22	4%	8	57%
		CB4	Active team's skills training	41	8%	8	57%
	<i>Harmonious guanxi maintenance (HGM)</i>	CB5	Attending meetings and activities positively	14	3%	11	79%
		HGM1	Keeping harmony with government units related to megaproject	3	1%	14	100%
		HGM2	Actively building harmony with external stakeholders(e.g. surrounding residents)	30	6%	13	93%
<i>Initiative behavior (IB)</i>	HGM3	Neglecting personal conflicts with stakeholders in order to maintain harmony	35	7%	11	79%	
	IB1	Raising suggestions to improve task efficiency and quality	48	9%	9	64%	
	IB2	Active adoption of advanced managerial and technology method(e.g. BIM)	16	3%	8	57%	
	IB3	Point out some potential improvement	15	3%	9	64%	
<i>Dropped items</i>	IB4	Voice that contribute megaproject implement even without asking to do	21	4%	7	50%	
	CCL1	Routine breaking to assure task completion	8	1.5%	2%	14%	
	CB6	Willing to take extra project task	8	1.5%	2%	29%	
	HGM4	Maintain relationship even beyond the project termination	5	0.9%	1%	29%	
		HGM5	Never backbite other participating entities or the project	0	0.0%	0%	36%
	Total		539	100%	—	100%	
<i>Dropped type: Job dedication (JD)</i>	JD1	Sacrificing family responsibility for project benefit	28	—	4	29%	
	JD2	Insisting working even being ill	28	—	0	0%	
	Total		595	—	—	—	

*Note: CCL1, CB6, HGM4, HGM5 were deleted for less than 2.5% of items and less than 50% of experts' agreement ;type of job dedication were deleted by experts' opinion ;CCL6 and CCL5 were added by literature.

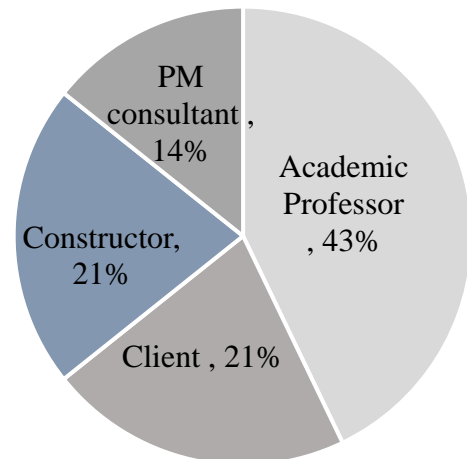
Stage II: Reliability Test based on industrial and academic experts' interviews

To test the reliability of our designated categories, we referred to not only (Fath et al. 2004) business study on OCB in Chinese field but also Liu et al. (2004) and Le et al. (2014) , both were similar explosive case studies in project management, where expert interviews was conducted to revise the items. We invited further 14 experienced academic and industrial experts to serve as test judges. Firstly, we emailed the revised list of behavior items that resulted from the stage I to the 14 experts and acquaint them with the research topics. Secondly, two weeks later, each interviewee was requested to complete a face-to-face discussion. They were required to provide opinions on the constructs validity and item statement, and then presented their affiliated measurement items in terms of agree or disagree that indicated which items should be included in the final items list. Finally, the discussion results included 100 thousands of words record and items scores.

To ensure the reliability and quality of interviews, the selection of interviewees considered



Experts' experience years in construction megaprojects



Experts' roles in construction megaprojects the diversity of experience

backgrounds and professional expertise of experts, which could improve the heterogeneity of the interview background and thus bettered the validity of interviews. Fig.1 shows the backgrounds of interviewees. The 8 industrial interviewees had at least 8 years of experience and senior management positions in construction megaprojects. They consisted of 2 owners, 3 contractors and 3 consultants. And the whole of 6 academic experts were professors working on research in large scale and complex projects from excellent universities in China.

