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Strategic Guidance Effect of Large-Scale Construction Enterprise Growth to Programme Contracting

Abstract In the case of single project management standing the major place, the management on the organizational level and project level is separated from each other in large-scale construction enterprises, and it is not long before program management theories applied to construction industry. Under the new situation of construction project clustering, how to choose projects has been the strategic decision for construction enterprises. Therefore, with the theory of program management and strategic management, this paper analyzes the relationship between the strategic growth of large-scale construction enterprises and program contracting, and attempts to provide meaningful ideas for enterprises to choose program from the strategic level.

Keywords: large-scale construction enterprise, enterprise growth, programme contracting, strategic interaction

1 Introduction

Large-scale construction enterprises play a pivotal role in infrastructure construction, faster and better infrastructure projects not only meets the country's needs, but also meets the corporate strategic development. With the environment of program construction and limited resources, how to choose projects from the construction market becomes a strategic decision that influences the development of the construction enterprises.

From the production and operation way of construction enterprise, construction enterprises belong to the typical project-based enterprise. But for a long time, management is separated from each other on the enterprise level and project layer because project managers are not necessarily required to understand enterprise strategies and enterprise

organizers have not fully learned each project's contributions to the firm growth, and as a result, project management cannot meet the needs of the enterprise strategy development.

Programme management has more advantage than the separate management of multiple projects, because construction enterprises can eventually create more value than the total value of the individual projects by the way of collaborative management on the other hand, more than 70 percent of the business of the construction enterprises in our country is as the general contractor of railways, bridges, and others, and a large number of enterprises in similar size and business areas compete with each other. Besides, competition internal of an enterprise is also intense. China Railway Group and China Railway Construction, the two big listed enterprises have as many as more than 30 large enterprises, but the scale, property, business, technology and available resources of some of these enterprises are very similar, and the internal competition and consumption on the strategic development of construction enterprise is very adverse.

Therefore, this paper studied the strategic relationship between the corporate growth and program construction in order to deal with the situation of project clustering and internal competition by introducing program management, and to promote the strategic sustainable growth of large construction enterprise. This paper combined the ideas of program management and strategic management and attempted to provide beneficial suggestions for large construction enterprises to select the project from the strategic level.

2 Literature review

Construction management body of knowledge suggested that program was a combination of internal connection of multiple projects, based on the organization's strategic objectives and associated with the internal and external environment, in order to obtain greater overall interests in the way of coordinated management (Athony & Reiss,

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2006; Burke, 2003; Pellegrinelli, 2011). To be clarified, the “programme” in this paper is not a collection of projects under the same owner, but starts from the construction enterprises and belongs to a construction enterprise in a period and influence the firm growth. Furthermore, “programme contracting” refers to the process of construction enterprise selecting and implementing projects, controlling projects dynamically, evaluating these projects to meet the requirement of the enterprise sustainable growth, not only to achieve the goal of the project, but to achieve the maximum benefit of construction enterprises.

The development of construction enterprises is the process of achieving organizational strategic targets. Enterprise development is usually described from the “quantity dimension” and “mass dimension.” Qualitative growth is associated with organizational changes, functional optimization, management maturity improvement, and so on. Quantitative growth of construction enterprises is represented by the increased number of construction projects, enlarged enterprise scale, and increased market share, among the others. Qualitative growth and quantitative growth are interdependent and interacted. In general, there are few domestic research on program management for enterprise strategic role. Liu and Shi constructed a program management model based on the strategy management of construction enterprises (Liu, 2011; Shi, 2010).

However, outside China, the mainstream of program management research focuses on problems such as project selection under the guidance of enterprise strategies. Jiang and Klein analyzed how enterprise strategies guided the project selection criteria (Jiang & Klein, 1999), Pellegrinelli and Partington developed an integrated framework to choose the optimal project under the strategic guidance (Partington, Pellegrinelli, & Young, 2005). Strategic fitness methods can ensure that the organization is the most important project portfolio, so as to realize the goal of the portfolio coordinate with strategic goals (Guo, 2011). Existing literature revealed relations between Large-scale construction enterprise growth and program construction, and this article will analyze from the perspective of strategy management.

3 Analysis on strategic interaction of large-scale construction enterprise growth and program construction

Corporate strategies provide guidance for construction enterprises to select suitable project program, and to improve the benefits of the program (Lycett, Rassau, & Danson, 2003; Ohara, 2005). Meanwhile, project program reflects to enterprise strategies, and the evaluation of project program will reveal whether the program achieves expected earnings and whether the enterprise strategies are adaptable to situation changes, so that the enterprise decides any necessary adjustment in business strategies according to the feedback.

