IMPLEMENTING CUSTOMIZED METHOD FOR THE EVALUATION OF SUBCONTRACTORS

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ABSTRACT

Different types of evaluation of suppliers have been used in the construction industry. In those evaluations it is important to consider the level of client-supplier relationships that exists. This is particular important for companies that establish long-term relationships with a few suppliers. Insufficient understanding of how to determine these levels can lead to problems such as considering the requirements for a long-term relationship when the requirements for a transactional relationship is enough. In the literature, very little exist on the criteria for establishing those levels and also on how to translate such criteria into operational dimensions. This paper proposes a method of suppliers' evaluation for construction companies, considering the need of customized this assessment based on the type of the supplier-firm relationship. The method intends to provide a better understanding of the construction firm needs as well as to translate them into operational dimensions. This method was tested in a case study conducted in a medium sized company which deals with complex projects. A framework containing operational dimensions that categorize suppliers was developed according to needs of the construction company. Finally, a set of guidelines for making the evaluation tools more useful is proposed.

KEY WORDS

supplier management, performance evaluation, relationship, supply chain management

INTRODUCTION

In the last decade, there has been a shift on the way firms compete in the construction industry sector, as well as in other sectors. Nowadays, the competition usually occurs between project supply chains, rather than between individual companies (Lambert et al. 1998). Hence, inter-firm close relationships become critical to improve the efficiency of the whole production process, eliminating waste and unnecessary efforts (Vrijhoef and Koskela 2000).

As a result, project suppliers with different interests will have to work in a more integrated approach. In this respect, Li and Wang (2007) call for the development of mechanisms for aligning the objectives of independent supply chain members and coordinate their decisions and activities to improve project performance.

Such mechanisms should be based on the development of innovative

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managerial approaches, rather than on simply trying to solve existing problems in ill-structured project systems (Holt et al. 2000). The construction industry has long been characterized by highly-fragmented supply chains, poor communication across inter-firm boundaries, adversarial relationships, and a lack of institutional trust and commitment. The construction industry has also had a legacy of obsolete information systems, which tends to increase transactional costs (Miller et al. 2002).

These problems are even more evident among subcontractors (SC). The practice of subcontracting, which has greatly increased in recent years, is often responsible up to 90% of project value (Hinze and Tracey 1994) and extremely important as a means of surviving the volatility of the construction process (Dainty et al. 2001).

One solution for those problems is through a well-structured performance evaluation system, which should follow some important requirements and focus on SC's development. However, the available methods fail to fully provide those requirements. While some performance evaluation methods involve too many criteria or complex mathematical equations (Ko et al. 2007), others are too vague to provide a useful result and to effectively develop SCs (Maturana et al. 2004). For this reason, a customized method to adapt to SC's characteristics is needed.

To achieve this objective it is essential to understand how these relationships are created and which factors are determinant in these issues. In this sense, Sen et. al. (2007) propose a method to assist decision makers define selection criteria according to the buyer-supplier integration level. However, this method is not adequate to define critical SCs, because of the peculiarities of this specific type of supplier.

This paper reports the partial results of a research project which aims to devise a method for evaluating the SCs of construction companies, considering the need of customized this assessment based on the type of the supplier-firm relationship. Based on a literature review, an evaluation method was proposed and tested in two construction companies. This paper describes one of the case studies in which the method was fully implemented in a company involved in complex industrial and commercial construction projects.

PERFORMANCE EVALUATION

Performance evaluation is the process to quantify the effectiveness and efficiency of an action (Neely et al. 2005). It can be used either to select or to control suppliers (Lasch and Janker 2005). This investigation focuses on the evaluation of SC as a mechanism for enhancing proactively SCs performance.

Performance evaluation can potentially play an important role on the management of SCs. However, many construction companies do not provide an adequate feedback to their SCs, and when they do, there is not much concern about the SCs' point of view. Yet, in order to truly develop SCs through the evaluation process, some aspects must be observed.

Firstly, key subcontractors must be selected and reduced to a manageable number, so that it becomes possible to improve the relationship with them (Dowlatshahi 2000, Lambert et al. 1998). It is also important to provide

feedback periodically to SCs in order to encourage them to improve their performance (Maturana et al. 2007).

