Total Supplier Risk Monitoring

Knowledge Management as a Basis of a Preventive Supplier Evaluation

Anja Wilde¹, Anna Nowak²

¹Anja Wilde, Project Manager @ contractus GmbH and Researcher @ TU Berlin, Germany, anja.wilde@contractus.com
²Anna Nowak, Student @ TU Berlin

Robert Dust is an expert of Total Supplier Management. If you want to know more about Total Supplier Management ask Prof. Robert Dust @ TU Berlin.

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Abstract: Industrial companies obtain much of their value and technology innovations from external suppliers. Due to the rising dependency of companies on their suppliers it is necessary to monitor the suppliers performance constantly. The current object of research is to create new business processes with a holistic IT-concept to get all significant information about the entire supplier base. The aim is to be flexible and fast in decision-making in case of non-performance or even to take preventive measures to avoid irregularity in production. But how to evaluate thousands of suppliers at once? How does Data Mining support the knowledge management in the supply chain management? The Stepped Evaluation Model of The Total Supplier Risk Monitoring and the Smart Data Advanced Analytic Process approach a corporate knowledge management which forms a basis of a preventive supplier evaluation.

Today modern industrial companies obtain much of their value and technology innovations from external suppliers. In the automotive industry, the external value added depth is currently 82 percent[1], with tendency to rise. New trends, such as networking and digitalization result in a strong network of supply chain activities between various global industries. Due to the increasing relocation of processes and know-how into the supply chain the independency of companies from their suppliers decreases accordingly. In conclusion, the controlling and monitoring of suppliers becomes an indispensable factor to the business success [2]. New methods and a holistic supplier risk management are essential to secure the suppliers performance. Especially companies with a high level of external added value and an extensive product complexity are dependent of their suppliers. Therefore, a cooperation in the global supply chain network is a premise to avoid friction loss at the interface between the customer and the supplier. The use of integrated organizational structures, processes, methods and tools is necessary to achieve a higher efficiency.

Today's supply chain management no longer meets the requirements of this increase in external performance. Complete and robust statements about the entire supply base of a company are rarely available. To achieve an early identification of problems and risks in the supply of components and services a preventive and inter-divisional assessment of each supplier must be realized [3]. Currently the supplier risk management is based primarily on weighted and consolidated key performance indicators which often do not allow performance-related or risk-related statements. Therefore, this method does not generate knowledge about the entire supplier base. Due to the lack of transparency there is no suitable basis for decisions. High risks will not be detected and urgent problems can be hidden. As it takes a high effort to rate every single supplier two-thirds of the companies declare that they assess only some of their suppliers [4]. In this case important suppliers with their potential risks may not be considered. This can have negative impacts on the company's success and has to be avoided by using innovative methods.

MONITORING SYSTEM FOR EFFICIENT PERFORMANCE AND TREND ANALYSIS OF EACH SUPPLIER

The appropriate deployment of forecasts and expert sensors increases the decision’s transparency and validity. The stepped evaluation model supports the regular assessment of every single supplier. The aim is to early identify the risks in the supplier-customer relationship such as bottlenecks in delivery or deficits in quality to counteract those immediately and thus minimize negative consequences. This efficient and preventive supplier rating requires inter alia a knowledge management with intelligent evaluation algorithms [5]. Cross-divisional statements are created by a consolidation of individual ratings of every concerned division in to a stepped evaluation model. The targeted and systematic use of operational and expert sensors as well as forecasts allow efficient application with maximum transparency (figure 1).
Each supplier passes through a three-stage analysis methodology that functions as a filter and reduces the number of suppliers in scope. In the first step all active suppliers of the company are analysed by a few selected key performance indicators. Furthermore, forecasts are used to early identify critical suppliers and to take appropriate preventive measures. This leads to a time and cost advantage compared to a reactive approach. Only the striking suppliers reach the second step. Further criteria (expert sensors) e.g. the communication behaviour of a supplier are added to the decision basis to identify suitable improvement actions for the critical suppliers detected in the first step. The re-filtered suppliers are preferentially selected so that only a few reach the third step. In this final step the process capability of suppliers is evaluated, considering their components and sites, to achieve a cause-related identification of deficits. This generates a long-lasting solution of problems. Using this approach reduces the analytical effort and provides all required information within a step. The principle of this procedure: Evaluation of all suppliers with relevant sensors within one step instead of evaluating only the "important" suppliers with all sensors [6]. But the increasing amounts of data that have to be processed along the external value networks require further efficient methods to generate knowledge.

