

Design and Best Practices of Supplier Performance Evaluation in Supply Chain

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Abstract

Abstract: Over the years, many in-depth discussions around the topic of “Investment in the supply chain can bring value to the enterprise” are continuing. Through some scientific operations of the supply chain, we can see that the promotion of supply chain brought the great change to the enterprise.

Take an aviation manufacturing company to conduct suppliers performance evaluation as an example, focuses on supplier performance management in the supply chain scope, and explains the past misunderstandings, performance defect analysis and performance indicator setting in the process. Aims at different types of suppliers, designs initiation plans, selects balanced evaluation indicators, then collects data and benchmarks.

All supplier performance evaluations are based on the perspective of the company. From the effect of the use, the data extraction of the supplier determination for the procurement activities can be directly derived from the supplier performance results, so the supplier performance evaluation has inevitable guiding significance for the formulation and adjustment of procurement strategy. In other words, as long as the performance data can be used properly, it will inevitably affect the direction of the company's procurement strategy.

Keywords: Supplier performance evaluation; Best practice; Performance indicator; Procurement strategy



Figure 1 Analysis of factors affecting supplier performance evaluation

Performance attribute	Performance attribute definition
Quality compliance	Qualified products; product qualification rate; quality of deliverables; abnormal quality information; overdose and scrapped of deliverables
Delivery reliability	Qualified products are delivered to the right customer at the required time and at the required location;
Airworthiness reliability	Development of supplier airworthiness management
Service responsiveness and agility	the speed at which products are delivered to customers, responding to market and demand changes or maintaining a competitive agility
Cost	Efficiency of management measures related to product negotiation, cost reduction, etc.

Figure 2 Selection of supplier performance evaluation indicators

1. Preface

Supplier performance management is an important part of the supplier's procurement module. With

the continuous advancement of the supply chain research, the supplier performance evaluation has become one of the hot spots in management science. Supplier management is an extension of the company's business, and the success of the company's operations is inseparable from suppliers. A reasonable evaluation of suppliers not only motivates and supervises suppliers, but also matches the company's strategic goals. Establishing a supplier performance management system that meets the needs of strategic development, continuously improving the level of supplier capabilities, ensuring product quality, and building a strategic cooperation management based on parallel trust and monitoring is an important task in the realization of the company's supply management.

In the field of civil aviation and aerospace, the main manufacturers of aero engines use supplier performance control to control their suppliers. At this stage, domestic civil aviation engine companies are still in the research development stage, with many changes in configuration and no batch production capacity, which has a certain impact on supplier performance evaluation.

2. Case study

AEMC is a civil aviation engine manufacturer in China. The direction of supplier performance management is clear, and a multi-dimensional evaluation method is adopted. The evaluation factors include quality, delivery, cost, and service. Each part is assigned a different weight. The weight and the score are multiplied, and then added together to get the final score. The calculation method is

$$C=Kq*Q+Kd*D+Ks*S+Kp*P. \quad (1)$$

Among them, Q(quality), D(delivery), S(service), P(price) are supplier quality score, delivery score, service score and cost score respectively. Kq, Kd, Ks, and Kp are the corresponding weight values, and the sum of the four weight is 1. However, the results of the performance evaluation did not get a good response, and the supplier did not approve it; multiple data could not be implemented. The results of supplier performance evaluation is basically unable to use.

As the responsible department, the procurement management department collected opinions from related parties and found the following problems:

2.1 The scope of supplier selection is not clear.

In order to facilitate the collection of data, the suppliers with delivery records in this quarter are counted as the evaluation objects. The problem that this brings about is that the participating suppliers are not comprehensive and there are omissions. For example, a contract was signed this quarter, but it was not included in the scope of assessment because the delivery period had not arrived.

2.2 The departments responsible for the evaluation are too concentrated.

Except for the quality dimension, which is scored by the quality department, the other three dimensions are scored by the relevant team within the procurement management. Although for risk control reasons, the internal procurement department has been Internal separated. Sourcing evaluation, supplier selection, contract management, procurement project management, and supplier performance management functions are all carried out by different teams, but other departments of the company are also directly or indirectly related to suppliers in business. How to collect opinions from all partner departments in the company and prevent one-sided conclusions?

2.3 Important suppliers have low scores; conversely, regular suppliers with few tasks have high scores. There are certain controversies both inside and outside.

There is a subjective scoring problem in the evaluation, which is difficult to quantify. After analysis, although AEMC has a definite calculation method, the above problems make it difficult for the performance results to truly reflect the supplier's level, the supplier's performance cannot play a role, and the value cannot be reflected, which reflects the flaws in the system design.

