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Integration Assessment and Evaluation of Supplier Performance System in Electricity Generation Company

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Abstract. The supplier performance system has gained important to assess and evaluate suppliers in order to determine supplier performance level. The assessment and evaluation integration is needed in supplier performance system for the companies that have many branches and unit in order the results of assessment each company's supplier could be used to evaluate in among branches and units. The case study in this research is the Indonesian electricity generation company that has 34 power plant unit and has approximately 4,000 suppliers. Based on discussion and focus group discussion (FGD) with the case study's managers, the criteria and sub criteria of supplier performance system including their weight have been determined such as budget, supplier positioning matrix, procurement per period, and blacklist history. AHP approach is used to determine the weight each aspect and indicator. Software based on online platform was developed to support the assessment and evaluation in each branch. Supplier performance system proposed was applied in case study. Based on interviews with the case study's manager, the supplier performance system proposed has comprehensive aspects and indicators to evaluate each project purchasing order and managers is easier to determine the supplier's selection and blacklist.

1. Introduction

The purchasing for goods and services is very critical because the percentage of purchasing costs can reach between 40% -70% of the total costs of an end products [1]. The fails and inaccuracies in supplier selection results can cause disruption in the operations of a company[2]. If the selected supplier is less responsible for fulfilling the request, it will lead to a stock out and a longer lead time. Therefore, companies that have many alternative suppliers must be selective and appropriate in choosing suppliers. To get a selective supplier, a good and objective evaluation and selection system is needed. Supplier Relationship Management is a process that includes all processes that focus on the liaison between the company and its suppliers [2].

[3] pointed out that supplier performance system for supplier selection is one of the most important in decision making research. Selecting the right suppliers can reduce purchasing costs and improves the competitiveness of companies [3]. [4] used Analytical Hierarchy Proses (AHP) & Quality Function Deployment (QFD) to defined the best supplier for manufacture industry used three criteria: cost, delivery, and quality. [5] used Analytical Hierarchy Proses (AHP) and TOPSIS with cost, delivery, quality, and service as the criteria of choosing the best supplier for manufacture industry. [6] used fuzzy Analytical Hierarchy Proses and Mixed Balanced Scorecard with learning and growth, internal business, customer, financial as the criteria of choosing the best supplier for automotive industry.



This study focuses on development of a new supplier performance system in electrical generator company that has many power plant units. The pre-implementation and implementation of a new supplier performance system also described as results in this research. The paper is organized as follows. Section 2 address the literature review. In section 3 the research design used to identify how companies apply a new supplier performance system in case study is described. The results and discussion are presented in section 4. A conclusion of research is provided in section 5.

2. Literature Review

[7] argued that the supplier performance system for supplier evaluation has been studied extensively in literature. Supplier performance system for supplier evaluation and selection is an important issue in supplier relationship management program. The supplier performance system is needed to support decision maker to collect, assess and evaluate the suppliers [8]. According to [9], benefits of supplier performance system for supplier evaluation such as (1) avoid supply chain risk and disruptions, (2) protect and improve reputation, (3) avoid costs and achieve savings, (4) segment and rank vendors, (5) collaborate with suppliers, and improve internal processes.

Supplier performance system for supplier evaluation and selection is complicated with various criteria and sub-criteria must be considered. [10] reviewed some research papers on supplier evaluation and selection and identified some criteria used including costs, delivery, quality, production capability, reputation, financial position, performance history, and warranty criteria.

Some techniques were used in supplier evaluation and selection such as analytical hierarchy process (AHP) techniques ([5],[11],[4], and [12],[13]). Integration between AHP and others techniques such as TOPSIS, DEA, and QFD were conducted with researchers. [5] used AHP and TOPSIS to select the best suppliers in manufacturing industry. [11] developed hybrid method (AHP and DEA method) for supplier selection in Turkish appliance industry. [4] integrated the AHP between QFD to supplier selection in manufacturing industry. [12] used AHP, QFD and SWOT analysis to justify RFID investment in healthcare.

3. Research Design

The three main research stages are used to develop and implement a new supplier performance system for electricity generator company. Initially for developing a new supplier performance system (SPM) using several discussion and focus group discussion (FGD) with case study's manager and staff. Secondly, pre-implementation activities were conducted to ensure successful implementation of a new supplier performance system (SPM) including (1) create the guidelines of a new SPM, (2) SPM software development and installation, (3) establish policies for a new SPM implementation, and (4) conduct a new SPM socialization.

The case study approach was applied in this research. Case study research has been used in the purchasing literature [14]. The case study as objective in the research is used to examine "how" the company apply supplier performance system to evaluate and grading their suppliers. [15] suggested that case study approach is used by form a "how" question as research question. The case study used in this research is justified with suggestion from [16]. Case study research is more suited to how and why from research questions that can be explanatories in nature [17] and to focus on contemporary events [17]. [19] 2006 believed that a single case study can provide a major challenge to a theory and provide a major challenge to a theory and provide a source of new hypothesis and constructs simultaneously.

