

Key Practices Circumscribing the Construction Complexities: Challenge for Chinese Construction Industry

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Abstract

This research contribution has been drafted to explore the basic complexity traits which trigger the construction projects towards complex premises. Complexity cannot be avoided during project execution but it can be managed by rehearsing key construction management practices. This research determines the impacts of key practices on construction projects in Chinese economy. To address the primary aim, a survey was conducted to determine correlations between variables. The analyses has evoked that weak design verification, business politics, ambiguities among stakeholders, ignorance of user inputs, lack of trust among stakeholders, commercialized glazing of construction industry and bureaucratic environment are major items of construction complexity continuum which make the construction projects complex. The key practices positively related to construction projects. Project managers from Chinese construction industry participating in this research are agreed that these practices are necessary to achieve optimal environment for executing construction projects.

Keywords: *Project Management, Project Complexity, Risk Management in Construction Projects, leadership*

1. Introduction

Project is a sequence of tasks and these tasks are undertaken for a fixed period of time to meet the specific and unique goals [1, 2]. Initiating, planning, executing, controlling, and closing are the processes for project management [3]. Considering the importance of project management in construction industry, many organizations have turned their directions to adopt new project management tools and techniques [4, 5]. Complexity of construction projects has been increased during last few decades. Rapid developments and discoveries have expanded the technology but shortened the life span of innovations for this business. These challenges have made construction firms and organizations risk-prone. Mega construction projects with strategic and defense objectives, construction projects, IT projects and oil and petrochemical projects [6] have become more complex due to their volume and ignorance of unforecasting factors.

Due to the enhanced levels of development in the field of construction, customer requirements have gained much importance. It has been proved in the empirical researches that planning phase and customer requirement analysis is very crucial during the project planning phase and can lead to project success [7]. Lion share of literature has been stream lined to narrate the importance of other management field as human resource management and project performance has been observed to be improved by using human resource practices [8]. Literature on project management also has supported the notions as innovation tendency and technology strategy has helped to improve project quality [9]. At the same time, material management cannot be ignored as a key factor to improve project performance [10].

Leadership is a complex but indispensable process for organizations' maneuvering in right way to achieve its objectives [11]. Performance of project manager directly relates with the effectiveness of project being managed [12]. Nevertheless, project manager's appointment is not taken for instant solution [13] to manage all modules of project. Construction industry demands some specific skills as preparing, producing and understanding information as drawings and schedules [14]. A great deal of diversity in characteristics of project managers have been realized [15]. A project manager with leadership traits must be equipped with the competency spectrum. Professional competency is the combination of knowledge based on trainings and technicalities, application of this acquired knowledge with skills developed during practice [16]. Forecasting the possible risks and analyzing the available resources are performed through such frameworks [13-17].

A lion share of literature has raised the problems faced by this industry and solutions have been provided. Rapid technological changes and shortened innovation life span has made this domain more complex. China has been renowned as world's great economy. Strong economical structure has encouraged China to enhance infra structure and living standards. Construction industry is at its boom in China. Great competitions and ever-growing complexities in construction industry triggered the project managers and construction moguls to adopt the scientific approaches in this arena. This research can be proved as a guiding step for construction industry to consider these challenges seriously and pay attentions on alignment with competency spectrum to avoid the project failures in future.

Lists of construction project complexities and key managerial practices required to cope with these uncertainties has been designed on the basis of initial interviews of the project managers doing various construction projects in China.

2. Research Methodology

Project managers grasping experience of successful construction projects in China have been targeted to know their views about the construction complexity continuum with various complexity enhancing factors. This research has narrated various key construction practices which significantly influence the construction complexity continuum for optimal construction environment. An empirical research has been performed to examine the perception of the project managers and experts doing construction projects in the various domains. These experts have been serving as project managers or consultant in the different geographies of China for long period of time. A questionnaire has been designed on the bases of above said complexity continuum and construction practices necessary to overcome these construction complexities. The research instrument has been designed on the basis of initial interviews of the project managers and researchers in China. Initially, interviews were conducted from the project managers in construction department of Huading Project Management Consulting Limited Company Xi'an (HPM). HPM is incorporated in 2001 with 5.4 million Yuan registered capital. It has been established as the sole professional project management consulting and training organization in China. Well known project management experts and professionals, belonging to various industries and various fields with experience of many years became the part of this prestigious organization. Till 2010, the company has successfully completed nearly 100 consulting projects including construction projects. HPM has more than 70 branches in the country.

