Project Management in the Chinese Construction Industry: Six-Case Study

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Abstract: Originating from the West, project management was introduced into China after the country's economic reforms in the 1980's and has since spread quickly throughout the whole country, particularly in the construction industry. However, despite the wide adoption of project management practices by construction organizations and the growing recognition of the importance of project management as an enabler of organizational success, empirical studies on project management in the context of the Chinese construction industry have been inadequate. This paper presents the results of an empirical study of six Chinese construction organizations in order to come to a more comprehensive and sophisticated understanding of project management practices in the Chinese construction industry. The findings revealed: (1) a good appreciation of the role of projects and project management and satisfaction with current project management practices; (2) 11 key aspects of project management implementation; (3) 12 resultant value and benefits; and (4) five aspects of the main challenges facing the organizations. Meanwhile, variations in project management practices and the resultant organizational value were identified, first between the three owner- and the three contractor-case study organizations, then between the two construction contractor organizations and the one design contractor organization.

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Introduction

Although China began to import certain concepts and skills of project management, such as PERT and WBS, from the West in the 1960's, these were confined to its major national research projects in the defense sector (Qiu 2001). It was only after the Chinese economic reforms of the 1980s that the Western originated project management concepts and practices became increasingly recognized as a management approach in China, particularly in the construction industry (Chen and Partington 2004).

China's construction industry performed quite poorly under the country's prereform central-planning system. Since the 1980s, it has carried out major reforms toward adopting a commercial approach, including the introduction of Western project management practices. It is now mandatory and a common practice for all Chinese construction organizations to adopt project management. However, despite the growing recognition of the importance of project management as an enabler of organizational success (Thomas and Mullaly 2007), empirical studies on project management in the Chinese construction industry have been inadequate and largely single faceted. This paper reports an empirical study of six Chinese project-based construction organizations in order to present a more comprehensive investigation of current project management practices in the Chinese construction industry and a sophisticated understanding of the resultant organizational value and benefits. More specifically, the aims of this paper are to identify (1) what are implemented in Chinese construction organizations in order to improve their organizational project management capabilities; (2) what important value and benefits project management implementation has created for these organizations; and (3) what challenges, if any, the organizations are facing.

Following this introduction, the section Project Management in the Chinese Construction Industry of the paper presents an overview of the historical background of project management in China's construction industry and the current literature relevant to construction project management practices in China. The section Research Methodology describes the research methodology including sample selection, data collection and data analysis. The section Research Results thereafter presents the research results. The section Conclusions of the paper summarizes the research results and discusses the implications of the results for management practice and future research. The paper ends with an identification of limitations of this research.

Project Management in the Chinese Construction Industry

As one of the oldest traditional industries that formed the backbone in China's economy, the Chinese construction industry has developed rapidly since the country's economic reforms in the 1980s (Low and Jiang 2003). It employed about 40 million people

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and contributed about 10%to GDP in 2006 [Ministry of Construction (MOC) 2007]. It performed quite poorly under China's pre-reform socialist central-planning system. With the progress of the economic reforms and the opening up policy since the 1980s, its management systems have changed tremendously toward a commercial approach and one major reform was the introduction of the Western originated project management concepts and practices. The World Bank also made a modest contribution to this process by introducing competitive bidding and international contractors for the first time in the Chinese construction industry on one of the bank's early projects, which is well known in the industry as the "Lubuge impact" (Yang 1987).

The Lubuge Hydropower Plant is located in China's Yun Nan province. In 1984, the Diversion Works of the hydropower development project obtained a loan from the World Bank. One of the World Bank's conditions for providing the loan was that the main contractor for the Diversion Works must be selected by international competitive bidding (ICB), which was the first time that an ICB was made in the People's Republic of China. Eight overseas and one Chinese state owned contractors submitted their tenders. Finally Japan's Taisei Construction Corporation won the contract at a price 43% lower than the estimates made by the Chinese government. For implementing the project, Taisei Construction Corporation sent a team of 30 to manage and control the project based on project management concepts and methods, and used the same Chinese contractor to undertake the construction works on site. Finally, the contract was completed 5 months ahead of schedule and to a good standard of quality (Lu 2004; Yang 1987).

The Chinese government and the whole Chinese construction industry were astonished by the outcomes of the project, which demonstrated the advantages of ICB and the project management approaches for cost effectiveness, quality control, and early project completion. The Chinese State Council sent a team of officers and experts to go to investigate and conclude the "Lubuge experience" and to reform the construction administration and management systems. Since then, Chinese construction organizations have come a long way toward adopting a commercial approach. Project management concepts and practices, after being piloted and proved as effective, have been widely pursued in the Chinese construction industry (Chen and Partington 2004).

It is now mandatory and a common practice for all Chinese construction organizations to adopt project management practices. In order to guide and monitor construction project management practices, the Chinese government has developed and has been continuously updating its laws and regulations pertaining to issues such as project owner-responsible systems [National Development and Planning Commission (NDPC) 1996], project contract systems [MOC 1993; National People's Congress (NPC) 1999], project bidding and tendering systems (NPC 2000), project supervision systems (MOC 1996), and many other management issues such as health and safety, and environmental protection. Meanwhile, an overall construction project management standard was first published in 2002 and then revised in 2006 (MOC 2006). In accordance with these governmental regulations and standards, Chinese construction organizations have established their own management processes, guidelines, and tools, and taken measures to improve their project management practices and capabilities so as to ensure the organization's success.