Several authors (Ko et al 2007, Tam et al. 2000) suggest to avoid subjective on evaluations by using performance measures based on facts or quantitative data. Performance measures are important to avoid intuition and to provide that both contractor and SC can establish, understand and proactively react to negative evaluations (Ko et al. 2007). By contrast, Clark (2003) argues that subjective criteria are also important because objective criteria solely do not really portrait SCs performance, and a relationship between both types of criteria is needed.

However, it is counterproductive to provide such evaluation with both type of criteria (objective and subjective) to evaluate every SC, and a simple evaluation is needed (Maturana et al 2007). Hence, the number of criteria should be limited in order to keep the evaluation process simple (Meyer 2002). Therefore, SCs should be evaluated by appropriated criteria according to their capabilities and the importance they represent.

MAIN CONTRACTOR – SUBCONTRACTOR RELATIONSHIP

The relationship between main contractors and SCs ranges from purely independent transactional, price-based interactions (discrete transactions) through highly interdependent relationships to situations where dependent sourcing arrangements are the only alternative (relational exchanges) (Dwyer et al, 1987; Cox and Ireland 2002). From one hand discrete transactions involve limited communication and narrow content. On the other hand, relational exchanges involve intense communication and knowledge sharing which will last for a fairly long time. Past performance in this case is extremely important (Dwyer et al. 1987).

It is important to avoid using the wrong governance structure which can lead to problems, such as attempting long-term relationship when transactional relationship is more suitable (Ganesan 1994). Different types of relationship are useful in different circumstances, and closeness is not always the best option (Heide and John 1990). In this respect, literature provides a number of contributions for the choice of a governance structure (Table 1) that will be explained in the following.

Table 1: Determinants of governance structure

Determinant	Operational Dimensions	Author
Joint Action		Heide and John (1990)
Continuity		Heide and John (1990); Noordewier et al. (1990); Ganesan (1994)
Flexibility		Noordewier et al. (1990)
Assistance		Noordewier et al. (1990)
Information		Noordewier et al. (1990)
Verification / Monitoring	Operation Technological capabilities Production capacity	Heide and John (1990); Noordewier et al. (1990)
Trust	Expertise / Credibility Reliability Intentionality / Benevolence	Ganesan (1994)
Dependence	Alternative sources Asymmetrical dependence Value / importance of outcomes	Ganesan (1994)
Interdependence	Magnitude Asymmetry	Izquierdo and Cillian (2004)

Heide and John (1990) establish three dimensions of buyer-supplier relationship: joint-action, continuity, and verification. Joint action is the degree of interpenetration of organizational boundaries, such as for example during the development of a product design. Continuity is the bilateral expectation of a future exchange. Verification represent the SC`s examination of operation, technological capabilities, and production capacity.

Noordewier et al. (1990) propose a set of dimensions of governance structures: supplier flexibility, supplier assistance, information, monitoring of supplier, expectation of continuity. Suppliers' flexibility is the ability to react to unexpected changes, while supplier assistance is the position that suppliers take toward assisting buyers. Information is referred to the quantity and type of information provided to suppliers. By monitoring its supplier, a buyer ensures their performance.

Ganesan (1994) argues that the expectations of continuity is one important characteristic of relationship, being related to the desire of the parties toward a long-term relationship. He also suggests that trust and dependence play a key role in determining the long-term orientation. Ganesan (1994) uses the term trust as a belief in the exchange partner that results from its expertise, reliability, and intentionality. Trust reflects to: (a) credibility, i.e. the SCs' expertise to perform the job effectively and reliably; and (b) benevolence, which is concerned with the intentions to perform the job when new situations arise. Finally, dependence is the need to maintain the channel relationship to achieve desired goals, being a result of (a) the importance of the service provided by SCs and how valued it is; (b) the availability of alternative sources; and (c) how asymmetrical this dependence is.

In addition, Izquierdo and Cillian (2004) suggest that relational-oriented

exchanges are the consequence of mutual dependence between firms, also named interdependence, which is reflected through two other concepts: magnitude and asymmetry. The former is the sum of the dependence in an exchange, whereas the latter is the comparative level of dependence.