Research instrument comprised of two parts. Initial part explored the demographic information of the respondents while second part was based on the complexity continuum and practices to reduce the effect of these complexity enhancing factors. Respondents were requested to evaluate the questions on the basis of their expertise. Responses were scaled on 5-likert scale. Detailed survey of responses has been analyzed using SPSS software. Scientific

investigations are performed by following deductive or inductive research approaches. Known facts and figures are logically generalized on the basis of reasoned conclusion through using deductive research approach. While, the lateral research method deals with the observation of certain phenomena conclusions are derived on the basis of this remarkable development. It can be concluded that a logically general propositions are established on the basis of observed conceptions [18]. This empirical research has been conducted based on hypothetico-deductive method which uses both qualitative and quantitative research approaches. Project managers doing project for construction industry were asked about the major challenges faced during managing the projects. Their responses were converted into the list of factors and a research instrument had been established.

Author has used non-probabilistic snow-ball data sampling techniques. This technique is helpful to select the respondents where sample has some specific traits. In our case, respondents are selected based on their specialties and core competencies regarding construction projects. Selected population for this research was Chinese construction industry. There were many difficulties to conduct this research as,

1. It was not easy to target and interview general population for this research
2. Project managers were very busy with their hectic schedules and meetings. After contacting many times, project managers were willing to give the appointments.
3. Construction project sites are scattered at various geographies. Many visits were done to accomplish this job

2.1. Hypothesis

Following hypotheses have been designed to test the relationship among variables,

H1: Construction complexity continuum with complexity traits as slapdashness in requirement analysis, weak design verification, business politics, delays in supply, ambiguities among stakeholders, ignorance of user inputs, ignorance of key risks, lack of trust among stakeholders, commercialized glazing of construction industry and bureaucratic environment makes the construction projects complex

H2: Key construction practices significantly influence the construction complexity continuum for optimal construction environment

2.2. Data Characteristics

Total of 57 research questionnaires were sent to respondents. These questionnaires were sent using both online and face to face techniques. 23 online and 34 face to face questionnaires were requested to 57 construction moguls. In the first phase, we received only 3 responses. Respondents were again requested through email and telephone calls to send their responses. At the end total 11 online respondents sent their feedback. Considering this problem, face to face interviews were emphasized for quick responses. Interviewees were requested to fill the questionnaire in author's presence. This factor may influence the results due to biasness. 64.7% responses were collected through face to face approach. Only 57.9 % responses were received due to research limitations which already have been mentioned in the last section. One more reason is language barrier. We had also to filter respondents only who can speak English especially for initial interviews. Responses with 25% missing values have been rejected for this research. 2 respondents didn't provide complete information and their questionnaire were considered to be dropped. At the end, only 31 responses were included to conduct this research. Further details have been depicted in Table 1. Luckily, project

managers equipped with rich construction management experience participated for this research. Figure 1 shows the ranges of experiences of research participants. Project managers with experience of construction projects within range of 11-15 years constituted the major parts of this research. Managing Director of HPM and some other team leads had experience more than 35 years.