However, despite the wide adoption of project management practices within construction organizations and the growing recognition of the importance of project management in the Chinese construction industry, empirical management studies in this context have been inadequate. In particular, the few studies in the context of the Chinese construction industry are largely single faceted. For example, focusing on safety management, a study by Fang et al. (2004a) identified the key factors that influence construction safety management in China and presented a safety assessment method. Shen et al. (2004) investigated procurement management and identified the key assessment criteria for awarding construction contracts in China. Another study by Shen et al. (2006) examined Chinese contractor competitiveness indicators. Gale and Luo (2004) summarized factors that affect construction joint ventures in China. There are also several such studies with focus on risk management (Fang et al. 2004b; Tang et al. 2007), partnering mechanism (Tang et al. 2006), construction project managers' competence (Chen et al. 2008), cross-cultural management for China's international construction projects (Low and Leong 2000), and various topics on build-operate-transfer (BOT) construction projects in China (Chan et al. 2005; Wang and Tiong 2000).

While these studies have investigated single-faceted aspects and different levels of the construction management activities in China, there is a need for a more comprehensive and sophisticated understanding of current project management practices in the Chinese construction industry and the resultant organizational value and benefits, which have implications for both practice and further in-depth research.

Research Methodology

To serve the purpose of this research, the case study approach was adopted for its potential to provide rich understanding of the practice and value of project management in Chinese construction organizations. Within the case study research strategy, multifaceted data were collected from multiple instead of single respondents in each sample of case study organizations, which ensured that an organizational rather than individual profile of project management practices and the resultant value and benefits was developed (Harrison 2002; Tsai 2002). The sample, data collection and data analysis of this research are described next.

Sample of Case Study Organizations

Apart from accessibility to case study organizations and availability of the organization's top management support, which are very important in any case study research (Harrison 2002), two main criteria were considered in selecting the sample of case study organizations for this research: (1) they are project-oriented organizations and (2) they have put efforts, and/or are trying to put efforts, to improve their project management practices and capabilities.

A total of six Chinese construction organizations were selected as the sample of case study organizations for this research, among which three (Org1, Org2, Org3) are project development enterprises who are the owner of the projects, three (Org4, Org5, Org6) are contractor enterprises who undertake either construction works (Org4, Org5) or design works (Org6) for customers (usually the project owner). Variations in these six case study organizations allowed for cross-case analysis, which enhanced the validity of the research results and provided insight for future in-depth research. The similarities and differences in the characteristic of the six case study organizations are further discussed in the section of Research Results. The six case study organizations are briefly described in the succeeding sections.

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Org1: Hydro Project Development Co., Owner of the Projects Constructed

Org1 was established in the late 1980's to develop and construct a large and important hydropower project in China, which recorded the first full application of project management on all aspects and throughout the whole life cycle of a project in the Chinese construction industry. It was soon after the Lubuge impact (Yang 1987) that marked the first introduction of construction project management methods into China, as introduced earlier, when the Chinese government had decided to reform the construction management systems and was keen to learn advanced management concepts and approaches from the West. Another key driver for the full project management implementation on this project was to follow the requirements of the World Bank who provided two long-term loans for the project. This project has been fully completed and now the organization has got several other large hydropower projects under development and construction.

Org2: Hydro and Wind Power Project Development Co., Owner of the Projects Constructed

Org2 was established in the mid-1990's to develop and construct a very large and national important hydropower project in China. It was when project management practices had been piloted and increasingly recognized as an effective management approach in China and the government had started to gradually reform the construction management systems. Following this trend and the government's relevant laws and regulations, the organization has established its own project management processes, procedures, guidelines and templates, which, after being proven as effective on the organization's own project management practices, have contributed to the popularization and gradually standardization of project management practices in the whole Chinese construction industry. Now the organization has several large hydro and wind power projects under development and construction.

Org3: Hydro Project Development Co., Owner of the Projects Constructed

Org3 was established in 2003 as an ordinary hydropower project development company when project management has been mandatory and a common practice in the Chinese construction industry. The organization has completed two small-medium hydropower development projects and has currently several medium-sized hydropower projects under development and construction.

Org4: Construction Co., Contractor of Projects

Org4 was restructured from a military engineering construction department to a commercial construction enterprise entity in 1984. It started to adopt project management practices in the mid-1990's to follow the trend and the government's relevant regulations. As a construction contractor, the organization undertakes construction works for customers based on contracts signed between the two parties.

Org5: Construction Co., Contractor of Projects

Org5 was restructured from a governmental construction department to a commercial enterprise entity in 1984. Quite similar to Org4, it started to adopt project management practices in the mid-1990's to follow the trend and the government's relevant regulations. The organization is also a construction contractor who undertakes construction works for customers based on contracts signed.