Fig.1. Experts background information in stage II

Background information of portfolio experts' experience involved in stage II :

- 2010 Expo Shanghai
- Shanghai Hongqiao international traffic hub
- Shanghai Pudong International Airport
- Shanghai Caohejing Hi-Tech Park
- Shanghai International Finance Centre (IFC)
- Eastern Nanning high-speed rail station
- Shanghai West Bund media harbor

- Shanghai Disneyland OC1 section
- Hongkong-Zhuhai-Macau Bridge

For the sake of scientific parsimony, we set out to reduce the types to a more manageable number using two guiding principles. First, we collapsed conceptually similar formats into broader, more abstract categories. Second, we rejected formats that had very few items or little expert agreement. Our working assumption was that if a category or dimension had less than 2.5% of events (Farh et al. 2004) and less than 50% of experts' agreement(Liu et al. 2004), it suggested that most experts did not regard such behavior as MOCB, and that such behavior happened relatively infrequently.

Result

Forming MOCB Five Types

According to discussion feedback, 14 of the experts in this stage thought that absolute dedication was not sustainable and just an individuals' action, rather than participating entities' behavior. The dedication was also seldom mentioned in recent literature (Podskaoff et al. 2000; Podskaoff et al. 2014) . Therefore, this type of behavior that captured 2 items (JD1 and JD2) and 56 events was discarded, resulting in 5 usable types, 25 items and 539 incidents available. Table 2 presents a description of the 25 categories, frequency of distribution of both the 14 experts' agreement opinions and 539 events. The items CB6 “ willing to take extra project task”(encompassing only 1.5% of events, easy to venture out of control and not advocated), HGM4“maintain relationship even beyond the project termination”(encompassing only 0.9% of events and not related to project)、 HGM5 “never backbite other participating entities or the project”(no events and just individual behavior), CCL1“ routine breaking to assure task completion” (encompassing only 1.5% of events, and easy venture out of control and not advocated) were eliminated using the guiding principles; the added CCL6 and CCL5 that had

few events were retained because they received more than 50% of votes from the experts; All the items statements were simplified by discarding unnecessary explanation, named final each categories as broader, more abstract concept. Finally, a total of 21 clear categories, 5 types were included in valid items pool for subsequent analysis, see Table 2. Five types MOCB were named contingent collaboration behavior, compliance behavior, harmonious “*guanxi*” maintenance behavior, initiative behavior, conscientiousness behavior.

The first type is contingent collaboration behavior (CCL) : Behavior that indicates participating entities’ willingness to flexibly assist others and collaborate even without explicit description in formal contacts, such as giving flexible convenience at interface and between construct process (CCL2, 20 events, 11 experts support), contingent assistance to solve difficulty for other participating entities (CCL3, 29 events, 8 experts support) ; sharing useful information and experience (CCL4, 21 events, 8 experts support), help to settle conflicts among participating entities (CCL5, 1 events, 12 experts support), taking steps to prevent the creation of problems for other entities (CCL6, added, 7 experts support) ; This type totals 71 events (16.5%). The contingent collaboration behavior is derived from helping behavior in Table 1. However, participating entities’ collaboration in construction megaprojects is more complicated in content than individual helping’s counterparts in that it happened at inter-organizational level and pay more attention on contingency continuously on situation.

The second type, compliance behavior (PC), refers to voluntarily compliance with rules, norm, procedures and their internalization in participating entities’ behavior without supervision, totaling 140 events (26%, the most percent). For instance, compliance with task schedule (PC1, 33 events, 9 experts support), managerial requirement (PC2, 15 events, 12 experts support), project objective (PC3, 68 events, 11 experts support), and governmental task-related

requirement (PC4, 24 events, 11 experts support). The last item goes beyond project task scope and extends into social network including government who did not attend directly project implement, which is quite different from OCB in literature.

The third type is harmonious *guanxi* maintenance (HGM), referring to behavior that is aimed at positively facilitating and preserving harmonious formal and informal relations / *guanxi* with internal and external stakeholders around a megaproject, which refers to keeping harmony with government units related to a megaproject (HGM1, 3 events and 14 experts support), actively building harmony with external stakeholders (e.g. surrounding residents) (HGM 2, 30 events and 13 experts support), neglecting personal conflicts with stakeholders in order to maintain harmony (HGM 3, 35 events and 11 experts support). This type totals 68 events (13%). However, here *guanxi* is broader in scope than relationships in the Western counterparts in that it includes informal elements beyond formal contract.

The fourth types is initiative behavior (IB) that describes task-related action of voluntary creativity and innovation designed to improve project performance beyond the minimal expected requirement levels; this type included 100 events (19%). This behavior refers to raising suggestions to improve task efficiency and quality (IB1, 48 events, 9 experts support), active adoption of advanced managerial and technology method (e.g. BIM) (IB2, 16 events, 8 experts support), pointing out some potential improvement (IB3, 15 events, 9 experts support), voice that contribute megaproject implementation even without asking to do (IB4, 21 events, 7 experts support). This one is most similar with OCB in literature.