RESEARCH METHOD

Based on the literature review, a method to customize the evaluation of SCs was proposed and afterwards guidelines suggested. A case study was carried out in a construction company in order to test the application of the proposed method to practical situations involving complex projects.

The main contractor involved in this case study was a medium sized company, focussed on industrial and commercial building projects. Most projects are renovations or extensions in existing buildings where the client facilities need to operate continuously. These projects usually have a relatively short duration and a high level of uncertainty, mostly due to the interference from the client in the production process, and the need for product flexibility.

The case study was divided into three main phases. The first phase consisted of an assessment of the existing SCs evaluation system. Also, the processes for establishing which SCs should be evaluated and the reasons for such choices were investigated. During this first phase, documents of the general contractor were analysed, as well as interviews were carried out with key managers involved in the evaluation system. Representatives of some key SCs were also interviewed aiming to understand their needs and how they receive feedback about their performance.

The second phase involved the development of a procedure to categorise SCs according to their importance for the main contractor. This procedure allowed the establishment of levels of SCs. For each of those levels (basic, advanced and specific) a different evaluation process was established. Participant observation was used during meetings carried out by a working team involved in the development of the new SCs evaluation system. Several meetings were held separately with managers from different departments of the company: bidding, administration, safety, quality, and production. On average two meetings were held with the representatives of each department. Then a final meeting was carried out for discussing aspects concerned with all departments. The final product of this phase was the new SCs evaluation forms to be used by the company.

The third phase consisted of the implementation of the proposed evaluation method in seven different projects. All of them had a high level of complexity, and short duration, involving a large number of SCs.

RESULTS AND DISCUSSION

The assessment of the existing situation indicated that the SCs were not properly classified according to their importance. There was only a very simple classification into two categories: to be evaluated or not to be evaluated. To make this distinction, five aspects were analysed in a meeting, involving the company top managers and also production managers: project cost impact, product quality impact, lead time impact, technological complexity of the sub-system, and degree of interdependence with other project supply chain

members. However, according to the users of the evaluation system those aspects were rarely used and SCs were classified in a fairly subjective and informal way. This is consistent with the data from interviews, which indicated that some users did not even know the meaning of these aspects.

According to the company's procedures, all SCs classified to be evaluated must be assessed every month. However, the empirical evidence showed that this rarely happened. Some evaluations were only completed at the end of the project, others were badly completed, or even forgotten. One reason for that was the huge amount of work needed to perform those evaluations. As the company had a single evaluation form with more than thirty criteria, every SC demanded a time-consuming evaluation regardless their importance for the firm. Moreover, several criteria that were included in the evaluation form were not applicable, since SCs were rarely assessed according to all criteria.

Some improvements were proposed in the second phase of the study in order to reduce those problems. The first step was to propose three categories of criteria: basic, advanced and specific. Basic criteria were those that were considered to be extremely important by the company, and that should be used to assess all SCs. Those criteria should be general (i.e. applicable to all the SCs), easy to be applied, and limited to a manageable number of criteria (only 10 items were chosen to be in this category). For instance, the PPC (percentage of plan completed) was classified as a basic criteria: it was a quantitative, well known metric that was applicable to all SCs.

By contrast, the advanced criteria were used to evaluate only the most important SCs (how to classify SC is further discussed in the following). Such criteria were not meant to replace the basic ones, but rather were added to the evaluation form if appropriate. A set of 13 advanced criteria were included in the method, which provided a more detailed assessment of SCs` performance. For instance, meeting participation was an advanced criterion because it was more subjective and only close suppliers used to participate in meetings.

Finally, specific criteria consisted of aspects that were very particular of a SC or of a specific project. Those criteria were identified from the previous SCs assessment procedure, which had several criteria that were not applicable to many SCs. Although important in some specific projects or suppliers, they were only applicable in very specific situations. Moreover, specific criteria were dependent on the availability of performance measures, such as index of production planning and control good practices (PPCP). This criterion was added to the evaluation form only when individual measures for each SC were available.