Table 1. Summary of Interview Respondents and Their Demographic Information

		Senior management	Project manager	Project team member
Profile of interview respondents in each case study organization	Org1	5	4	2
	Org2	4	5	0
	Org3	3	4	1
	Org4	5	6	1
	Org5	4	5	0
	Org6	3	4	0
Total number of interviews (=56)		**24**	**28**	**4**
Age	Range	41–57	29–46	24–35
	Mean	46.6	38	29.8
Number of years in their current position	Range	1–9	1–18	2–11
	Mean	4.5	10.7	7.5
Number of years in the case study organization	Range	3–18	3–22	2–14
	Mean	7.5	14.1	8.8
Number of years in the construction industry	Range	11–34	7–25	2–14
	Mean	20.8	15.5	8.8

Org6: Design Institute, Contractor of Projects

Org6 was restructured from one division of a large governmental construction research institute to a commercial construction design enterprise in 2001, when project management has been mandatory and a common practice in the Chinese construction industry. Similar to Org4 and Org5, the organization's role is also a contractor. It undertakes construction design works for customers based on contracts signed between the two parties.

Data Collection

Three sources of data, namely, organizational background information, interviews, and surveys, were collected in each of the preceding six case study organizations and described respectively next:

1. Organizational background information of each case, including, but not limited to, the organization's overall statistics, governance structure, history of project management, management policies, management processes/guidelines/procedures/tools and so on, were gathered from interviews with senior management and project management staff, review of documents, and project files, and the researchers' observations.
2. Semistructured interviews were conducted with at least three senior management (including executives and human resource management), and four project managers and team members in each of the six case study organizations. A total of 56 interviews were conducted in the six organizations. The profile of all the 56 interview respondents in each case study organization and their demographic information are summarized in Table 1.

An interview guide was developed focusing on the following five key aspects:

- Respondent's perception of projects and project management for the organizational development and success.
- Respondent's description of project management practices in the organization and particularly in their own work.

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- Respondent's identification of the most important aspects of project management practices in the organization and in their own work.
- Respondent's identification of the resultant organizational value and benefits of project management implementation.
- Their identification of the main challenges facing the organization.

Open-ended questions around the aforementioned five aspects were used, and follow-up questions such as "Could you please give me an example?" "Could you explain that further?" were asked throughout each interview to further explore the meanings attached to the respondent's statements. All the interviews were conducted in the respondent's workplace either in the head office or on project sites. Each interview lasted about 1 h.

3. Surveys were conducted with project managers and project team members in the six case study organizations in order to triangulate and rank the results drawn from the interviews. The initial requirement that at least 30% of the total number of project managers and five project team members in each case study organization should respond to the survey was met in all the six organizations. The survey respondents did not overlap with the interviewees except in Org3 that had a total of 10 project managers and all the organization's 10 project managers, including the four already being interviewed, completed the survey form. The survey form was distributed and collected by the contact person appointed in each case study organization for coordinating and supporting this research.

A total of 136 surveys were completed in the six case study organizations, among which 89 were with project managers and 47 were with project team members. The profile of all the 136 survey respondents in each case study organization and their demographic information are summarized in Table 2.

Table 2. Summary of Survey Respondents and Their Demographic Information

		Project manager	Project team member
Profile of survey respondents in each case study organization	Org1	10	11
	Org2	14	11
	Org3	10	8
	Org4	25	7
	Org5	20	5
	Org6	10	5
Total number of surveys (=136)		**89**	**47**
Age	Range	28–50	21–39
	Mean	36.8	28
Number of years in their current position	Range	1–19	1–15
	Mean	12.3	6.8
Number of years in the case study organization	Range	3–23	1–16
	Mean	15	7.1
Number of years in the construction industry	Range	5–29	1–18
	Mean	16.8	9.3

Data Analysis

The aforementioned three sources of data were analyzed respectively, described next:

1. The organizational data gathered were categorized and captured using a structured form for each case study organization, which provided the contextual background for facilitating better understanding of other data and further discussion of the research results.
2. Interviews were the main source of data for this research. All interviews were recorded, transcribed, and then coded in ATLAS.ti 5.0 using primary codes derived from notes taken during the interviews and the process of transcription. As transcripts were coded, the researchers reviewed the data for emergent themes, which might suggest additional codes and modification to the primary codes used. Meanwhile, in reviewing the data and the coded statements (quotes), the basic principle of contextual analysis was followed so as to identify the meaning of a particular statement in relation to its context of the surrounding statements (Svensson 1989).

   Ultimately it was found that the primary codes were sufficient to capture the themes evident in the data. But modifications to the name of some codes were made in order to reflect its meaning more precisely. Further analysis resulted in grouping of codes as primary code families in accordance with the aims of the research, as well as in line with the focus of the interview guide described earlier. The codes and groups of code family are listed in Table 3. These groups of codes were also used to formulate the survey questions and to structure the presentation of research results.
3. Surveys were conducted in order to confirm and rank the results drawn from the interviews. The survey form contained 31 questions in line with the three groups of 31 codes as listed in Table 3, where participants were asked to respond to each item using a 1–5 ranked scale (typically from strongly disagree to strongly agree). Meanwhile, there was an "Other" section under each group of questions in the survey form to allow for capturing additional themes. The score for each item of all the 136 completed surveys was averaged for participants within each case study organization first, and then was averaged and compared across the six cases. The final results are described in the next section.