**EFFICIENT KNOWLEDGE GENERATION**

To realize the stepped supplier evaluation, a conscious use of the detected supplier-specific data is important. Big Data is currently experiencing a hype around the immense amounts of data, which are recorded in many business areas as a result of digitization. Thus, industrial companies already collect a large number of performance data of their suppliers, but the data is often incomplete or incorrect [7]. Subsequently calculations based on that data are not useful. The cause is often located in historically developed IT structures that are not always state of the art. The result is not only an insufficient data quality of individual key performance indicators, but also the prevention of the consolidation of information into a reasonable statement about the performance of suppliers. Thus, essential preconditions for an efficient control of the supply chain are unavailable. However, a customized knowledge management with intelligent evaluation methods and the approach of a stepped evaluation model offers the possibility to identify all critical suppliers from the entire supplier base. The data collected in the supply chain management is based on many indicators that provide information about the performance of external supply partners. As the volume of data doubles every two years [8], there is a risk of a data overload, which has increasingly negative effects on the companies processes. The frequent lack of transparency in the data collection and the growing demands on employees to analyse a large heterogeneous data volume have a demotivating effect on the staff. An inevitable consequence is the development of innovative methods that analyse and evaluate the data for application. Therefore, the aim is not Big Data, which means many, randomly gathered data, but rather Smart Data, which creates a conscious, cross linked and robust data base, available in real time that serves as a reliable basis for decision [9]. Smart Data generates knowledge from all relevant data and provides transparency, so that a preventive control of the full amount of suppliers is possible. The studies „Total Supplier Management – Strategische Wettbewerbsvorteile durch Risikoprävention im Lieferanten management“[10] and „Big Data in deutschen Unternehmen“ [11] show, that most of the companies do not have a digitization strategy and therefore no strategy for generating knowledge by using Smart Data. The absence of these critical success strategies restricts the company in managing its external value networks and thus avert preventive risk hedging.

**SMART DATA ADVANCED ANALYTIC PROCESS**

The Smart Data Advanced Analytic Process (figure 2) increases data quality and creates a transparent and robust basis for decision making in dealing with suppliers and partners [9]. The methodologies to ensure a valid data base are as important as the automatic data mining. Along the following seven steps, the information base is generated for the initiation of appropriate measures in the steering committee.
Strategy and Task definition:
The process starts with a strategy to control the supply chain. Furthermore, the criteria which distinguish critical suppliers have to be defined. This includes performance gaps, e.g. quality and logistics requirements that are not complied.

Data and relevance analysis:
During the second step the database is chosen. To that, all significant figures are provided in real time. The data selection refers to the records that already exist in the systems of the company. These are mostly performance data such as quality and logistics indicators (e.g. delivery and quantity stipulations). In addition, also general information such as the production site of the supplier is useful. This data provides a supplier specific vector including all characteristics. This vector will be tested on relevance for further analysis.

Data Checker for internal and external data:
A fundamental principle of generating knowledge is that the extracted information is only as valid as the data base itself. In companies the data quality is often insufficient for the representation of reality, for example manual entry errors caused by the carelessness of the user produce false or missing data. Using a systematic Data Checker, which scans the data for plausibility, validity and availability improves the robustness of the data [7]. The existing performance data of the suppliers is imported into an analysis model where it passes through standardized evaluation methods. The significance of the information is analysed during the conceptual design of the data set (Conceptual Data Checker). This is part of the strategy phase, in which e.g. the key performance indicators are designed. A plausibility check of the basic data investigates the logical linking of data (Logical Data Checker). The recorded data from different systems have a high quality, when they are consistent. If a data set is statistically illogical, compared to values of the past, it is conspicuous (Statistical Data Checker). A formal control adjusts the content that is not corresponding to the desired data format (Formal Data Checker). A manual data entry always provides the highest potential for error, e.g. when entering a date in a system not only the accuracy has to be considered but also the predetermined format of the system.

Data Mining:
The actual generating of knowledge takes place in data mining. In this process patterns are scanned in all relevant supplier-specific data using mathematical algorithms. If a pattern is striking it is possible to draw conclusions about risks within the supply network early. For example, suppliers with the same or similar pattern will be inspected even before they appear negatively. Therefore, the generated knowledge creates value through the ability to act early. In the automated application of data analysis, the data sets are analysed independently and data-driven. Previously unknown patterns can be discovered without prior hypotheses or assumptions. To amend the supplier management with analysis of internal and external data sets may provide competitive advantages for the company because the early information enables a preventive action.

Visualization of the results:
The generated results are edited clearly and concisely, so that they are understandable for a large number of employees from various divisions of the company.

Evaluation and interpretation of the results:
The results of the Smart Data Advanced Analytic Process will be presented and evaluated regularly in a cross-divisional suppliers steering committee. The members of the committee, which is formed by competences of different departments, e.g. purchasing, logistics, development and quality, exchange their views about the risks within the supply chain regularly.

Operational and strategic decisions:
The steering committee decides on preventive measures to control risks in the supply chain based on the obtained information and by means of efficient escalation models. As a result, the supplier performance is preventively protected or sustainably recovered.

PREVENTIVE SUPPLIER EVALUATION TO ENSURE THE BUSINESS SUCCESS

An efficient and preventive supplier evaluation is critical to the competitiveness of the own company. Smart Data support many internal corporate processes due to the holistic knowledge management. The successful implementation of the Smart Data Advanced Analytic Process offers the
necessary information base for the early identification of critical suppliers by providing a data amount which is investigated for plausibility, validity and availability in real time. The information extraction from the data sets runs automatically using mathematical analysis tools. Therefore, errors in the decision-making process are reduced and time is saved. New technologies and innovations within the external value network are hedged using these new policies. Thus, the evaluation of the data and the information obtained there from have a direct impact on the company's success.

REFERENCES