Table 2: Set of criteria

	Basic	Advanced	Specific
Which SC?	All	Very important	-
Characteristics	Easily evaluated	Better portrait	Particular
Number of criteria	10	13	8
Example	PPC	Meeting participation	PPCP

Obviously, each department could have their own categories. For instance, a SC that carries out work that have high safety risk should be evaluated using advanced criteria by the safety department, whereas using basic criteria by other departments.

After classifying each criterion, a standard procedure was established. It consisted in three steps. The first one was to define whether the SC had a minimal importance for the company so that an evaluation was necessary. In this respect, the same aspects used in the previous evaluation system were maintained, although they were made explicit to assure that all participants had the same understanding about them. Moreover, a form was devised for grading each SC as shown in Table 3: each aspect receives a score between very important (5) to not important (1). Only SCs with more than 15 points have to be evaluated.

Table 3: Definition of SCs that should be evaluated.

Aspects	**Level of importance**				
	5 High	**4**	**3**	**2**	**1 Low**
Project cost impact	√				
Product quality impact		√			
Lead time impact			√		
Technological complexity of the sub-system		√			
Degree of interdependence with other SC members				√	
Total points	18	Should be evaluated			

The second step was to determine which departments should evaluate each SC by basic criteria and which ones ought to use both basic and advanced criteria. Hence, another form (Table 4) was proposed containing six questions, which were used to assess the relationship of the SC with each department of the company by using three scores: high (1.0), moderate (0.5), or weak (0.0). Hence, the number of positive responses for a particular department highlighted the importance of the evaluation by that department.

Table 4: The categorization of SC between basic or advanced

Aspects		**Degree of relationship with departments 1.0 – high; 0.5 – moderate; 0.0 – weak**				
		Bidding	Admin	Safety	Quality	Prod
Is the client very demanding?	Y/N	1.0	1.0	1.0	1.0	1.0
Is the service very risky?	Y/N	0.0	0.0	1.0	0.0	0.0
Does the client demand safety manager?	Y/N	0.0	0.0	1.0	0.0	0.0
Is the interdependence with other SCs very high?	Y/N	0.0	0.5	0.5	0.5	1.0
Is the meeting participation important?	Y/N	0.0	0.0	0.0	0.0	1.0
Is the duration of the service long?	Y/N	0.5	0.5	0.5	0.5	0.5
Percentage of importance		%	%	%	%	%

For instance, if the first three questions were positive and the other three negative, the safety department would achieve 3 points from 4 available (1+1+1+0.5+0.5), or 75%. This meant that the importance to evaluate this department were high. All SCs who had high importance (more than 60%) were considered to be advanced.

Finally, the specific criteria were considered by using another procedure in which a customized evaluation form was automatically generated for each SC.

The last phase of the study provided insights about the applicability of the proposed method. In this sense, both the practical evaluation and the comparisons of the method the recommendations of literature were important. Even though the aspects which determine the importance of the SCs were suggested by the managers, the practical implementation indicated that those aspects did not exactly match the needs of the general contractor. Some SCs, which were important according to the managers, were considered basic by the procedure.

The practical evaluation also suggested that the second step of procedure (Table 4) was not very consistent. This happened because a single answer could change the whole categorization, as some departments had few aspects considered. For example, the bidding department had only two questions for deciding whether the SC was basic or advanced. For that reason, the weight of each one of those questions was extremely high for the final score.

The comparison of the framework with literature led to some improvements, which involved the inclusion of some new criteria and the exclusion of others. Not all aspects were included, only the most relevant for the general contractor.

It was included an aspect representing the expectancy of continuity of relationship. Although often mentioned (Ganesan 1994, Heide and John 1990, Noordewier et al. 1990), this aspect was not considered in the first proposal as it was vague and difficult to evaluate. For that reason, this aspect was supported by three questions: “Is SC bidding other projects with us?”, “Is the service provided by the SC exclusive of this project?” and “Is the SC hired by other projects?”

The level of joint action was already partly assessed by the question “Is the meeting participation important?” Yet, it was necessary to provide a better assessment of this aspect by including the following: Is SC`s participation in product development process (PDP) required?”. Similarly, the aspect flexibility was supported by the questions: “Does the SC rearrange his proposal when required?” and “Does the SC change their policies when necessary in order to fit in ours policies?”