Research Results

Perception of Projects and Project Management Practices

All the six case study organizations are project oriented. Projects and project management are central to these organizations' activities. All the interviewees were first asked about their perception of projects and project management in their respective organization. And they all expressed a good appreciation of the role of projects and project management for their organizational development and success. Although some had certain complaints, some gave suggestions to further improve the organization's project management capabilities, and most talked about challenges facing the organization, all the interview respondents were largely satisfied with the current project management practices and capabilities in their respective organization.

These were further confirmed in the later surveys in that most of the 136 survey respondents ranked 4 (agree) or 5 (strongly agree) and none ranked 1 (strongly disagree) or 2 (disagree) for the following survey questions: "Projects provide important contribution to the organizational development and success"; "Project management provides important contribution to the organizational development and success"; "The organization's current

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Table 3. Codes and Code Family Groups

Primary code family	Codes
Perception of projects and project management	A1. Contribution of projects to the organizational success
	A2. Contribution of project management to the organizational success
	A3. Satisfaction with current project management practices (and the organizational project capability)
Key aspects of project management implementation	P1. Project manager role and responsibility definition
	P2. Project manager competence
	P3. Senior management support
	P4. Project management processes/ procedures/guidelines
	P5. Resource planning and management
	P6. Procurement/Contract management
	P7. Governance processes/structure
	P8. Stakeholder management
	P9. Team building/cohesion
	P10. Training
	P11. Software tools
	P0. Other
Value and benefits of project management implementation	V1. Better project control
	V2. Better multi-project co-ordination
	V3. Better organizational reputation
	V4. More stakeholder/client satisfaction
	V5. More effective communication
	V6. More staff satisfaction
	V7. Increased efficiency/profitability
	V8. Increased competitiveness/increased number of projects
	V9. Improved organizational culture
	V10. Improved resource utilization
	V11. Greater project transparency
	V12. Greater innovation
	V0. Other
Main challenges	C1. Market competition
	C2. Policy uncertainty
	C3. Stakeholder (relationships) management
	C4. Lack of competent staff
	C5. Alignment with organizational strategy and change
	C0. Other

project management practices and capabilities are satisfactory." Table 4 shows the average score of these three aspects of people's perception of projects and project management practices within each case study organization and the mean for them in all the six case study organizations.

Key Aspects of Project Management Implementation

All the six case study organizations have established their own project management systems, and have taken measures to continuously improve their project management practices and capabilities. From analysis of the interview transcripts, 11 aspects of project management were identified to be most important for all the organizations to achieve better project performance and to improve their project management practices and capabilities.

More specifically, the 11 key aspects include (1) well-established and user-friendly project management processes, procedures, guidelines and templates; (2) senior management support to project management teams and efforts to continuously improve the organization's project management capabilities; (3) clearly defined project manager role and responsibility; (4) attention to and effective stakeholder management; (5) effective resource planning and allocation management; (6) effective procurement and contract management, such as bidding plan, bidding documents compilation, contract negotiation, and management; (7) attention to and efforts for teambuilding and creation of a cohesive team culture; (8) effective training, on both internal management systems and advanced management concepts and practices; (9) customized and easily followed software tools; (10) effective governance processes and structure, in particular for large complex projects; and (11) competent project managers.

These 11 important aspects of project management were then confirmed and ranked in the surveys. It is worth mentioning that most of the 136 survey respondents ranked 4 (agree) or 5 (strongly agree) for each aspect and none ranked 1 (strongly disagree) or 2 (disagree). Table 5 shows the 11 aspects in decreasing order of the average score across all the six case study organizations ranked on a 1 to 5 scale.

Value and Benefits of Project Management Implementation

As noted earlier and illustrated in Table 4, all the six case study organizations are project oriented. Projects and project management implementation are highly valued in all the six organizations. Although their first adoption of project management approach was somehow enforced either by the lender (such as the World Bank) or by the government, all these six case study organizations have continuously put efforts to improve their project management practices and capabilities, and they are now all satisfied with the contribution of projects and current project management practices to their organizational development and success. Yet none of the six organizations has quantified or has even tried to quantify the value and benefits of project management implementation to their organization.

Nevertheless, from the interviews, 12 aspects of qualitative value and benefits were identified, which were then confirmed and ranked in the surveys, listed in Table 6 and illustrated next. One survey respondent from Org1 added "Better quality assurance" in the Other section of this part of the survey form. This however has been covered in "Better project control" which in-

Table 4. Perception of Projects and Project Management Practices (on a 1 to 5 Scale)

	Org1	Org2	Org3	Org4	Org5	Org6	Mean
Contribution of projects	4.95	4.92	4.89	4.97	5.00	5.00	4.96
Contribution of project management	4.85	4.80	4.56	5.00	4.96	4.20	4.73
Satisfaction with current project management practices	4.29	4.40	4.28	4.63	4.56	4.63	4.47

Table 5. Key Aspects of Project Management Implementation (on a 1 to 5 Scale)

