The Establishment of Intelligent Review Rule Base of Material Procurement Plan

Ming YANG, Jian-hong LI and Dou-ping ZHANG

Yuncheng Power Supply Company, State Grid Shanxi Electric Power Company, Yuncheng, China

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Abstract. At present, a large number of electric power enterprises use the enterprise resource planning system to carry out fine management of enterprises, and the application of information systems effectively improves the standardization and standardization of enterprise management, which is conducive to the overall advantage of the enterprise. In the management of the material procurement plan, the review of the material procurement plan is a complex and important task. Each batch must be reviewed on a case-by-case basis in accordance with the requirements of the State Grid Corporation of China and the provincial company, and the material information is numerous and complex. This article gives the specific content of the rule base in the intelligent review of the material procurement plan, including the establishment of the review point rule base, the establishment of the review strategy association table and the expert database, and the time accuracy evaluation method. The rule base provides an accurate and easy-to-operate information platform for review experts and managers who participate in the review of the material procurement plan, making the original heavy manual review method and tedious and time-consuming statistical work a history, eliminating the need for centralized review arrangements. By recording the relevant data of the entire process of the review process of the material procurement plan, the information generated by the review process can be managed in time, providing data guarantee for subsequent retrospective query statistics. By accumulating a large amount of valuable data in long-term use, company managers can analyze these data to analyze the procurement requirements plan and the implementation of subsequent procurement plans in the entire process of material procurement plan review, which is conducive to discovering itself Problems.

Introduction

Under the current situation, the power grid has entered the development stage of high voltage, long distance and large capacity, and the requirements of the power grid construction on the material quality and procurement speed have also been constantly improved. The construction of "three sets and five major systems" by state grid corporation of China (SGC) means higher requirements for the intensification of power grid enterprises. With the large-scale investment of the state power grid in recent years, most of the key types of products in the power grid material and equipment market have been in the seller's market, the difficulty of material supply has increased, and strengthening the level of intensive material management is an inevitable requirement for the marketization development of power grid enterprise\(^1\).

At present, a large part of electric power enterprises uses ERP system for fine management of enterprises. The application of information system effectively improves the standardization and standardization level of enterprise management, which is conducive to the full play of the overall advantages of enterprises. Due to the current management of electric power enterprise supplies, supplies plan source has the characteristics of diversity and complexity, the use of ERP information system as a technical support, is more advantageous to implement the procurement plan management of universal coverage, ensure the timely and accurate materials supply, adapted to the management and development of enterprises, to promote a healthy and sustainable development of the enterprise\(^2\).
In material purchasing plan management, material purchasing plan review is a complicated and important work, each batch must be in accordance with the requirements of the state grid corporation and provincial company detailed case-by-case basis to review, and materials information and more complicated, such as material, delivery mode, delivery time, budget, technical specification book status, project name, material code ID, plan, cure ID number, technical specification book time, planning, etc. In addition to the need to ensure that these contents do not repeat, but also to determine the basic information of other information, such as the correctness, rationality, normality of the procurement batch, and even including the matching of technical parameters have to be reviewed, the difficulty can be imagined. And the review of the quality of the follow-up procurement, contract signing and settlement and other links have a great impact. In particular, the accuracy rate of the batch plan review directly organized and implemented by state grid will directly affect the target indicators of provincial companies, which also leads to great pressure and intensity of the staff of relevant review work. Therefore, it is necessary to carry out the research on the intelligent review technology of material procurement plan, so as to automatically review the procurement plan, so that people can be liberated from repetitive mechanical labor, and greatly improve the efficiency and accuracy of the review of procurement plan.

Review the Status of Purchasing Plan

Research Status of Rule Engine Technology

Rule engine is an important application in the field of rule-based expert system. Among the existing products, most of the commercial rule's engines are powerful but expensive and not applicable. However, the emergence of open source rules engines has not been for a long time, and the technologies and application models are still not mature and need to be further developed. From the regional point of view, foreign countries are in the lead in the research and application of the rule engine, while domestic application of the rule engine is less, but also in the process of rapid development.

In foreign countries, the rules engine research began in the 1970s, by Stanford university to try first, they have developed the world's first rule-based system MYCIN, diagnosis and treatment for blood diseases, but because at that time, the lack of technical aspects, the system has not been widely used, but the system has landmark significance in the field of rule engine.

In the 1980s, due to the advent of object-oriented technology, rule engines regained their popularity and began to develop rapidly. Now there are a series of commercial or open source rule engine products, most of which are based on the Java language. Among the existing systems, representative products include JRules developed by ILog, which is a mainstream product in the current market and has advantages in the description of business rules and the design of special language. In addition, Jess is also one of the products with a wide range of applications. It is developed by sandia laboratories in the United States and mainly applies to some control systems. However, due to its complex rule language, it is not commonly used in enterprises and public institutions. Drools has received the most attention in recent years. It is based on the Java language and adopts the ReteOO algorithm, which adds object-oriented thinking to the most important Rete algorithm in the traditional rule engine, thus greatly improving the flexibility of the product and becoming the most popular open source rule engine system at present. At present, domestic applications are mostly based on Drools.