As proposed by Ganesan (1994), dependence was also included in the new framework and supported by the questions: “Are there alternative sources?”; “Are there asymmetrical dependence?”, “Are value and importance of outcomes high?” Lack of alternative sources and high value and importance of outcomes increase the necessity of evaluating SCs, because this makes the bargain power of SCs high. By contrast, asymmetrical dependence can increase the bargain power of only one side and make the evaluation less important.

To reduce the amount of work, the aspects of the first step (Table 3) were merged with the second one (Table 5), so that users had not to answer them again. Hence, the question "Is the interdependence with other SC very high?" was suppressed from the second step.

Table 5: The categorization of SC between basic or advanced

Aspects		**Degree of relationship with departments 1.0 – high; 0.5 – moderate; 0.0 – weak**				
		Bidding	Admin	Safety	Quality	Prod
Is the SC bidding other projects with us?	Y/N	1.0	0.5	0.5	0.5	0.5
Is the service provided by the SC exclusive of this project?	Y/N	1.0	1.0	1.0	1.0	1.0
Is the SC hired by other projects?	Y/N	1.0	1.0	1.0	1.0	1.0
Is the meeting participation important?	Y/N	0.0	0.0	0.0	0.0	1.0
Is SC`s participation in the PDP required?	Y/N	1.0	0.0	0.0	0.0	1.0
Does the SC rearrange his proposal when required?	Y/N	1.0	0.0	0.0	0.0	0.0
Does the SC change their policies when necessary in order to fit in ours policies?	Y/N	1.0	1.0	1.0	1.0	1.0
Are there alternative sources?	Y/N	1.0	1.0	1.0	1.0	1.0
Are there asymmetrical dependence?	Y/N	1.0	1.0	1.0	1.0	1.0
Are value and importance of outcomes high?	Y/N	1.0	1.0	1.0	1.0	1.0
Is the client very demanding?	Y/N	1.0	1.0	1.0	1.0	1.0
Does the client demand safety manager?	Y/N	0.0	0.0	1.0	0.0	0.0
Is the service very risky?	Y/N	0.0	0.0	1.0	0.0	0.0
Is the duration of the service long?	Y/N	0.5	0.5	0.5	0.5	0.5
Percentage of importance		%	%	%	%	%

The implementation process also indicated that the users did not fully understand the meaning of all criteria adopted. Hence, it was necessary to make those aspects explicit or to support them by more practical aspects. Similarly, establishing rules and automatic systems in the SC classification stops users from determining the importance of SCs solely according to their perception.

Moreover, the customized tool eliminated unnecessary evaluation activities and evaluation of non critical SCs. The results of the tests indicated that only 33 out of 541 criteria (6%) were not applicable. This is an important reduction from the previous form, when 37% of criteria were not applicable. Besides that, users reported that the new method provided a full evaluation only of the most important SCs and that the customized evaluation process reduced the time required to complete the forms.

At the end of the case study a set of guidelines for assessing subcontractors was proposed:

- A performance evaluation system must include basic criteria for a wide range of SCs and also some advanced criteria for those that have a close relationship with the general contractor;
- Performance evaluation must enable comparisons among SC through few basic criteria regardless their importance for the general contractor;
- Specific criteria should be included on evaluations only if necessary;

- Rules should be established to avoid subjectivity in the evaluation process.

CONCLUSIONS

Using more advanced criteria only in the performance evaluation of most important SC enabled the main contractor to reduce the amount of work and make the evaluation simple as proposed by Maturana et al. (2004). At the same time, the method to customize SCs enabled fully evaluation about the most important SCs.

Establishing basic criteria which were applied to all SC evaluated enabled comparisons among different types of SC which would be impossible if each type of SC had exclusive criteria. Specific criteria were several times very important to evaluate only a particular SC. However extremely important, those criteria must not be included in the regular evaluations in order to avoid unnecessary work.

This paper investigated a quite simple way to categorize only SCs, although other supply chain members play an important role in the development of construction projects. Given the diversity of context, this paper did not provide a method to all types of suppliers and studies in other contexts are still needed. Future work should address the need to make SCs more participative on evaluation process, and enabling an objective and transparent method to classify SCs is the first step to do so.

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