The last type, conscientiousness behavior (CB), refers to behavior that participating entities try their best to complete task to the most degree and beyond minimum requirement without monitoring, totaling 139 events (25.8%). This type contains 5 items and was almost as popular as

compliance behavior (PC). It includes: willing to accelerate the completion of tasks without extra payment (CB1, 40 events, 10 experts support), voluntary effort to perform in accordance with higher requirement without supervision (CB2, 22 events, 7 experts support), investing more resources to support task accomplishment (CB3, 22 events, 8 experts support), Active team's skills training (CB4, 41 incidents, 8 experts support), attending meetings and activities positively (CB5, 14 events, 11 experts support). Seemly, CB3 is one extended item from OCB in literature.

Extended content of MOCB

By contrast, while OCB in business firm always directed toward coworkers or organizational well-being (Podskaoff et al. 2014), and directed toward one or more projects in the general project field (Braun et al. 2013), MOCB is to direct toward broader social networks constituted of both internal and external stakeholders, including government, megaproject, other relative participating entities, social-public institutions and so on, and its core is megaproject benefits. Different from helping behavior in Table1, this similar type of MOCB presented as contingent collaboration, a kind of flexible inter-organizational behavior contingently on situations. Harmonious *guanxi* maintenance was evolved from keeping relationship. Here *guanxi*, rather than the relationship based on formal contract, covers both formal and informal ties among participating entities that happened and was further strengthened during the project implementing stage. Beyond traditional project organizational scope, harmonious *guanxi* maintenance happened not only with other participating entities but also with other stakeholders in the inter-organizational network, e.g., governmental sectors, residents surrounding the project. Objects that participating entity's comply with also extended to host governments beyond the project boundary; The type of conscientiousness behavior was quite popular (139 events, 25.8%) in this field, excepting for the similar content with Table1, investing more resource to support

task accomplishment (CB3) was also included. Among these five types of MOCB, compliance behavior was the most popular based on incidents percentage (26%) and experts' agreement (more than 64%).

Discussion

Using an inductive approach to explore the state of MOCB practice in construction megaprojects, we identified 5 major MOCB types. Under the influence of construction megaprojects context factors, each type of MOCB presented unique meanings and extended features. Fig.2 show MOCB model and their utmost obvious characteristics.