In general, the enterprise strategies direct the choice of specific projects in the program, through the analysis of the strategic decision project construction, and the allocation of resources and the optimization of the project. In turn, the effect of program management affects the form and implement of strategic management and its adjustment. The fundamental goal of program management is to achieve the company growth objectives set by the enterprise strategy, through the forecast of the trend of enterprise business, external environment and competition, and evaluation of the internal resources and capabilities, strategic planning and implementation.

Enterprise goals determine the enterprise strategy, and the enterprise strategy instructs the choice of projects in construction enterprises. The series of enterprise growth through strategic level to the role of the construction project group called strategic guiding role. Firm growth through strategic guide project group construction and the program contracting in turn affect the path of enterprise growth. This dual functional relationship is similar to a closed loop, and the dynamic process between both is shown in *Figure 1*.

The guiding role of enterprise strategy to program contracting is mainly in the following ways. First, the enterprise growth directs program strategically on organization constructs. When multiple projects are carried on simultaneously, they share enterprise resources simultaneously and any biased of resources could cause conflicts among project managers. However, the project manage-

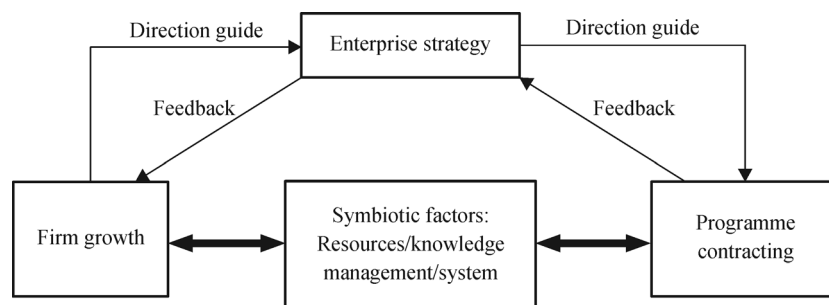


Figure 1. Relationship of program contracting and enterprise growth in the strategic level.

ment office under the guidance of enterprise strategy can allocate resources scientifically and avoids conflicts within the organization effectively. Secondly, the enterprise growth directs program formation strategically. Enterprise strategy enables the enterprise to choose projects that conform to the organizational goal among alternatives, because the strategy provides the criteria to construct a more effective program. Thirdly, the enterprise growth directs the evaluation of single projects strategically. Traditional standards measure the success of a project on its schedule, budget, and quality, but in the program, enterprises pay more attention to the project's contribution to the firm growth. If a project meets only the traditional standards, but is not able to support business growth, the project should not be considered to be successful (Wu & Yan, 2009).

4 The analysis of the strategic guidance of enterprise growth on construction program

4.1 The guidance of Enterprise strategy to the process of construction program

The construction program process under the guidance of enterprise strategy, adds the strategic assessment phase on the original process and combines the program goals and the direction of firm growth, aiming at solving the problem of too much focus on planning during the existing process. As the execution and completion of program, enterprise strategy should be analyzed and positioned again before going to a new cycle of program construction process, combined with the change of market environment and enterprise comprehensive strength (Liu, 2010). Specific program construction process under the guidance of strategy is as follows.

(1) The strategic assessment stage. Clarified enterprise mission, vision and strategic target provides clear direction for program construction. The stage is mainly to reassess the firm strategy before the program planning and confirm whether it adapts to the current environment and the actual situation of enterprises.

(2) The program planning stage. In this stage, the enterprise strategy is broken down to business level strategy and program level strategy, and defines the program and its basic goals and scope.

(3) The program contracting stage. The strategic target can be specified with corporate revenues, profits, rate of return and other indicators. The target projects are then assessed to match the firm growth from different angles. Main steps are identifying alternative projects, project evaluation, project selection, prioritization and division.

(4) The program implementation stage. The main tasks of this stage are program planning, prioritization, balance optimization, program implement, the execution report, program evaluation and finishing.

(5) The program assessment phase. This stage reassesses the existing enterprise strength on the basis of the evaluation of the program and provides basis for adjusting the enterprise strategic target. First, the program is assessed as a whole, then, the problems in the process of project management are summarized, and existing competitiveness and resources of the enterprise are assessed to find the disadvantages of strategic objectives and adjust it (Bai, Li, & Wang, 2015).

To this end, this paper proposes a dynamic program construction process diagram with negative feedback to improve the level of program contracting based on enterprise strategy, as shown in *Figure 2*.