4. Results and Discussions

4.1. Case study

The proposed supplier performance system was applied in an Indonesian electricity generation company in East Java. The company currently has 34 power plant units with approximately 4,000 suppliers. The amount of employees is 3,200 employees and is categorized as a large enterprise. The company was implemented best practice management system such as (1) asset management PAS 55, HSE OHSAS

18000, ISO 9000, ISO 14000, Malcom Baldrige and others. The company also was implementing supplier relationship management (SRM) program in order to manage the relationship their supplier to get better spare part and services from supplier. SRM program manages 3,200 suppliers in order to their suppliers are able to provide the best service for goods and services in accordance with the specifications of goods and services, right in number and on time delivery. Purchasing managers in holding companies need to make SPM to evaluate and monitor supplier performance.

4.2. Supplier performance system

The supplier performance system proposed has 3 sub system including supplier assessment system, supplier evaluation system and supplier performance level. The supplier assessment was proposed with nine indicators to evaluate the performance of their project based on purchase order (PO). The scale of supplier assessment for each purchase order is the Likert Scale (1 – 5). The weight of each indicator is different based on the significantly of indicators. The nine indicators for supplier assessment and their weight was shown in Table 1.

Table 1. Indicators in supplier assessment system

No	Indicators	Weight
1	Integrity	20%
2	Cooperation	15%
3	Quality	15%
4	Time	15%
5	Price	15%
6	HSE (K3)	5%
7	Environmental	5%
8	Security	5%
9	Energy management	5%

Based on FGD with managers, the proposed supplier evaluation system was developed. The 4 criteria were used to evaluate supplier based on their performance including the supply positioning matrix (SPM) criteria, budget criteria, procurement per period criteria, and blacklist history criteria. The sub-criteria each criterion also were determined such as four (4) sub criteria for supply positioning matrix (strategic critical, leverage, and routine). The analytical hierarchy process (AHP) method was applied to determine the weight of criteria and sub criteria each criterion. Several managers have agreed and filled out a pair-wise comparison for criteria and sub-criteria in focus group discussion session. The Table 2 and Table 3 are shown the pair-wise comparison questionnaires for criteria and supply positioning matrix criteria. The results of weight each criteria and sub-criteria using AHP method was shown in Table 4.

Table 2. Pair-wise comparison questionnaire for criteria

Criteria	Budget	SPM	Procurement	blacklist
Budget	1	3	5	5
SPM	0.333	1	3	5
Procurement	0.200	0.333	1	3
blacklist	0.200	0.200	0.333	1

Table 3. Pair-wise comparison questionnaire for supply positioning matrix

Sub Criteria	Strategic	Critical	Leverage	Routine
Strategic	1	3	5	7
Critical	0.333	1	3	5
Leverage	0.200	0.333	1	3
Routine	0.142	0.200	0.333	1

Table 4. Criteria and sub-criteria in supplier performance system

Criteria	Weight	Sub criteria	Weight	
			absolute	normal
Budget	0.118	> 20	0.564	0.0666
		3 – 20	0.263	0.0310
		0.5 – 3	0.118	0.0139
		< 0.5	0.055	0.0065
SPM	0.263	Strategic	0.564	0.1483
		Critical	0.263	0.0692
		Leverage	0.118	0.0310
		Routine	0.055	0.0145
Procurement	0.055	1	0.637	0.0350
		2-4	0.258	0.0142
		> 5	0.105	0.0058
Blacklist	0.564	Ever	0.05	0.0282
		never	0.4	0.2256

Four (4) grade is proposed for the supplier performance level using Likert Scale (1 until 5). Suppliers that have a good performance (grade A ($3 \leq x < 4$) and grade B ($4 \leq x \leq 5$)) can participate in the procurement next year. However, suppliers in grades C and D must follow the coaching program in SRM program. The grade level of supplier performance is shown in Table 5.

Table 5. Grade of Supplier Performance

Grade	Value
A	$0 \leq x < 2.5$
B	$2.5 \leq x < 3$
C	$3 \leq x < 4$
D	$4 \leq x \leq 5$

4.3. Implementing of a new supplier performance system

Before implementing the new supplier performance system (SPM), several activities is need to be carried out such as (1) develop the guidelines of a new SPM, (2) making and installing SPM software, (3) establishing new policies from the board of directors, and (4) conducting a new SPM socialization. First, the guidelines of a new SPM were developed to make it easier for all employees to understand and be skilled in assessing the work of suppliers. The Work Instructions (IK) to support implementation of a new SPM have been also compiled and stipulated in April 2018. Secondly, a new SPM Software based on online platform was developed to facilitate the integration of the assessment and evaluation among power plant units by managers and supervisors who responsible to give assessment for projects. Several features in a new SPM software are needed such as (1) supplier performance evaluation features, (2) access for supplier features, and (3) supplier performance evaluation reports. Thirdly, a new SPM has been approved and signed by the directors in April 2018. Finally, the dissemination of a new SPM has been carried out to all relevant unit managers and staff in May 2018.

5. Conclusions

This paper has contribution to examined how integrated supplier performance system apply supplier assessment, supplier evaluation and grade of supplier performance in electrical generator company that have many power plant units. Applied criteria include the following budget, supplier positioning matrix, procurement per period, and blacklist history. The results also indicate that criteria and sub-criteria are relatively relevant in case study and pre-implementation activities are important to successful

implementation a new supplier performance system. The integration of supplier performance system is relatively easier to be conducted using integrated supplier performance software.

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