	Org1	Org2	Org3	Org4	Org5	Org6	Mean	Rank
Project management processes/procedures/guidelines	4.67	4.72	4.72	4.63	4.40	4.67	4.64	1
Senior management support	4.57	4.60	4.83	4.69	4.56	4.33	4.60	2
Project manager role and responsibility definition	4.62	4.60	4.56	4.72	4.64	4.40	4.59	3
Stakeholder management	4.57	4.64	4.72	4.63	4.60	4.07	4.54	4
Resource planning and management	4.72	4.80	4.44	4.25	4.40	4.27	4.48	5
Procurement/contract management	4.29	4.40	4.28	4.69	4.80	4.00	4.41	6
Team building/cohesion	4.52	4.56	4.00	4.13	4.28	4.33	4.30	7
Training	4.42	4.60	4.28	4.09	4.16	4.20	4.29	8
Software tools	4.24	4.64	3.94	4.56	4.08	4.07	4.26	9
Governance processes/structure	4.52	4.56	4.11	4.00	4.28	3.80	4.21	10
Project manager competence	4.29	4.28	4.28	4.25	4.16	3.93	4.20	11

cludes control of all aspects of the project such as cost, time, quality, and safety. It is also worth mentioning that most of the 136 survey respondents ranked 4 (agree) or 5 (strongly agree) for each of the 12 types of value and benefits and none ranked 1 (strongly disagree) or 2 (disagree). Table 6 shows the 12 aspects of value and benefits in decreasing order of the average score across all the six case study organizations ranked on a 1–5 scale.

In order to illustrate the earlier described key aspects of project management practices and the resultant value and benefits, some typical examples of statements by the interviewees are demonstrated next.

Better Project Control

"Some contractors do not have a lot of project management experiences. The established site supervision and control process have provided them with a well structured format to follow and have guaranteed the construction quality, and have also facilitated cost control and time control" (Org1PM1).

"Now we have less, concise, and easily followed documents for everyone to follow. We have also complied standard templates. It is very easy now for all levels of control over the project " (Org6Senior1).

Better Organizational Reputation

"Project management approaches had been pioneered in China through our first hydropower project. At that time people from all of the country came to learn from our project management experiences. Now, we (the company's name) have become a well known label for advanced construction project management practices and we are proud of our good reputation and project management capability. So the value is really the creation of such intangible assets" (Org1Senior3).

"Our professional and consistent manner in managing projects has built us very good reputation in project management capability. We had been the best in construction technology and now we can say that we have become the best in effective construction management as well" (Org4Senior2).

Increased Efficiency/Profitability

"The formal and careful use of project management methods and tools has allowed improvements in the efficiency and profitability of projects and has helped to raise our profile as a well-organized and disciplined company" (Org3Senior2).

"We have established and standardized our project management processes, which has helped ensuring high efficiency in our work. We advocate high efficiency in our work . . . we must be very efficient, to save time and cost while ensuring quality" (Org2Senior4).

Table 6. Value and Benefits of Project Management Implementation (on a 1 to 5 Scale)

	Org1	Org2	Org3	Org4	Org5	Org6	Mean	Rank
Better project control	4.57	4.80	4.56	4.69	4.72	4.60	4.66	1
Better organizational reputation	4.76	4.88	4.72	4.56	4.40	4.47	4.63	2
Increased efficiency/profitability	4.42	4.56	4.56	4.63	4.60	4.40	4.53	3
Greater project transparency	4.57	4.56	4.28	4.69	4.56	4.27	4.49	4
More stakeholder/client satisfaction	4.62	4.72	4.44	4.56	4.28	4.33	4.49	4
Increased competitiveness/increased number of projects	4.42	4.40	4.38	4.66	4.56	4.47	4.48	6
More effective communication	4.38	4.60	4.11	4.63	4.64	4.40	4.46	7
Better multi-project co-ordination	4.85	4.64	4.44	4.25	4.08	4.27	4.42	8
Improved resource utilization	4.67	4.56	4.50	4.13	4.09	4.07	4.34	9
Improved organizational culture	4.29	4.27	4.28	4.56	4.40	4.20	4.33	10
More staff satisfaction	4.24	4.28	4.00	4.25	4.33	4.63	4.29	11
Greater innovation	4.19	4.33	3.94	4.09	4.16	4.67	4.23	12

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Greater Project Transparency

"The standardized processes and templates can improve consistency and transparency and make it easier to trace back the basic calculations or the intermediate outcomes when necessary, in particular for preparing final drawings at the end" (Org6PM2).

"We have updated the project management systems based on our company's current situations and tried to provide templates and detail procedures for every project team to follow and to communicate with the head office. This has improved transparency and clarity" (Org1Senior3).

More Stakeholder/Client Satisfaction

"Many contractors are involved in the construction works, and there are always a lot of interfaces among different parties' works on site. So when a new contractor joins the works, we give them the manual that shows the detailed management processes and we explain to them what they should do to follow the process. This makes all parties' works much easier, and all contractors appreciate our approaches very much" (Org2PM1).

"The payment software saves time and provides every contractor a common template to follow, which has also helped to avoid rework" (Org3PM4).