In China, in recent years, there are also some rules engine systems gradually. For example, hangzhou qizheng information technology co., ltd. once developed a set of qizheng business rules customization platform, realizing the visual business rules customization. The institute of intelligent information processing of soochow university has developed an opportunity rule engine for imprecise forward inference, which has a wide range of application environment and good universality, and can be used to construct powerful expert systems.
Research Status of Workflow Engine Technology

With the rapid development of science and technology, workflow technology is also breaking through. One of the most attractive is the realization of automated office, the human-computer interaction technology concept really into the enterprise business, through the interaction with office software and management tools, greatly improve the enterprise office efficiency, its influence is also growing. Workflow technology has played an outstanding role in all fields of work, whether it is enterprises, government agencies or financial fields. By modeling the business process, it can achieve automatic control and efficient management. Therefore, it has received widespread attention from all walks of life. At present, research on workflow technology has been developed and applied in many fields. No matter it is traditional enterprise, modern company, large company or small company, they cannot do without the help of workflow technology to their business process management.

Workflow has gone through three stages in the application of business processes: process modeling, which is an important basis for subsequent process analysis. For non-representational levels that exist within a process, process modeling can be presented in a concise and formal manner. Process simulation. This stage is to detect the process to find the problem and provide guidance for the subsequent improvement. Process improvement and optimization, on the basis of the second phase, targeted improvement and optimization. These three stages are inseparable from each other and interact with each other. It is a process of dynamic evolution, and a workflow model with high efficiency is inseparable from the interaction of these three stages. This over-dependence is also a problem in traditional process modeling and integrated simulation.

Workflow technology is not mature in the three stages of use, in the stage of the process modeling, now can only use some simple description tools, such as flow chart, the description language is also a simplified description of the process form, compared with the existing in the enterprise business process uncertainty, there is no definite executable mechanism. Furthermore, at present, both at home and abroad, the simulation and improvement of workflow model need to be improved. Instantiation is a prerequisite for the operation of past workflow models, and relevant management tools are not yet able to provide more help for simulation and statistical analysis of process models. However, there is no doubt that only the efficient combination of process modeling, workflow technology and simulation technology can achieve the goal of excellent integration of all nodes and stages in process change management.

Theoretical Basis and Content of Methods

In this paper, the center of the intelligent examination method of the procurement plan for according to the material types, material, small goods, material code in different materials, such as category, as well as the agreement procurement, inquiry of inventory, bidding and purchasing, supermarkets procurement and single source procurement, competitive negotiation procurement mode, to “describe + material” purchasing mode as the basic unit, based on historical bidding data, according to different categories, different levels of material of the project name, selection of material, the delivery date, unit price, review points are structured and standardized processing, forming standardized examination points library material purchasing plan, A systematic, structured and standardized processing method was established to match the material description with the main points.

Principle Brief of Method Contents

Basic Principles of Rule Engine Technology. The predecessor of rule Engine is Inference Engine, which is an expert system based on rules. Generally speaking, the expert system includes rule library, working memory and Inference Engine. When the rules engine is running, the data is
first loaded into the working memory, and the inference engine begins to compare the data objects in the working memory with the business rules. If the conditions are met, the rules are executed. It can be seen that the principle of the rule engine is how to use efficient algorithms to quickly match the rules that meet the conditions, so the performance of the engine largely depends on the efficiency of rule matching. The pattern matcher is at the heart of the rule’s engine. Whether the forward reasoning algorithm or the backward reasoning algorithm, the first thing to solve is the performance problem of pattern matching. The pattern matching of a rule can be defined as follows: a rule is a set of patterns, and the fact/hypothesis matching state is said to satisfy the condition if it matches all the patterns that the rule has. The operation principle of the rule engine is shown in Fig. (1).

Figure 1. How the rules engine works.

**Basic Principles of Workflow Technology.** In simple terms, workflow is the part or the whole of the business process. With the help of the computer model, all the links in the business process can be seamlessly connected to realize automatic interaction and execution. This process includes the processing and transfer of information, documents and tasks.

The system management technology developed under the support of workflow technology can generate a more comprehensive business management system through the docking with various applications to realize the management of different businesses. It is widely used in manufacturing, office automation, concurrent engineering and other fields. The concept of workflow is used more to explain the interactive execution of specific work and business processes. Through the management of each node, module and participant in the workflow, the enterprise can improve its work efficiency and competition level.