3. Research hypothesis

AEMC is determined to reorganize the system and reverse the execution method. First of all, it will solve the below key issues.

3.1 The scope of suppliers participating in the evaluation

In order to avoid missing suppliers, it is necessary to specify the scope of supplier performance evaluation to ensure that all suppliers have the same evaluation opportunity.

3.2 Performance indicators

Having the same evaluation opportunity does not mean that we have to use a completely consistent method for evaluation. How to overcome the unfair phenomenon of undertaking more tasks, more error probability; undertaking fewer tasks, less error probability?

First of all, set the comprehensive weights to balance: the supplier who undertakes the key task has a high weight; the supplier who has a few tasks has a low weight.

Second, refine the evaluation indicators.

3.3 How to obtain the results that are really true and verifiable?

Diversify the partner departments responsible for the evaluation of each indicator; standardize data sources; hold a final review meeting to correct the results of supplier performance evaluation

4. Research design

There is a saying in Six Sigma: if you can't measure, you can't control; if you can't control, you can't manage.

It is necessary to establish a quantitative index system to control the whole process, guide behavior, and achieve the expected goals.

4.1 Specify the scope of suppliers

Specify suppliers who are still fulfilling their contractual obligations as evaluation objects, and conduct unified evaluation.

According to the criticality of the task, set different evaluation cycles:

Suppliers who undertake key manufacturing, processing, and test verification tasks will be evaluated quarterly.

Suppliers who undertake non-critical tasks are evaluated every six months.

4.2 Set the comprehensive weight of the supplier

Combining two factors, the importance of the task and the contract amount, set the comprehensive weight index of the supplier. The supplier's comprehensive score is the result of multiplying the summary score of each indicator and the comprehensive weight index. The comprehensive weight index is based on the following table:

No#	Definition	Comprehensive Weight
1	Undertake the company's annual key tasks. Undertake the company's key technical research tasks. The contract value exceeds 30 million	1.2
2	Top 30% of suppliers in terms of contract value.	1.0
3	The top 30~70% suppliers of contract value.	0.8
4	Suppliers ranked after 70% in contract value.	0.6

Table 1 Standards for setting weights

4.3 Refine specific indicators, diversify the responsible departments for evaluation, and standardize data sources

AEMC analyzes the impact of relationship governance and control mechanisms on both partners, and uses a combination of three measurement methods to redesign supplier performance:

The first is to measure the specific supply indicators of suppliers(1st).

The second is to measure the efficiency and effectiveness of the supplier's supply(2^{ed}).

The third is to measure the satisfaction of the supply situation, which is a subjective judgment of the supplier(3rd). AEMC adopts a monitoring mechanism and a flexible bilateral control mechanism and a parallel approach. The flexible bilateral control mechanism is to establish a mechanism with suppliers to jointly participate in the formulation and execution of decisions to compensate for the supply caused by only the monitoring mechanism. The quotient produces a negative influence that lacks a sense of autonomy and affects the cooperative relationship.

The main evaluation indicators and corresponding weights remain unchanged and are set

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according to the company's current development. Refine the key evaluation indicators, and separate the evaluation subject from the procurement management department and be undertaken by different departments. The setting standards are as follows:

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measurement methods	Performance attribute	Performance attribute definition	Weight	Sub-indicator	Sub-index weight	Responsible department
1 st	Quality compliance	Qualified products; product qualification rate; quality of deliverables; abnormal quality information; overdose and scrapped of deliverables	0.3	Products acceptance data	0.4	quality department
				Products usage quality feedback	0.4	production department/technology department
				Abnormal quality feedback	0.2	quality department
1 st	Delivery reliability	Qualified products are delivered to the right customer at the required time and at the required location;	0.3	-	-	procurement management department
2 ^{ed}	Airworthiness reliability	Development of supplier airworthiness management	0.1	-	-	airworthiness management department
2 ^{ed}	Cost	Efficiency of management measures related to product negotiation, cost reduction, etc.	0.1	-	-	procurement management department
3 rd	Service responsiveness and agility	the speed at which products are delivered to customers, responding to market and demand changes or maintaining a competitive agility	0.2	-	-	production department/technology department, quality department
3 rd	Corporate integrity	such as Forgery Record, exceed compliance procedures, counterfeit parts, etc.,	One-vote veto	-	-	each department can vote

Table 2 specific indicators

Express it with a mind map, as shown below:

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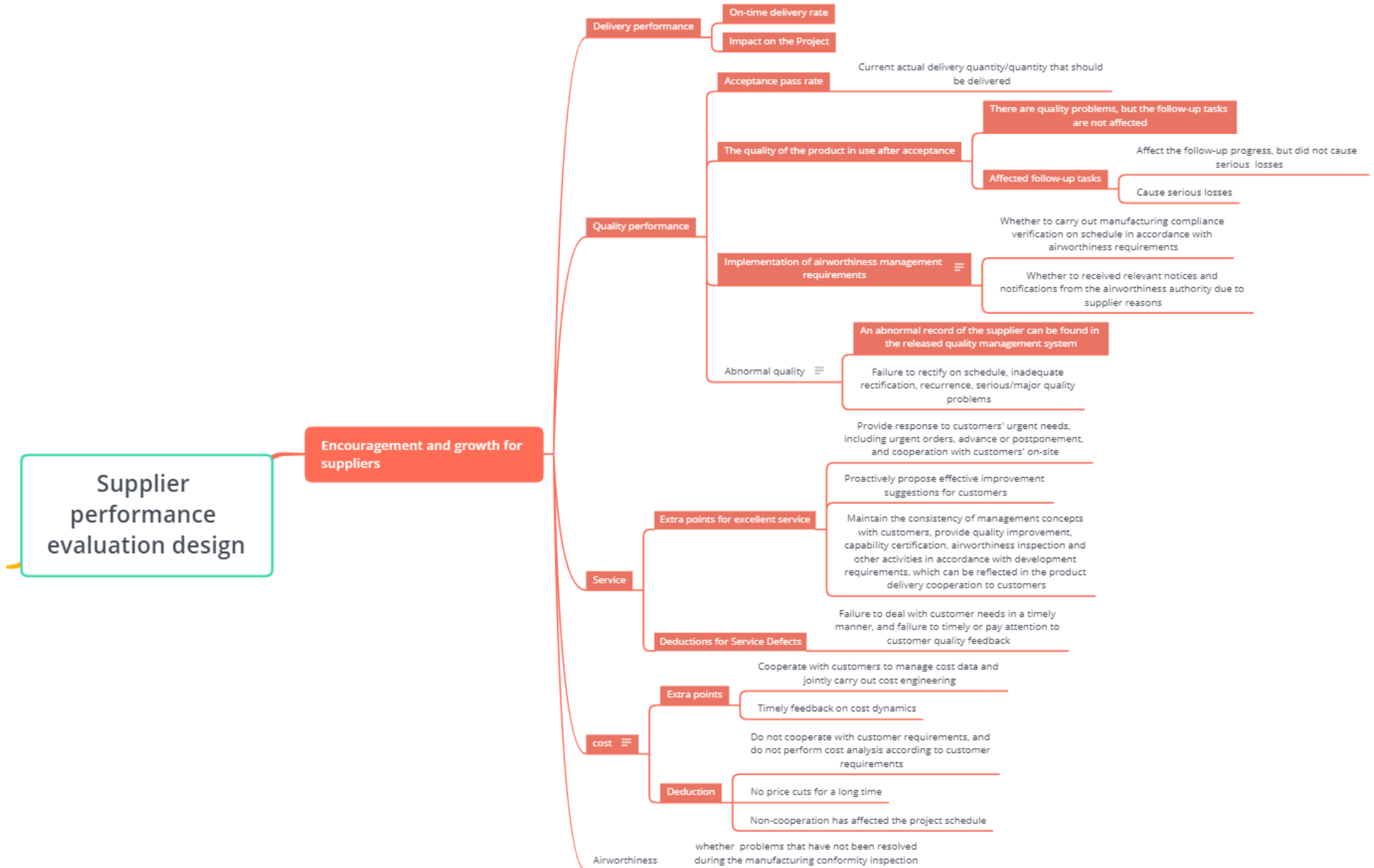


Figure 1 Supplier performance evaluation design index diagram

4.4 Organizational performance results review.

Organize a final review meeting of supplier performance within the company. All partner departments involved in the evaluation are invited to jointly review the overall results of the supplier's performance. The procurement management department announces the results of the evaluation team's scoring. The evaluation team members review the scores of the suppliers' indicators and see the reasons for each score. The result after all the members' opinions is summarized will become the final The supplier's performance evaluation conclusions.

4.5 Calculation method of each indicator of supplier performance

4.5.1 Quality compliance

a) Product acceptance quality

It is used to make statistics on the quality of the products delivered by the supplier during the acceptance process.

Calculation method: Number of deliverables that have passed inspection/total number of deliverables

Data source: Acceptance database in Enterprise Resource Planning system. All suppliers are required to perform the acceptance process on the system, and the system can automatically retrieve statistics for both the due quantity and the actual quantity.

b) Product quality

Statistics on the quality of products that have passed acceptance during reprocessing, assembling, and testing.