Table 1. Respondents' Frequencies

	Online Sent	Online Received	Online %	Face to Face Interview	Face to Face Received	Face to Face %	Total Sent	Total Received	Response %age	Rejected	Final
No of Responses	23	11	47.8	34	22	64.7	57	33	57.9	2	31

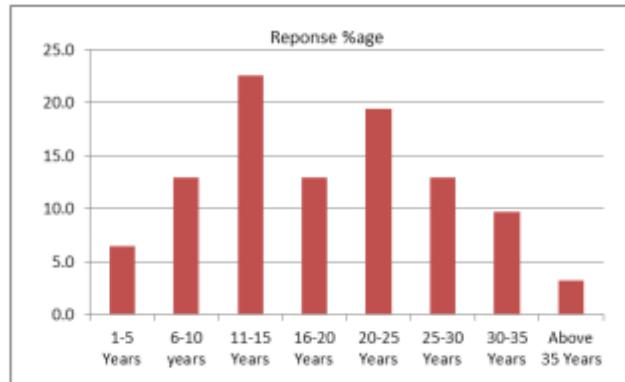


Figure 1. Experience of Respondents

Respondents were selected from construction industry but these project managers were managing projects in various domains of construction business. Most of the respondents belong to the consultant firm providing consultancy for construction projects, construction site managers and construction Research institutes. A sector-wise analysis has been shown in Figure 2.

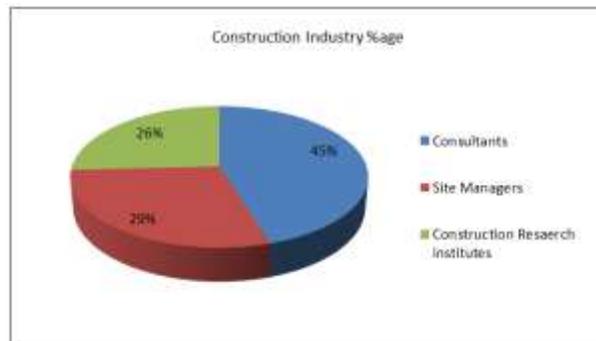


Figure 2. Respondents' Frequency Sector Wise

3. Results and Analysis

3.1. Construction Complexity Continuum Makes the Construction Projects Complex

Author has proposed a list of complexity traits, enhancing construction complexities, selected from literature. During the initial interviews from construction project professionals from Huading Project Management Consulting Limited, questions regarding these two domains were asked. On the basis of their advices and interview results, a questionnaire was designed and deployed to test the hypotheses. Regression analysis test has been performed to check the relationship among the variables. Results for this test have been given in Table 2. Analysis of the table depicts that most of the complexity continuum variables have a positive correlation with dependent variable. Positive sign is the indication that these traits enhance the construction complexities. According to the perception of construction professionals, construction project become complex in the presence of any of the above mentioned complexity traits. Their intensity may vary in magnitude but all traits with positive signs lead the construction managers to the complex premises. Unstandardized Coefficients (B) and T statistics have also been shown in Table 2. Values of R and R^2 (.822 and .675 respectively) are also satisfactory to prove that above listed construction complexity continuum includes the factors which cause to enhance construction complexities. These statistics indicate that, weak design verification, business politics, ambiguities among stakeholders, ignorance of user inputs, lack of trust among stakeholders, commercialized glazing of construction industry and bureaucratic environment are major items of construction complexity continuum which make the construction projects complex.

Despite anything to the contrary, slapdashness in requirement analysis, delays in supply and ignorance of key risks have been observed having a negative relationship with complex environment for construction project variable. Respondents for underlying research have perceived these items not to be very important to influence construction project execution. Reason of conflict among these variables may be due to difference in the working environment and culture of respondents. Construction managers managing construction sites have various approaches as compare to the project managers providing consultancy for same projects. As already has been mentioned that some researchers from construction research institutes have also been involved in this research to enhance the research sample, so variation among the responses is natural. The other reason may be the presence of the interviewer at the time when the questionnaire was being filled by the respondents. Biasness for these results cannot be ignored. Such sorts of environmental factors influence the results and cannot be avoided in empirical research. Overall, all items have been observed to have significant impact on construction projects