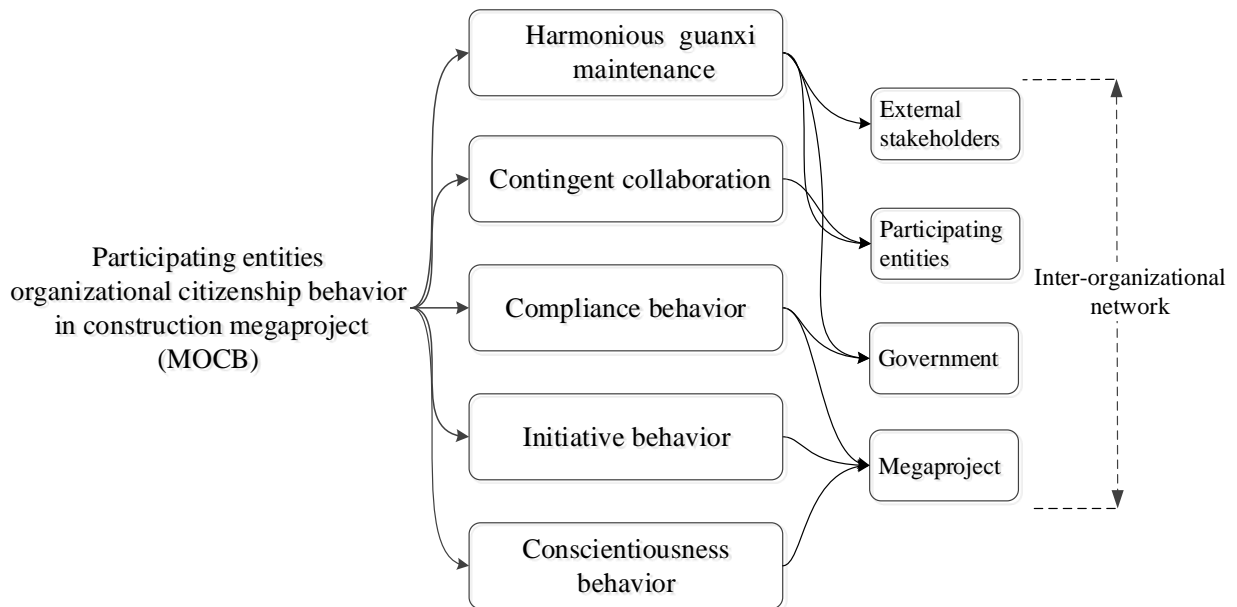


Fig.2. MOCB model in construction megaprojects

Contingent collaboration behavior has become the center of currently new project management paradigms. Participating entities in construction megaprojects are composed of diversely different professional firms (Hanisch and Wald 2014), their task interdependency and considerable uncertainty create collaboration needs between inter-organization (Hoegl et al. 2004) , collaboration is prerequisite to avoid conflicts and deal with uncertainty (Eweje et al. 2012; Hu et al. 2015) . Project parties will have to coordinate their actions in terms of who will

provide what assistance and when to the party asking for it. This is the reason that reciprocal helping between participating entities is obviously distinctive from individuals' altruism and necessarily emphasizes the collaborated nature of actions (Alojaiiri and Safayeni 2012; Crawford and LePine 2013) . Therefore, the degree of participating entities' effective altruism exists at inter-organizational level as the extent to which their coordinated altruistic actions are observed (Li et al. 2014) . Megaprojects always confront considerable uncertainty, e.g. the project scope will typically change over time (Flyvbjerg 2014) , project management faces even more emergency from social transitions (Hu et al. 2015), it is inevitable that too much situation is lack of clear and explicit description in contract in advance, collaboration between inter-entity must be discretionary and timely contingent on changing circumstance (Azhar et al. 2014; vom Brocke and Lippe 2015) .

Regarding compliance behavior, different from common projects, objects of compliance in construction megaprojects are not limited to the traditional project itself but extending into multivariate organizations network including many stakeholders. Most of megaprojects are public goods or services and instruments of strategy realization for government sectors, it is inevitable that major decision and management are susceptible to many internal and external factors (Eweje et al. 2012; Flyvbjerg 2014) . Most of experts argued that these factors connected mutually in the opening inter-organizational network where administrative system, including agencies, authorities, and administrative personnel, coexisted with project management system by market principle. Administrative system take charge of major decision and played an important role in facilitating project execution and coordinating the relationships with key external stakeholders (e.g. Hu et al. 2015), project management system engaged financing, construction management and operation (e.g. Hong Kong-Zhuhai-Macao Bridge Authority). Key

project managers take double roles or positions in governmental sectors and project management system (Hu et al. 2015), and the interview show that participating entities chose to comply with administrative power on the purpose to integrate necessary resource (PC4) and with market principle to optimize resource allocation, they must depend on these “two backers”.

Harmonious *guanxi* maintenance behavior is great behavior strategy of managers in megaprojects (Mok et al. 2015). This type originated from keeping organizational climate of civic virtue (Organ 1988) and is action for long term consideration. More than 80% of experts pointed out *guanxi* harmony-related activities make up the utmost important part of MOCB. Developing with other participating entities brother/sister *guanxi* and long-term cooperation also is an important objective for project managers (Wang and Huang 2006), such high quality *guanxi* entails reciprocal taking and giving and helps to moderate the conflicts and tension among stakeholders (Chen and Partington, 2004; Xue et al. 2010). This is also the condition where they know well about their advantages and further build trust that result in long term cooperation spontaneously (Smith et al. 1995; Braun et al. 2013).

Initiative behavior included voice and self-development (George and Brief 1992; Farh et al. 2004). Megaprojects’ technology and designs are often non-standard and as such megaproject management faces even more uncertainty from social transitions (Brockmann and Girmscheid 2007; Flyvbjerg 2014). Task schedule and quality should take higher priority; keeping projects on time and without cost overrun relies on creative contributions of multiple participating entities (Maier and Branzei 2014). Usually high time pressure and task uncertainty generate systemic influences, e.g. it is necessary and useful to overcome inertia (Lundin and Soëderholm 1995; Eweje et al. 2012). Project teams focus more on adopting a more heuristic way of exploring

potential improvement opportunities, e.g. advanced task processing technology and proposing voice to reform management method (Bakker et al. 2013) . However, most experts thought that great technology innovation should not be viewed as MOCB, which usually were accomplished by formal special funding program and therefore did not go beyond contracts.