Calculation method: The base is 100 points, and points will be deducted based on the number of problems and the degree of impact.

Data source: each partner department records the problems during the use of the product.

c) Abnormal quality information

Count the occurrence of quality abnormalities. For example, low-level quality issues, omission of technical status to implement, etc.

Calculation method: The base is 100 points, and points will be deducted based on the number of problems and the degree of impact.

Data source: Quality problem handling report. Abnormal quality information is often a major quality problem, which needs to be notified within the company, and the supplier is organized to rectify and close it.

4.5.2 Delivery reliability

Calculation method: the difference between the delivery on-time rate and the delivery impact evaluation (deduction item).

Among them, the delivery on-time rate = (the number of deliverables delivered by the node as agreed in the contract / the delivery that should be delivered by the node as agreed in the contract Number of objects) *100.

The delivery impact evaluation is a deduction item, which is mainly applicable to the situation where the delivery of the deliverables is delayed and affects the progress of the subsequent project.

Data source: contract delivery data in the Enterprise Resource Planning system.

4.5.3 Airworthiness and reliability

It is used to measure the progress of the supplier's airworthiness management. Mainly aimed at suppliers who need to implement the company's airworthiness requirements. The main assessment is:

Whether there are problems that have not been completely resolved during the manufacturing conformity inspection.

Whether the airworthiness related verification report has not been submitted as planned.

Whether the airworthiness Authority has issued the unsatisfactory complaints.

Calculation method: base is 100 points, and points will be deducted based on problems.

Data source: airworthiness inspection problem handling report. Abnormal information is often a major problem, which needs to be notified and announced within the company.

Claimed suppliers to rectify and close down.

4.5.4 Cost management

Evaluate the cost performance of suppliers, and whether there are any positive measures in the cost reduction projects for customers and suppliers.

Data source: standardized quotation, performance in negotiation records.

4.5.5 Service responsiveness and agility

Evaluate the supplier's performance in customer response.

The situations that are suitable for bonus points include: being able to actively cooperate with customer requirements, adjusting plans, and meeting delivery node requirements. Seeking improvement, making suggestions for improvement and adopting them. Assisting customers in overcoming key technologies, improving capabilities, and solving bottleneck problems.

The situations that apply to deductions include: information processing is not timely. Non-response to demand information, non-implementation, etc., resulting in failure to delay the development schedule and so on. Whether to actively respond to AEMC's policy requirements to carry out a series of work. The supplier has always abided by its commitment to AEMC. When there is a problem in cooperation, customer can get the full support of the supplier.

Calculation method: Take 100 as the base and count the sum of extra points and deduction items.

Data source:

Bonus points: the number of urgent purchase orders in the ERP for the quarter.

Points deduction: work records registered by each department.

4.5.6 Corporate integrity

Added the attribute of Corporate integrity, it is one vote to veto the item. In the procurement process, once there is any good faith behavior, such as Forgery Record, exceed compliance procedures, counterfeit parts, etc., adopt zero tolerance, this attribute score is **ZERO**, and the current performance results. If it is judged to be a failure, it will be included in the black list and the supplier qualification will be suspended.

4.6 The latest calculation method

The calculation formula of the final design method is

$$C = \text{Comprehensive Weight} (Kq*Q + Kd*D + Ks*S + Kp*P) \quad (2)$$

5. Data application and results

5.1 Sample source

AEMC uses the second, third, and fourth quarters of 2020 as the time interval. In the second quarter, it chooses 56 suppliers, the third quarter chooses 72 suppliers, and the fourth quarter chooses 69 suppliers. All suppliers in the process of fulfilling the contract are selected as research Object.

Representatives from the airworthiness management department, quality department, procurement management department, and technology department form an evaluation team to carry out the evaluation. Finally, the supplier scores in the time intervals are valid and can be used as samples for inspection and analysis.

5.2 Evaluation result

In the evaluation, 90% comes from the Enterprise Resource Planning System and related databases. For the inevitable subjective evaluation of service indicators evaluation indicators, due to the cross-effects of the monitoring mechanism and the flexible bilateral control mechanism, the center average value is used.

The analysis shows that according to the score results, the data is normally distributed:

50% to 84% of the suppliers are distributed in the range of good performance.

0 to 7% of the suppliers are warned because the indicators are not met the target, and then need to be improved.

7%~12% of suppliers performed excellent in all indicators.