4.2 The strategic guidance of enterprise growth to program contracting

4.2.1 The strategic guidance of enterprise growth to project bidding evaluation system

Evaluation index system of project bidding is constructed in conformity with the enterprise growth and under the guidance of enterprise growth strategy, to make sure that the program can achieve the strategic targets of enterprise growth under the constraints of resources, knowledge, management and system. By reviewing indicators in the existing literature and considering the features of project risk and bid-winning possibilities, this paper gradually broke down the evaluation criterion to the evaluation index with enterprise strategic goals, and constructed the project bidding evaluation index system as shown in Table 1.

4.2.2 Strategic guidance of enterprise growth for project bidding evaluation model

The gray analytic hierarchy process (GAHP) was used to build the comprehensive evaluation model of project bidding priority. When the enterprise makes the project bidding decision, it is generally impossible to obtain enough information of the project as a result of the limited bidding preparation time; while the project itself has a great deal of uncertainty with the long and complex construction process. Therefore, enterprises need to adhere to the strategy to comprehensively consider the expected value, opportunity cost and risks of projects, to choose "correct" project, while there is inadequate accurate information to support decision making (Bai, Li, & Wang, 2015). The comprehensive evaluation model based on GAHP complies with the thinking process of decision makers, and lays no strict requirements on the decision-making information, and is possible to achieve good results of project priority evaluation. The main steps of this method are as follows.

(1) Setting up the hierarchy model. Combining the factors of the expected value of the tendered project, expectation value hierarchy of tendered project could be

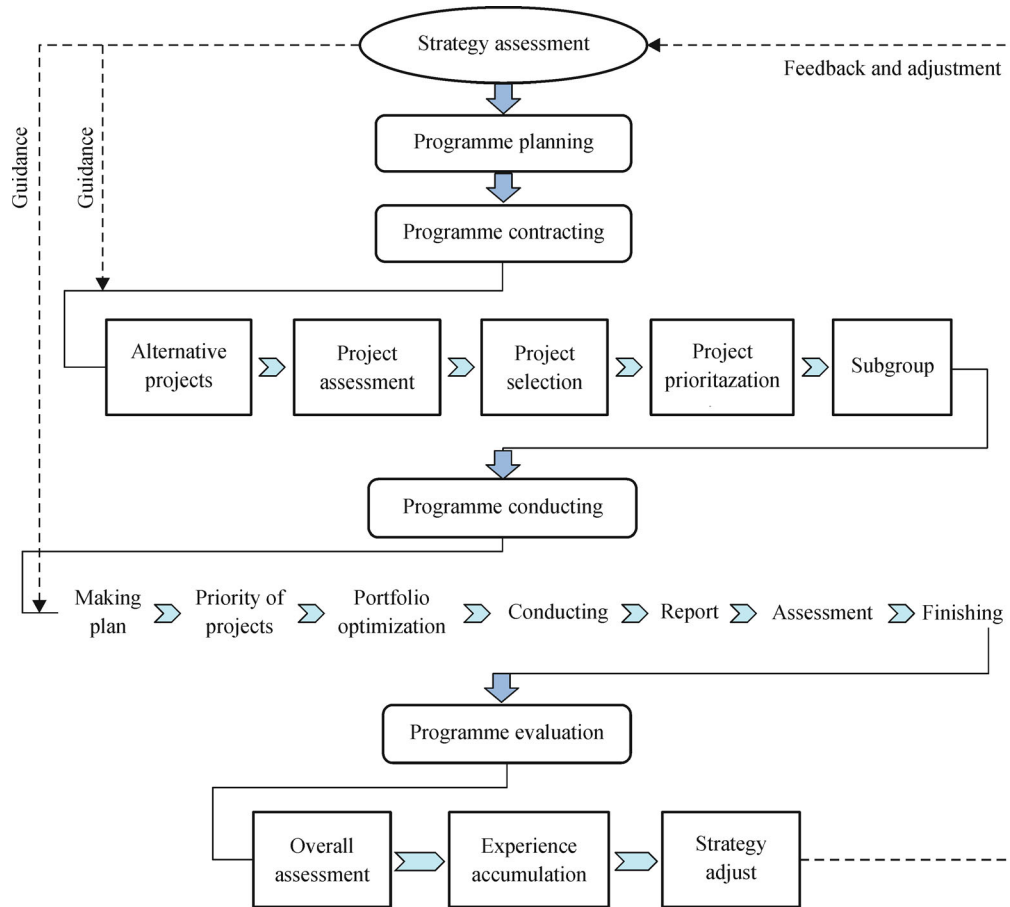


Figure 2. Strategic guidance of enterprise growth for program construction process.