Table 2. Unstandardized Coefficients and T values for Model 1

Coefficients				
Model		Unstandardized Coefficients		t
		B	Std. Error	
1	(Constant)	1.360	.356	3.818
	CC1	-.044	.140	-.311
	CC2	.229	.164	1.399
	CC3	.418	.107	3.909
	CC4	-.262	.118	-2.219
	CC5	.074	.126	.589
	CC6	.017	.116	.143
	CC7	-.460	.143	-3.213
	CC8	.372	.122	3.049
	CC9	.079	.130	.602
	CC10	.080	.097	.830

Collinearity Statistics for the same data has been depicted in Table 3. Tolerance defined as $1-R^2$ and variance inflation factor (VIF) in all the cases have been satisfied i.e. Tolerance > 0.1 and variance inflation factor (VIF) < 10.

Table 3. Collinearity Statistics for Model 1

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
CC1	.520	1.923
CC2	.422	2.367
CC3	.423	2.365
CC4	.433	2.307
CC5	.335	2.983
CC6	.392	2.549
CC7	.243	4.120
CC8	.320	3.123
CC9	.648	1.543
CC10	.624	1.602

3.2. Key Construction Practices Significantly Influence the Construction Complexity Continuum

Managerial practices to defeat construction complexity traits were listed down on the basis of literature and interviews from construction management tycoons. Regression analysis has been renowned as the best tool to find the relationships among the understudy variables. Managerial practices include items as core competencies, ability to predict future risks, project estimation, commitment to project, frequent meetings, adequate budgets, tuning up construction planning, awareness of new construction discoveries, leadership traits and intervention of user requirements. Results for this regression test have been given in table 4. Analysis of the table depicts that key practices required to overcome complexity spectrum has a positive correlation with dependent variable. Positive sign is the indication that key practices are necessary to be practiced diminishes the construction complexities. According to

the perception of construction professionals, construction project become complex prone in the absence of mentioned key practices. Their intensity may vary in magnitude but practices have influence to reduce the construction complexities and can provide an optimal environment for executing projects smoothly. Unstandardized Coefficients (*B*) and *T* statistics have values as .675 and .675 respectively and can be declared as satisfactory. Values of *R* and *R*² (.512 and .262 respectively) are also justified to prove that above listed Key construction practices to attain optimal environment.

Collinearity Statistics for the same data has been depicted in Table 5. Tolerance defined as 1-*R*² and variance inflation factor (VIF) in all the cases have been satisfied e.i. Tolerance>0.1 and variance inflation factor (VIF)<10.

Table 4. Unstandardized Coefficients and T values for Model 2

Coefficientsa				
Model		Unstandardized Coefficients		t
		B	Std. Error	
2	(Constant)	1.083	.416	2.606
	KeyPrac	.675	.210	3.210

Table 5. Collinearity Statistics for Model 2

Model	Collinearity Statistics	
	Tolerance	VIF
KeyPrac	1.000	1.000

5. Conclusion and Recommendations

Construction projects have got much importance after the 2nd world war. Ever-growing changes and rapid innovations in this field has pushed construction industry towards complex scenarios. Many researchers have contributed to help construction professionals but still the accuracy is a dream. This research is an effort to foreground those complexity traits which enhance the ambiguities and create complex situations. This empirical research also has blueprinted key construction practices which significantly influence the construction complexity continuum and lead to optimal construction environment where mega and complex construction projects can be executed smoothly. Population for this research was Chinese construction and management firms. Most of the samples were targeted from HPM. Results analysis has categorized various complexity traits on the basis of evaluation of practitioners. Out of 10 complexity traits, 7 were observed to have strong influence on construction industry. This contends that weak design verification, business politics, ambiguities among stakeholders, ignorance of user inputs, lack of trust among stakeholders, commercialized glazing of construction industry and bureaucratic attitude are major construction complexity traits. Construction projects become complex when project managers encounter such complexities. Interviews with project managers helped the author to assemble key practices required to deal with these complexities. Regression analysis has shown a

strong relationship among the complexity traits and these key practices. All respondents of this article were agreed to apply these practices to avoid complex scenarios and project success.

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