Conscientiousness behavior more or less is disputed for duty always is viewed as in-role task (Organ 1988). Actually, here conscientiousness behavior means discretion regarding effort, because even though participating entities' responsibilities are usually well specified in contracts, effort is typically less so (Organ 1988; Li et al. 2014). The result show that 25.8% of events and more than 50% of experts' agreement show that conscientiousness engagement were quite popular among participating entities in construction megaprojects. Firstly, megaprojects are unrepeated and always public goods (service) (Flyvbjerg 2014) , and will attract high social public media and community attention, project implement success have significant social and economic impacts therefore it will cause a more severe dampening effect than common projects once failed (Mok et al. 2015).“No party could take the responsibility for any failure” (one expert said), as a result, to guarantee project success possibility, the participating entities will do their best. Secondly, megaprojects success could portray a positive brand image for participating entities and mean some implicit value in the future, e.g. future business opportunities (Heere and Xing 2012) , political promotion (Flyvbjerg 2014). Therefore, even without supervision and formal reward, they still work their best, comply with strict task requirement without extra payment, and even invest plenty of resource to support project implement.

Among five types of MOCB, compliance behavior was the most popular. The reason mainly relies on the government role in projects according to interviews. Interviewed experts point out, firstly, that a host of megaprojects are in government sectors that give important effect on project

management, where the use of power or politics give project management absolute authority and power advantage (Wang and Huang 2006; Müller et al. 2014). And most of experts pointed out, the role of government can make compliance behavior more important. Secondly, this study context is the developing country China where popular system administrative advantages results much more compliance with the authoritarian political system (Wang et al. 2013). Thirdly, in construction industry of developing countries, contract management and legal system is still not sound or reliable, unlike mostly dependence on formal contracts in western developed countries, project implementation always depend on organizational flexibility in task arrangement which is unnecessarily consistent with signed contracts and taken for granted by most of participating entities.

Fig.2 show utmost obvious characteristics of MOCB. The first one is that MOCB extends beyond considerations for project scope and directed toward network of overall stakeholders. Diverse objects of this behavior include task/ megaproject, government, participating entities and external stakeholders. The former three objectives belong to megaproject organization, and the four objects constitute of megaproject network. Therefore, both initiative behavior and conscientiousness behavior direct toward task in the scope of megaproject. The objectives to compliance with are task and government including host government and local relative governmental sectors that are belong to megaproject organization scope and not directed toward by behaviors in common project filed. Contingent collaboration mainly occurs between and toward other participating entities rather than into the scope of any one entity's field. Harmonious *guanxi* maintenance involves others entities and relative government sectors, and even external stakeholders who constitute of megaproject network based on *guanxi* among them. Second, MOCB happens at inter-organizational level with more flexibility and continuous

contingency. Both actors and their behavioral objects (except megaproject task) are organizations with diverse backgrounds in the megaproject network that leave MOCB inter-organizational. Governmental sectors and external stakeholders lead this network to be open and more uncertainty, MOCB must be flexible and contingent on situations. Thirdly, MOCB indicates concern for harmonious inter-organizational network relationships. The behavior that associated with most number of objectives is harmonious *guanxi* maintenance. This type happens between governmental sectors, participating entities and external stakeholders that involve all the organizations in the megaprojects inter-organizational network. 80% of experts in Table 2 argued that the *guanxi* contains formal and informal inter-organizational connection among a great deal of stakeholders and has been one of most important behavioral content.