"We started to adopt project management concepts and practices to follow the government's regulations about implementing project management approaches in all construction works. Meanwhile, we have also continuously put efforts to improve our project management capability so that we can be more competent in meeting the time, scope, and budget constraints to the customer's requirements and to all stakeholders' satisfaction" (Org5Senior1).

Increased Competitiveness/Increased Number of Projects

"Having successfully built the (name of the famous project) Project, we have acquired project management skills for developing world-class large hydropower schemes and we have got our staff trained on project management practices. With our advanced project management capabilities and increased competitiveness, we have achieved the government's authorization for undertaking further hydropower development projects on the River" (Org1Senior2).

"We have shown our project management capabilities during the two completed projects, which has helped the company to win several new projects" (Org3PM1).

More Effective Communication

"TGS (name of the software) makes it easier for the project site team to communicate with the head office, and I think it is also easier for the senior management to trace and check the progress of project works" (Org2PM3).

"With the current project management quality control manual and the standardized templates to follow, people all speak the same language about project management now" (Org6PM2).

Better Multiproject Coordination

"TGS (name of the software) can copy the system when the organization or management structure changes or varies, we actually have done such changes several times and it really worked. So it is now adapted according to the company's current multiproject management systems and has ensured better coordination among projects" (Org2Senior1).

"The Four Systems are the central principles, based on which we had compiled full set of project management methods, processes, and guidelines. These became the basis for us to further develop effective management systems for coordinating multi large projects" (Org1Senior2).

Improved Resource Utilization

"The software can integrate the construction schedule and the investment plan, and can help the company to make the most economic plan for purchasing materials, thus to save money and to avoid overstock" (Org3PM4).

"The use of competitive bidding process has guaranteed the choice of the most competent subcontractors with the lowest price . . . It could cost more if we utilize resources to do the construction works by ourselves" (Org4PM2).

Improved Organizational Culture

"The company was a military unit before and was transferred into a civil construction enterprise after the economic reforms. But the organizational culture and people's conceptions could not be easily transformed. It was only since the adoption of project management concepts and practices that the company started to really reform its management systems and to establish a project-oriented construction enterprise culture" (Org4Senior2).

"One important aspect in our project management system is to create a teamwork culture… The company has provided training on team building and teamwork, and created a system of performance evaluation and motivation" (Org5PM1).

More Staff Satisfaction

"Most of our project managers have been educated in engineering or civil construction. The company has provided various trainings in order to improve our management competence, which has also helped us to pass the project management professional certification and supported our career development" (Org4PM4).

"It is now easier to train the new staff, just showing them the three books of established processes and templates, and explaining to them each book's function and usage. New staff can very quickly understand and follow the process" (Org6Senior1).

Greater Innovation

"Project management approaches have been guiding our enterprise management systems. Compared to the prere-

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Table 7. Main Challenges Facing the Case Study Organizations (on a 1 to 5 Scale)

	Org1	Org2	Org3	Org4	Org5	Org6	Mean	Rank
Market competition	4.24	4.09	4.50	4.63	4.56	4.47	4.42	1
Policy uncertainty	4.42	4.27	4.44	4.56	4.60	4.07	4.39	2
Stakeholder (relationships) management	4.52	4.40	4.38	4.66	4.60	3.80	4.39	2
Lack of competent staff	4.38	4.33	4.11	4.25	4.33	4.60	4.33	4
Alignment with organizational strategy and change	4.57	4.28	4.28	4.00	4.08	3.07	4.05	5

form central-planning system, now projects can be done more efficiently, and the methods can also encourage competition and greater innovation in both construction technology and management practices" (Org2Senior4).

"Our intention is to simplify the management and control process so as to improve management efficiency and leave people more time and attention to applying new technology and innovation in their designing work" (Org6Senior2).

Main Challenges Facing the Case Study Organizations

All the six case study organizations are facing certain challenges that may impede them in implementing project management and improving organizational capabilities. From the interviews, five aspects of the main challenges were identified, which were then confirmed and ranked in the later surveys. Similar to their ranks for other items in the survey form, most of the 136 survey respondents ranked 4 (agree) or 5 (strongly agree) for each of the five aspects of challenge and none ranked 1 (strongly disagree) or 2 (disagree). Table 7 lists the five aspects of the main challenges in decreasing order of the average score across all the six case study organizations ranked on a 1–5 scale.

Moreover, one respondent from Org1 (a hydropower development company) added "Local inhabitants resettlement" in the Other section of this part of the survey form. This however has been covered in "Policy uncertainty" and "Stakeholder (relationships) management." Local residents are one of the key stakeholders of hydropower development projects. The main reason for local inhabitants' resettlement to become more difficult and expensive for the hydropower development company is due to the Chinese government's recent regulations on the matter that intended to better protect the local residents' benefits.

Variations in Organizational Project Management and the Resultant Value

Despite the aforementioned commonalities, some variations in the six case study organizations' project management practices are evident in the data. Such variations are found obvious: (1) between Organizations 1, 2, and 3, who are developers and owners of projects constructed, and Organizations 4, 5, and 6, who are contractors of projects; (2) between Organizations 4 and 5, who are construction contractors, and Organization 6, who is a design contractor.