Table 1

Project Bidding Evaluation Index System under the Guidance of Strategy

Target layer	Strategic layer		Index layer		Strategic layer		Index layer	
Expected value of the project Matching firm growth(W)	Quantitative growth of enterprise	U_1	Profits	V_{11}	Competence advantage	U_3	Dynamic capability	V_{31}
			Return on investment	V_{12}			Market influence	V_{32}
			Investment cycle	V_{13}			customer Satisfaction	V_{33}
			Cost reduction	V_{14}			Brand image promotion	V_{34}
			Resource nature Change	V_{21}			Building partnership	V_{35}
	Qualitative growth of enterprise	U_2	Knowledge innovation ability	V_{22}	Project risk	U_4	Technology risks	V_{41}
			Management frame Change	V_{23}			Market risks	V_{42}
			System improvement And innovation	V_{24}			Business risks	V_{43}
			Expending market	V_{25}			Policy and environment risks	V_{44}
			Enterprise bidding Ability	V_{51}				
Project bid-winning possibility	Project bid-winning possibility	U_5	Main bidding enterprise Ability	V_{52}				

established by using the analytic hierarchy process (AHP) as shown in Figure 3. The expected value of the project is the target layer of evaluation, as the target W ; factors of the value of the project is the rule layer, set to U_i ($i = 1, 2, \dots, m$); and the bottom layer is the secondary evaluation index V_{ij} ($i = 1, 2, \dots, m; j = i_1, i_2, i_3, \dots, i_n$).

(2) Determining the rating standards of secondary index. The superiority of V_{ij} was divided into four levels and assigned 4, 3, 2, 1 points respectively, and if the index level was between two adjacent levels, the corresponding grading standards should be 3.5, 2.5, 1.5.

(3) Using AHP to determine the weights of the primary evaluation index U_i and the secondary evaluation indexes V_{ij} . AHP is used for weighting index and building judgment matrix by comparing two indexes. Besides, the weight sets of criterion index layer U_i and index layer V_{ij} is calculated by using characteristic root method. Then, consistency index is calculated, and weights can be finally obtained after the normalized processing of index weight.

We assume the weight distribution of primary evaluation index U_i as P_i , ($i = 1, 2, 3, 4, 5$) and index weight set as

$P = (p_1, p_2, p_3, p_4, p_5)$, and $\sum_{i=1}^5 p_i = 1$; the weights allocation

of the Secondary evaluation index V_{ij} as C_{ij} ($i = 1, 2, 3, 4, 5; j = 1, 2, \dots, n_i$), and index weight set $C_i = (c_{i1}, c_{i2}, \dots, c_{in_i})$,

and $\sum_{j=1}^{n_i} c_{ij} = 1$, $i = 1, 2, 3, 4, 5$.

(4) Expert grading. A total of m experts graded index C , according to the index measured values and professional experience, then evaluation matrix D is built according to the experts' evaluation results of different indicators. Experts are numbered in p , $p = 1, 2, \dots, m$.

$$D = \begin{pmatrix} d_{11} & d_{12} & \dots & d_{1m} \\ d_{21} & d_{22} & \dots & d_{2m} \\ \dots & \dots & \dots & \dots \\ d_{n1} & d_{n2} & \dots & d_{nm} \end{pmatrix}$$

where m is the number of evaluation experts, n is the index number.

(5) Determining the evaluation gray class. The rating standard of the evaluation index is analyzed and four evaluation gray class are adopted, where gray class number as e , $e = 1, 2, 3, 4$, respectively "best," "good," "moderate" and "bad." Its corresponding gray Numbers and gray whitening weight function is as in the following Table 2 (Guo, 2011).

(6) Calculating the gray evaluation coefficients and weight matrix

For evaluation index V_{ij} , if the first project belongs to the e evaluate gray class, the gray evaluation coefficient notes as X_{ije} , and the total number of evaluation of different gray class notes as X_{ij} , then

$$x_{ije} = \sum_{j=1}^m f_e(d_{ij}),$$

$$x_{ij} = \sum_{e=1}^4 a_{ije},$$

$$i = 1, 2, 3, 4, 5$$

Thus, gray evaluation weight of the e th(?) gray class of the evaluation index V_{ij} is set as $r_{ije} = x_{ije}/x_{ij}$, and the gray evaluation weight vector of each evaluation index is set as