Conclusion, Limitation and Future Research

Based on (1) 652 incidents collection and classify, (2) 40 industrial and academic experts interviews, this study contributes to the knowledge body of construction megaprojects in three ways. First and foremost, our study verified that there were popular MOCB in construction megaprojects. MOCB is a kind of positive action or effort that benefits other participating entities and the whole of the megaproject. Actors must take charge of behavioral cost and even short-term benefits lost; this point does not comply with the traditional rational principle. Secondly, we identified five main types of OCB engaged by participating entities in construction megaprojects, including contingency collaboration behavior, compliance behavior, harmonious *guanxi* maintenance behavior, initiative behavior and conscientiousness behavior. In contrast with OCB in existing literature, MOCB is directed toward broader social inter-organizational network constituted of both internal and external stakeholders. The objective of compliance goes beyond the project boundary and extends to the host government. Inter-organizational

collaboration derived from helping and keep contingent on situations. Harmonious *guanxi* maintenance covered both formal and informal tie among participating entities, host government, external stakeholders. Conscientiousness was quite popular instead of opportunism, and even investing voluntary enough resource to support megaprojects. Thirdly, influenced by contextual factors, e.g. governmental leading role, diverse stakeholders, inter-organizational network, uncertainty, MOCB presented special characteristic: (a) extends beyond considerations for project organization scope and directed toward network of overall stakeholders; (b) happens at inter-organizational level with more flexibility and continuous contingency; (c) indicates concern for harmonious inter-organizational network *guanxi*.

Interpretation of the results of this research should be made on the basis of several limitations. Firstly, MOCB still does not belong to traditional project management scope. There is a lack of system statistics and document records; this study just is exploratory research, it is necessary to verify results in large scale empirical studies. Secondly, this study was conducted in a specific context in the Chinese construction industry. Larger variations by country do seem likely due to relatively few responses spread globally; this limits the generalizability of the findings. Nevertheless, Chinese construction megaprojects have pretty great scale and play more and more important role in global construction market, the result still is quite reliable for quite large scope and area; on the other hand, for country or area with obvious culture difference, it is possible to conduct multiple culture research based on this study result and analyze culture effect on MOCB. Finally, this study did not conclude the other key topics regarding MOCB, e.g. behavior drivers, influencing factors and effect on megaprojects management effectiveness, which really need to be conducted through deep empirical study to explain discipline behind MOCB in the future.

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Appendix A. List of 24 megaprojects where MOCB events have been collected in this study stage I.

#	Portfolio name	Investment (Billion)	No. of MOCB events	Portfolio types	Portfolio high profile
1	2010 Shanghai Expo engineering	4.4	97	Large exhibitions projects	National five-year plan
2	South-to-North Water Transfers mid-line I	14.0	95	Water projects	National five-year plan
3	Beijing-Shanghai high-speed rail	33.6	76	High-speed rail	National five-year plan
4	Three Gorges Dam	37.8	67	Water projects	National five-year plan
5	Qinghai–Tibet railway section 2	5.0	59	Railway	National five-year plan
6	Hong Kong-Zhuhai-Macau Bridge	10.9	44	Long and large scale bridges	National five-year plan
7	2008 Olympic Beijing engineering construction	7.4	43	Large contests and exhibitions projects	National five-year plan
8	The West–East Gas Pipeline section 2	7.0	42	Energy facility	National five-year plan
9	Yangshan Deep-Water Port I	1.1	35	Harbor	National five-year plan
10	Shanghai Tower	2.2	20	Skyscraper buildings	Provincial five-year plan
11	Hangzhou Bay Bridge	2.4	14	Long and large scale bridges	Provincial five-year plan
12	Shanghai West Bund media harbor	1.5	10	Building complex	Local five-year plan
13	Qingcaosha water reservoir	1.2	3	Water projects	Provincial five-year plan
14	Shanghai Disneyland	0.3	4	Them playground park	Provincial five-year plan
15	Sutong bridge	0.1	9	Long and large scale bridges	Provincial five-year plan
16	China National Offshore Oil Corporation building	1.5	8	Skyscraper buildings	Local five-year plan
17	Shanghai public health center	5.2	8	Public health center	Local major project
18	Shanghai city mid-line elevated	7.2	7	Elevated high-speed drive	Provincial five-year plan

high-speed drive Pudong section

19	Shanghai Hongqiao international traffic hub	2.6	4	Transportation	Provincial five-year plan
20	Shanghai Pudong International Airport	3.2	3	Transportation	Provincial five-year plan
21	Zhengzhou metro line 1	2.3	2	Metro	Local five-year plan
22	Kunming metro line 2	4.0	1	Metro	Local five-year plan
23	South square of Shanghai west railway station	0.6	1	Railway station	Local five-year plan
24	The I-495 and I-95 Express Lanes	3.0	2	Express Lanes	Interstate program
Total			652		