Owner Organizations (Org1, 2, 3) versus Contractor Organizations (Org4, 5, 6)

As introduced in the preceding research methodology section, Organizations 1, 2 and 3 are hydropower development companies. As the owner of a project, they are responsible for controlling and overseeing all aspects of the project throughout the whole project life cycle. These hydro projects are usually large, complex, located in remote isolated areas, and involve more risks. Meanwhile, the owner company has to deal with more important stakeholders such as the local residents to be resettled due to the project. Whereas Organizations 4, 5, and 6 are contractors, they sign a contract with the owner of a project for undertaking the specified construction or design work, which are not necessarily large or complex. Their responsibilities are defined and limited in the signed contract, and they take less risk and may face less number of stakeholders.

Thus, although all the six case study organizations have similar key aspects in their project management implementation (as shown in Table 5), their main focus varies and the meaning behind some of the identified key aspects of project management may also be different. More specifically

- On the first key aspect, namely "project management processes/procedures/guidelines," the three owner organizations have more and complicated management processes and guidelines than the three contractor organizations, and they attend more to the procurement process in order to select correct contractors and suppliers just in time for the project.
- On the key aspects of "training" and "software tools," all the three owner organizations have developed and customized their own software and have invested more in different types of training compared to the three contractor organizations.
- On the key aspect of stakeholder management, as already discussed earlier, the three owner organizations have more stakeholders throughout the whole project life cycle, and they would have more difficulties and cost in stakeholder management than the three contractor organizations.
- On the key aspect of "governance processes and structure," the main focus of the three owner organizations is to establish an effective project governance structure, so as to fully empower the project team while not influencing the head office's control over the project that is usually located in a remote isolated area and lasts for many years. In contrast, the three contractor organizations' focus is mainly to deliver individual project according to the signed contract so as to satisfy the owner, namely their customer.

Moreover, as introduced in the research methodology section, the three owner organizations were all first established to develop one hydropower project, and then move to multiprojects development simultaneously, they have all experienced, and are still experiencing, certain adjustment and modification to their management systems and processes. In their transition from developing one single project to nowadays multiprojects, one big challenge facing these organizations is to get its management processes and structure aligned with the organizational strategy and change. In contrast, the main challenge facing the three contractor organizations is to win more projects to do in the very fierce market competition. This is evident in the survey results as demonstrated in Table 7, in that the three owner case study organiza-

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Table 8. Apparent Differences between the Three Owner- and Three Contractor-Organizations

	Org1, 2, 3 (owner)	Org4, 5, 6 (contractor)
Role on project	Owner (development)	Contractor (construction/design)
Project life cycle	Whole	Part (construction/design)
Project size/type	Large, complex, hydropower projects	Not necessarily large or complex, building/road/railway projects
Responsibility	More, owner accountability for the whole project	Less, contractor accountability as stipulated in contract signed with the owner (customer)
Project management processes/ procedures/guidelines	More and complicated	Less and simple
	More attention to procurement process (to select contractor/ supplier, to decide on contract conditions)	More attention to standardizing process (to make it concise, consistent and easier to follow)
Software/training	More investment, More types of training	Less investment, less and simple training
Stakeholder management	More (esp. local administration authorities and inhabitants), more difficulties and cost in stakeholder management	Less, stakeholders are easily identified and managed
Governance processes and structure	More focus on balancing between overseeing and empowering project team working in remote area for many years	More focus on delivering individual project according to the signed contract
Main challenge	Alignment with organizational strategy and change (to adjust PM systems and processes from one project to multiprojects)	More fierce market competition (to win more projects to do)

tions (1, 2, and 3) ranked higher than the three contractor organizations (4, 5, and 6) for challenge of "alignment with organizational strategy and change," and ranked lower for challenge "Market competition." Table 8 summarizes the aforementioned apparent aspects of difference between the three owner organizations (Org1, 2, and 3), and the three contractor organizations (Org4, 5, and 6).

Construction Contractor (Org4, 5) versus Design Contractor (Org6)

Meanwhile, there also appear certain variations between the two types of contractor organizations, namely, Organizations 4 and 5 as construction-contractor and Organization 6 as design contractor. Although they are both contractors, the nature and types of their works undertaken are different, which result in variations in their project management practices, as described next.

On the first key aspect of project management implementation as listed in Table 5, namely project management processes/ procedures/guidelines, the two construction contractor organizations have more types of work activities to undertake than the design contractor organization, therefore, they have more and complicated documents to define and guide the management processes for the different work activities. In contrast, all that the design contractor organization has are three small books of the ISO document.

On the key aspect of "resource planning and management," the two construction contractor organizations need to plan and manage more types of resources including people, materials, machinery, and so on. In contrast, the main resource for the design contractor is people, and consequently the main challenge for the design contractor (Org6) is to be able to retain and motivate intelligent and competent people. This is also evident in the survey results of the identified main challenges as demonstrated in Table 7, where Org6 ranked the highest for "Lack of competent staff."