**Practical Basis for Material Procurement Plan Review.** The batch procurement plan shall be examined and approved by the demand unit, the material supply center and the material supply enterprise, and the "three up and three down" plan control mode shall be implemented. The first level for examination and approval, the key audit application material whether accuracy, non-standard material rationality, technical specifications, delivery time, quantity, and evaluate the information such as unit price, and a preliminary judgment procurement way (mainly includes the agreement on the mode of procurement procurement, inquiry of inventory, bidding and purchasing, supermarkets procurement and single source procurement, competitive negotiation, etc.), organizational project management department, technology department in charge of the unit and design unit review the tender specification. Secondary examination and approval in addition to reviewing the above information, professional competent departments are also organized to focus on the project compliance, material accuracy, technical specification rationality review. The review
committee of the three-level examination and approval organization shall solve the problems in the preliminary examination and finally determine the accuracy of the plan and upload it. The existing material plan review mode focuses on routine audit, centralized review and statistical analysis. Daily audit is a preliminary audit of the reported demand plan in the process of submitting the demand plan by the municipal companies; Centralized examination is to organize experts to conduct centralized examination of the demand plan and technical specification submitted by this batch; Statistical analysis refers to the statistics, classification and analysis of the problems in this batch after the examination.

(1) daily review of material procurement plan

Routine audit is to put the normative review node in front, not limited to the centralized review after the completion of all the reports of this batch of plans, but to ensure that the technical specifications submitted to the e-commerce platform are submitted along with the review, especially the preliminary review of key materials such as transformers, integrated electrical appliances, circuit breakers, iron towers and wires. The content includes whether the project name meets the requirements, whether the technical specification book name is correct, etc. daily audit is another line of defense for the accurate submission of material procurement plans. Routine auditing buys a lot of time for technical specification backtracking modifications that do not meet requirements before centralized review. At the same time, routine audit also greatly improved the efficiency of centralized review.

(2) centralized review of material procurement plan

Whether the material procurement plan is accurate or not is related to whether the subsequent procurement bidding, contract performance, settlement and payment can be carried out smoothly. Therefore, in order to ensure the accuracy and compliance of each plan and technical specifications, the company increased the intensity of audit, the organization of material procurement plans and technical specifications of the centralized review. The company grouped the material procurement plan to be examined according to the specialty, and organized the excellent talents of each specialty to conduct centralized review of the review plan and technical specifications as neutral experts. The content mainly includes the planned delivery time, place, quantity, price and whether the corresponding technical specification is consistent with the reported plan, etc. Through the centralized review, the wrong plan is effectively avoided, and the accuracy of material procurement plan and technical specification is improved.

(3) statistical analysis of material procurement plan

Batch concentration after the review, power grid companies to the problems arising from the review on statistical analysis of different dimensions, such as the plan and technical specification book return to modify, cancel the analysis of the reasons: first, to modify technical specifications book back to the reasons were analyzed, and the specific parameters can be summarized as fill in error, not using the latest version of the specification template, incomplete specification, drawings and technical specification inconsistent problems; Second, analyze the reasons for the return and modification of the plan, including the wrong delivery time and place, unreasonable price and wrong quantity. Third, analyze the reasons for the cancellation of the plan, such as the adjustment of the project or the wrong report. Through statistical analysis, problems can be identified in time and the next batch of review work can be guided to achieve the goal of continuous improvement. At the same time, the statistical results are published, which can be used as the basis for the assessment and ranking of each demand unit, so as to encourage and urge each demand unit to better improve the reporting quality of the plan and the reporting accuracy of the material procurement plan.
Specific Contents of Rule Base for Intelligent Review of Material Procurement Plan

According to the previous introduction, this paper provides the specific method to establish the review rule base of material procurement plan. Specifically, the review rule base of material procurement plan includes the following contents: according to the attributes and characteristics of the main points of structural review, the review rule base of material procurement plan is studied and established based on the comprehensive consideration of whether there are key elements and whether it is qualified or unqualified within the specified scope. In view of the key points such as the batch range and delivery date of the project items, combined with historical data and project characteristics, research, construct and formulate the strategic correlation table and expert database for the review of material procurement plan. According to the delivery date, judge the time accuracy of the batch of materials.

Establishment of Rule Base of Review Points. According to purchasing plan review point specific content, including the definition of project, monomer project name, initial approval document, the approval document number, comprehensive plan approval document, feasibility study document number, overhaul, overhaul project project WBS element voltage level, operational WBS element, purchasing organization, material voltage grade and technical specification book ID elements, these elements are of a similar review principle of each batch of censorship rules, a null value judgement for text information, keywords retrieval, the choice of the type hierarchy can be reviewed, so specific censorship rules are divided into: can is empty; determine whether there is wrong text, whether the keyword information is qualified and matches the rule base requirements. According to the specific text of different elements, the rule base of review points can be formed. The specific rule base of review points is shown in the Fig. (2).