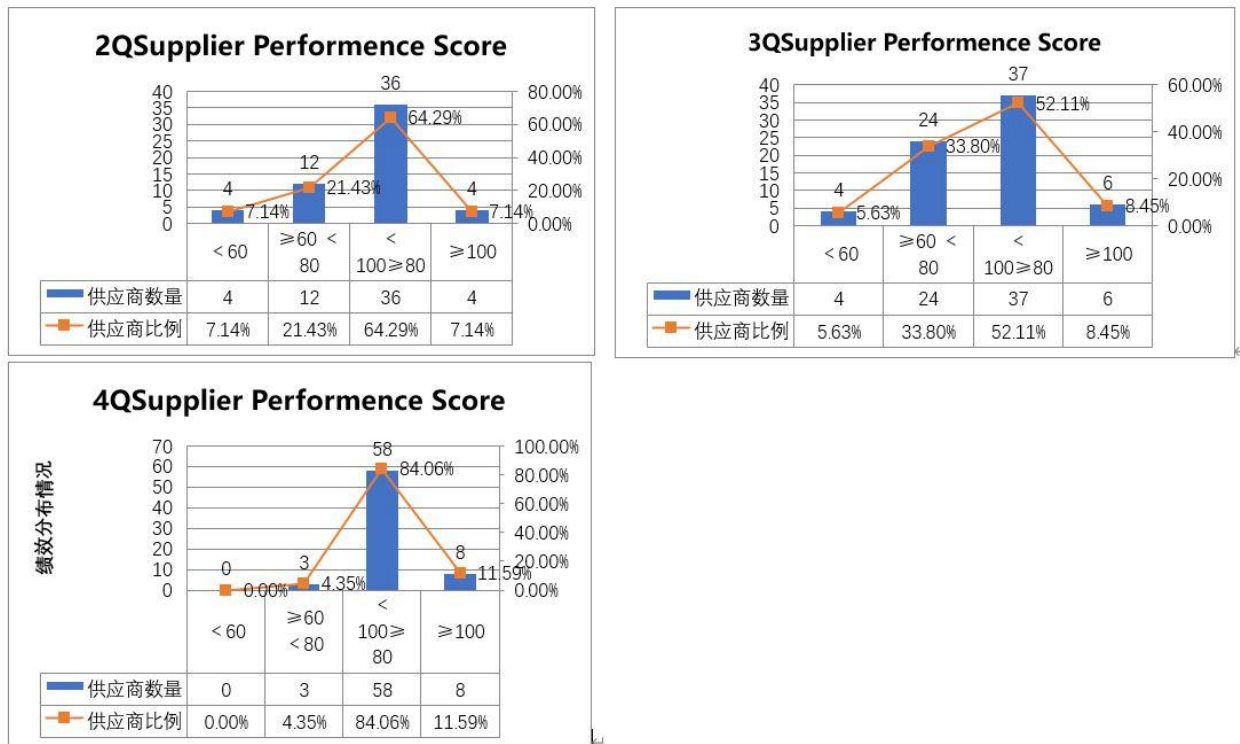


Figure 2 Supplier distribution map

5.3 The application of the excellent performance suppliers

- Performance data should be used in the supplier's selection process. Entry the supplier's performance score into the Enterprise Resource Planning System. The supplier's selection process has an interface with the Enterprise Resource Planning System, and the key scoring sources selected by the procurement comparison-"Historical Quality Performance", "Historical Delivery Performance", and "Service Performance" etc., can be directly associated and automatically called out.
- By publishing the list of preferred suppliers, excellent suppliers will be given priority in the selection process;
- Give preferential treatment in terms of contract payment terms, payment period and other terms, and give priority to payment;
- Suppliers that have performed well in more than 3 quarters are included in the scope of Product Supplier Cooperation List (QPL), and participate in the strategic cooperation with AEMC.

5.4 The application of the suppliers who are warned

Both sides need to deeply analyze the root cause of the problem. Increase the training of suppliers, and timely understand the doubts and confusions of suppliers in cooperation, delivery and quality, etc.

The qualifications are be suspended before the completion of the improvement. The procurement department coordinate and the relevant department is responsible for the closed loop of performance rectification issues.

Provide regular counseling to suppliers and carry out comprehensive training on special topics. Enhance the depth of suppliers' participation in the project.

Summary

There is a saying in Lean production: simplify complex issues, quantify simple issues, implement quantified issues, and methodize implementable issues.

Combining the AEMC's actual situation, by designing supplier performance evaluation indicators, the performance evaluation process is as clear and standardized as possible. On the basis of

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comprehensive consideration of performance, ability, demand and other factors, it is possible to establish a supplier-managed procurement strategy.

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