On the key aspects of "procurement/contract management" and stakeholder management, as already discussed earlier, the two construction contractor organizations need to subcontract some of the works and to purchase materials based on their contract with the project owner, they have to deal with more procurement and contract management than the design contractor, and they have more stakeholders to manage such as the different subcontractors and suppliers than the design contractor. For the design contractor, the main contract to manage is the one they sign with the project owner who is also their main stakeholder in most cases. This is somehow evident in the survey results of the identified main challenges as demonstrated in Table 7, where Org6 ranked the lowest for Stakeholder management.

Meanwhile, although they both have a contract with the project owner, their relationships with the owner can vary. At the design stage, the project owner may have only a general concept about the project and they tend to rely on the designer to find out the best solutions. Therefore, the relationships between the two parties are more cooperative. The design contractor needs to understand what the project owner wants and can then give suggestions and influence the owner's decisions. In contrast, the relationships between the construction contractor and the project owner can be more hierarchical with each party's obligations and rights being well defined in the project contract documents. Generally the construction contractor should do what the owner says and can then claim back payments according to the contractual stipulations. Of course, they may also give suggestions, which however should follow the contractual process and, when accepted, always result in variations to the original project contract.

Moreover, while all the contractor organizations need to focus on planning and controlling the cost, time, and quality of their works as stipulated in their contract with the project owner, the design contractor tends to have more focus on technological innovation as well. They need to know about new technologies and try to use them in their design works. This is somehow in line with the survey results of key value and benefits of project management as demonstrated in Table 6, in that the design contractor organization (Org6) ranked the highest for value "Greater innovation."

Table 9 summarizes the earlier described apparent aspects of difference between the two construction contractor organizations (Org4 and Org5), and the design contractor organization (Org6).

Conclusions

Twenty years after the western originated project management practices were introduced into China, it is now mandatory and a

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Table 9. Apparent Differences between the Two Types of Contractor Organizations

	Org4, 5 (construction contractor)	Org6 (design contractor)
Role on project	Contractor (construction)	Contractor (design)
Works undertaken	More types of activities	Less activities
Project management processes/ procedures/guidelines	Complicated, more documents to define the different activities	Simple, covered in 3 small books of the ISO documents
Resource planning and management	More types of resources, including people, materials, machinery, etc.	Mainly people (to retain and motivate intelligent people is the main challenge)
Procurement/contract management	More, to subcontract/purchase materials	Less (mainly the contract with the owner)
Stakeholder management	More (owner and subcontractors, suppliers, etc.)	Less (mainly the owner)
Relationships with owner (customer)	More hierarchical, do what owner says, get paid according to contract conditions	More cooperative, understand what owner want and give suggestions
Project management focus	More focus on cost/schedule/quality plan and control	Also focus on technological innovation

common practice for all Chinese construction organizations to adopt project management practices. In order to present a more comprehensive and sophisticated understanding of current project management practices in the Chinese construction industry and the resultant organizational value and benefits, six Chinese construction organizations were studied.

From the examination and analysis of three main sources of data collected in the six case study organizations, namely, organizational background information, interviews, and surveys, 11 key aspects of project management implementation and twelve resultant organizational value and benefits were identified and ranked. While all the interview and survey respondents expressed a good appreciation of the role of projects and project management, and satisfaction with their organization's current project management practices, five aspects of the main challenges facing the organizations were also noted. Meanwhile, variations in project management practices and the resultant value and benefits between the six case study organizations were revealed.

The results of this research confirm the central role of projects and project management for Chinese construction organizational development and success, and have important implications for both management practice and future research.

- Chinese construction organizations have put and are still putting efforts to continuously improve their project management practices and capabilities, for which the identified key aspects of project management as listed in Table 5 may provide important insights and guidance. For example, among other key aspects, project management processes/procedures/guidelines was ranked highest across all the six case study organizations, which has also been most frequently stressed in the interviews. This suggests that construction organizations should establish effective, consistent, and concise project management processes and guidelines, and those who are trying to improve their project management practices may start from examining the organization's existing management processes, guidelines, and templates, and update them or reengineer them if necessary.
- The identified variations in project management practices between the different types of case study organization, as summarized in Tables 1 and 2, highlight the very important contextual implications for both management practice and academic research. Apart from its political and economic context, organizations must also understand its own nature, types of project, main challenges, and needs in order to establish the most effective management systems and improve its project management practices. Meanwhile, each type of construction organizations, such as the project owner, needs to understand the contexts and practices of other parties involved in the project, such as the construction and design contractors, so as to achieve effective communication and cooperation with each other.
- Academic research into project management theories and practices should also attend closely to the contextual variables. The identified variations between the different types of organization in this study provide opportunities and insights for further in-depth research into contextual implications for best project management practices.
- Moreover, the research results have presented the most important aspects of project management practices and the important value and benefits resulting from the project management implementation. Future studies may look at the relationships between the aspects of practices and the resultant value and benefits, and try to identify some patterns to demonstrate what particular aspect of project management provides certain specific types of benefits in a specific context.

The research results are of course based on data from six Chinese construction organizations only. Caution needs to be exercised in generalization of the results to organizations in other industry sectors and other countries.

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