Establishment of Review Strategy Correlation Table and Expert Database. As the review rules of different batches are not exactly the same, it is necessary to stipulate different review rules according to different batches. For complex and special review points, it is also necessary to establish an expert database to explain the contents, which is convenient for the majority of people to use.

Taking the material coding as an example, the "classification" of the review rules was carried out by distinguishing the power transmission and transformation batches, the power transmission and transformation agreement inventory application batches, the provincial procurement batches, the distribution network agreement inventory procurement batches and the sporadic agreement inventory application batches. The specific contents are as follows:

As for the material column, due to its complex contents, according to the historical data and characteristics of the power grid, the corresponding information expert column is constructed. The specific contents are as follows: constructing "prompt column", "power transmission and transformation batch", "power transmission and transformation agreement inventory procurement batch" and "power transmission and transformation agreement inventory application batch".
Time Accuracy Evaluation Method. In view of the time accuracy, this paper puts forward specific methods to judge the time accuracy of different batches of materials according to the earliest delivery date, transmission protocol for power transmission and transformation batch, inventory application date. The examination way as follows. Compared with the earliest delivery time, if later than the time pass, if earlier than this time or the time is empty, then proceed to the second step comparison. The second step is that the earliest delivery date should be later than the “batch to the bid opening time + reasonable supply + 75”, later than is reasonable, the modified delivery date earlier than the annotation; For power transmission and transformation agreement stock procurement batch, distribution network agreement stock procurement batch, sporadic agreement stock procurement batch, e-commerce procurement batch, the date review method is: a fixed delivery date, different error reporting; Application batches for delivery point agreement stock, distribution network agreement stock and application batches for sporadic agreement stock. The date of review shall be as follows: the proposed deadline for the batch (set in "batch planning and arrangement") +20 days (no more than +50 days). Holidays shall be avoided.

Advantages

Due to material intensive management involves many units and departments, the long chain, management link, between the procurement and other business departments, of all the responsibility, the purchasing department hierarchy management function easily confused, resulting in the
procurement aspects, especially in the area of material purchasing plan of mutual shuffle, management confusion. The research and application of rule base, make purchasing plan review work on various management processes of clear, transparent working process, various departments more clear their respective material purchasing plan in the global situation, avoid repeat procurement, illegal acquisition, over purchasing and procurement procedures not compliance, procurement plan is not reasonable, and so on and so forth, is beneficial to all departments set up intensive management concept, consciously put their own material purchasing work closely integrated with the company's overall deployment, consciously in the management and work according to the requirements of the intensive management, in the procurement process to complete all should perform duties. To achieve all the work, each responsibility, implementation, active cooperation, to form a good working atmosphere of the company, work together, cooperation, mutual support, to promote the intensive management of materials to a new level.

Rule base for participating in the procurement plan review experts and management personnel to provide an information platform of accurate, easy to operate, making the original heavy and complicated time consuming manual review way statistical work history, put an end to the concentration of because review arrangement is not rigorous, accuracy is poorer and the serious influence purchasing schedule, and the disadvantages of passive follow-up work.

In the review process of material procurement plan, the review of technical specifications by experts of each review team can be transferred from offline to online, and all relevant data can be retained in the system, which improves the effectiveness of statistical work. By recording the relevant data of the whole process of the review of material procurement plan, the information generated in the review process can be managed in a timely manner, providing data guarantee for the follow-up tracking, query and statistics. By accumulating a large amount of valuable data in the long-term use, the company's management personnel can analyze these data and analyze the procurement demand plan in the whole process of material procurement plan review and the implementation of the subsequent procurement plan, which is conducive to finding their own problems.

Conclusion

In the era of rapid development of the Internet, the power grid is following the trend of The Times and heading for the Internet office. And the material procurement plan review and Internet office together is an inevitable trend.

According to the attributes and characteristics of the main points of structural review, the method of establishing the rule base of intelligent review of material procurement plan proposed in this paper is to study and establish the rule base of material procurement plan from the perspective of whether there are key elements and whether it is qualified or unqualified within the specified scope. In view of the key points such as the batch range and delivery date of the project items, combined with historical data and project characteristics, research, construct and formulate the strategic correlation table and expert database for the review of material procurement plan. According to the delivery date, judge the time accuracy of the batch of materials.

Moreover, as more and more widely used, the database generated from the historical data will be updated more and more accurately, more and more abundant, and can deal with more and more special problems. In this way, the manual work of the procurement plan review will be turned into machine work step by step, the efficiency and accuracy of the procurement plan review will be improved, and the intelligent level of the power grid company's material procurement plan management will be improved, which will become an important part of the power grid construction.
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