Table 2

Interpretation of Grey Expression

Gray class	Gray class number	Weight function	Expression(f)
Best ($e = 1$)	$\otimes \in [0, 4, \infty)$	f_1	$f_1(d_{ij}) = \begin{cases} d_{ij}/4, d_{ij} \in [0, 4] \\ 1, d_{ij} \in [4, \infty) \\ 0, d_{ij} \in (-\infty, 0) \end{cases}$
Good ($e = 2$)	$\otimes \in [0, 3, 6]$	f_2	$f_2(d_{ij}) = \begin{cases} d_{ij}/3, d_{ij} \in [0, 3] \\ (6-d_{ij})/3, d_{ij} \in [3, 6] \\ 0, d_{ij} \notin [0, 6] \end{cases}$
Moderate ($e = 3$)	$\otimes \in [0, 2, 4]$	f_3	$f_3(d_{ij}) = \begin{cases} d_{ij}/2, d_{ij} \in [0, 2] \\ (d_{ij}-4)/(-2), d_{ij} \in [2, 4] \\ 0, d_{ij} \notin [0, 4] \end{cases}$
Bad ($e = 4$)	$\otimes \in [0, 1, 2]$	f_4	$f_4(d_{ij}) = \begin{cases} 1, d_{ij} \in [0, 1] \\ (d_{ij}-2)/(-1), d_{ij} \in [1, 2] \\ 0, d_{ij} \notin [0, 2] \end{cases}$

$$r_{ij} = (r_{ij1}, r_{ij2}, r_{ij3}, r_{ij4}),$$

$$i = 1, 2, 3, 4, 5.$$

Thus, it is concluded the gray evaluation matrix R_i ($i = 1, 2, 3, 4, 5$) of different evaluation classes of the secondary indexes V_{ij} to its relative primary index U_i ,

$$R_i = \begin{pmatrix} r_{i1} \\ r_{i2} \\ \dots \\ r_{in_i} \end{pmatrix} = \begin{pmatrix} r_{i11} & r_{i12} & r_{i13} & r_{i14} \\ r_{i21} & r_{i22} & r_{i23} & r_{i24} \\ \dots & \dots & \dots & \dots \\ r_{in_i1} & r_{in_i2} & r_{in_i3} & r_{in_i4} \end{pmatrix}$$

(7) Calculating the comprehensive evaluation. To make a comprehensive evaluation of index layer U_i , and its evaluation results sets as B_i , there is: $B_i = C_i \cdot R_i = (b_{i1}, b_{i2}, b_{i3}, b_{i4})$, $i = 1, 2, 3, 4, 5$.

Then the gray evaluation weight matrix B which is made up of comprehensive evaluation results of criterion layer U for each evaluation gray classis denoted as $B = (B_1, B_2, B_3, B_4, B_5)^T$

So, for comprehensive evaluation of criterion layer, the result to R:

$$R = P \cdot B = (R_1, R_2, R_3, R_4)$$

According to the results of the comprehensive evaluation R, gray level can be determined by the different division principle, and the comprehensive evaluation value W can be calculated based on the principles of maximum. $W = R \cdot C^T$, where C is a vector through assignment according to the "grey level," $C = (4, 3, 2, 1)^T$ in this paper. By comparing of comprehensive evaluation value of W of alternative projects, the priority of the projects can be decided. The preferred project has the greater value of W.

Each index of the projects in scoring criteria is from 1 to 5, so if a certain index score of the project is below 2.5, it may not satisfy the requirements of program contracting. Assume that the score of each index is 2.5, it would be concluded that the standard value of W_0 is 3.3230. Then the value of W of the project to be evaluated is calculated and compared with standard value. If $W \geq W_0$, it means that the project can be selected as a part of program. The priority of projects can be determined after all projects carried out in accordance with the value of W from high to low. The number of projects within the program is under various kinds of constraints of enterprise, and projects with high expected value are preferred in the program.

5 Summary

With the trend of project clustering, program contracting and management is of greater advantage and with more benefits to the efficiency of enterprise resources compared to single project construction. One of the valuable

approaches for large scale construction enterprises to win the initiative position in market and improve the project management is to use program management and to re-examine the strategic relationship between program contracting and firm growth from the long-term perspective of the sustainable development. Research suggested that for large-scale construction enterprises, program contracting and management has more fulfilled process and construction and is easier to maximize the resource utilization efficiency of enterprises. Meanwhile, program contracting with the guidance of enterprise strategy can fully take the advantage of program management and achieve the goal of enterprise growth.

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