

# Risk Assessment of Low-Cost Suppliers

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## Abstract

Increasing competition requires as the forefront objective cost reduction. A competitive price of products is crucial in order to gain market share on both the domestic market and on emerging markets. Several studies revealed that 60-70% of the production costs are determined by bought-in part costs. In order to cut costs an increasing number of companies source their bought-in parts and even whole subsystems from suppliers sedentary in low-cost countries (LCC). In this case, benefits in cost reduction are confronted by an increasing risk of the buyer. Especially for technical components penalties in quality, the ability to deliver and price stability are the outstanding drawbacks when purchasing products from suppliers in low-cost countries. Therefore, in order to keep cost advantage and guarantee high quality to their own customers, the buyer has to develop the capabilities of the supplier. This paper aims to present a systematic approach on how to develop and assess a LCC supplier for technical equipment. Thereby, special attention is given to the question how the emerging risks can be identified and quantified. Therefore, the investigated hypothesis states: *Risk evaluation is one key factor of supplier assessment in low-cost countries.*

This exploratory research uses literature review in combination with the empirical results of a survey about supplier development and own field experience from consulting projects as research methodology. Thus, seven stages of a supplier development process in low-cost countries are identified. The emphasis is laid on risk assessment, which is a fundamental element for developing a LCC-supplier. In order to evaluate the risk significance of purchasing from low-cost countries the method *Failure Modes and Effects Analysis (FMEA)* is adjusted. Transferred to the problem at hand, the adapted FMEA is a structured approach to prioritize and quantify risks. The adaptation of the FMEA mostly refers to the rating scale that is used to assess the severity of each risk, its chance of occurrence and the likelihood of its detection. Furthermore, the probability of occurrence and risk severity is correlated with the caused costs in case that the specific risk occurs. Based on the risk priority number (multiplication of probability of detection, probability of occurrence, and severity), failure modes for action are prioritized. On that basis, the selection of risk sharing approaches is conducted. Every potential measure is additionally assigned with its cost. By this comparison the *Return on Investment (RoI)* for every measure is considered by its risk costs as well. Especially in the case of buying from a LCC supplier, the combination of monetary and non-monetary risks is fundamental.

The presented approach was applied and verified within the development of a Chinese supplier in the rubber-metal industry. The customer in the case at hand was a global playing company with mechanical engineering background. The challenge to tackle was the reduction of bought-in part costs by 30% through the transfer of the supply chain to a low-cost country supplier while not increasing after-sales costs. 48 risks are identified for purchasing activities from China at large. Risk height is quantified monetarily as well as by its probability of occurrence. Summarizing, the case study shows and verifies that an efficient risk assessment is an elementarily part of the overall supplier development process.

**Keywords:** Supplier Development, Risk Assessment, FMEA

## Introduction

Increasing competition requires as the forefront objective cost reduction. A competitive price of products is crucial in order to gain market share on both the domestic market and on emerging markets (Pfefferli 2002). Several studies revealed that 60-70% of the production costs are determined by bought-in part costs (Heberling, Carter, Hoagland 1992; Chapman et al. 1997). Nowadays, this fact is not only true for consumer products but for investment goods as well. In order to cut costs an increasing number of companies located in developed countries source their bought-in parts and even whole subsystems from suppliers sedentary in low-cost countries (LCC). In this case, benefits in cost reduction are confronted by an increasing risk of the buyer (Zsidisin, Panelli, Upton 2000; Harland, Brencheley, Walker 2003). Especially for technical components penalties in quality, the ability to deliver and price stability are the outstanding drawbacks when purchasing products from suppliers in low-cost countries (see fig. 1). Supply risks exist virtually in every organization. However, today few purchasing organizations perform rigorous supplier assessments and create plans to mitigate risks, even if the effects can cause significant damage to the organization's entire supply chain (Zsidisin and Ellram 1999). Therefore, in order to keep cost advantage and guarantee high quality to their own customers, the buyer has to develop the capabilities of the supplier.

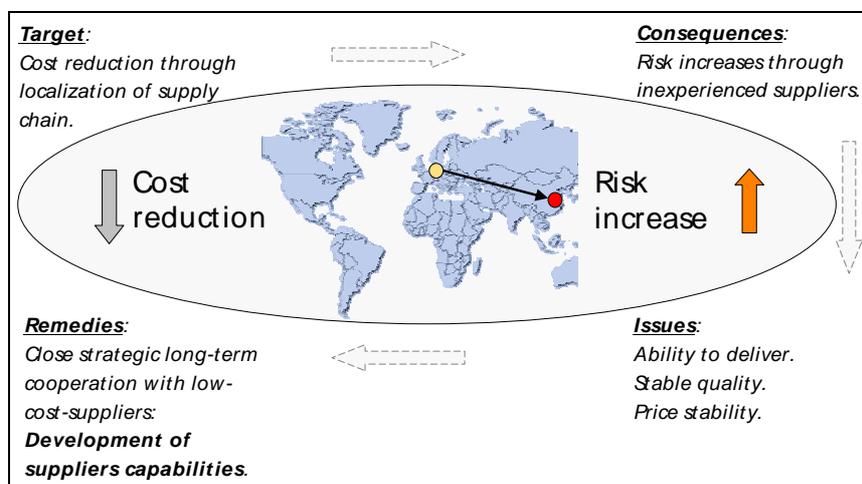


Fig. 1 Coherence between cost and risk when sourcing from a low-cost country

Consequently, especially when sourcing from low-cost countries, tools and methods of supplier assessment and supplier development must be used in a systematic and durable manner in order to form an inter-organizational relationship. However, little is known about supplier assessment and supplier development and especially the risks to face when purchasing components in low-cost countries. This paper aims to present a systematic approach how to identify and quantify risks. The investigated hypothesis states: *Risk evaluation is one key factor of supplier assessment and development in low-cost countries.*

## Research Method

In order to ratify the presented hypothesis the underlying process of supplier development has to be determined. This exploratory research uses literature review in combination with the results of a survey about supplier development and risk assessment as research methodology. The approach and the results of the literature review and the company interviews are presented in the following three sub-sections.

### **Literature Review (Supplier Development)**

A review of literature shows that most research regarding technical purchase addresses factors and characteristics of buyer-supplier relationship and supplier management, such as information exchange and communication (Mohr and Nevin 1990; Mohr and Sohi 1995; Calvi, Le Dain and Schlipf 2005), trust and commitment (Anderson and Weitz 1992; Doney and Cannon 1997) or dependence and safeguarding of relationship specific investments (Heide and John 1988; Buvik and Reve 2001). Here,

either criteria of a supplier selection or the already existing supplier/buyer-relationship are discussed. In reality, selection criteria are mostly given and predefined. On the other hand when sourcing from a low-cost country, seldom there is a broad base of knowledge about the supplier's capabilities. Hence, first the supplier has to be evaluated according to the given criteria. After the choice of the supplier which should also contain a risk assessment of the supplier, in a further step the supplier has to be developed and adjusted to the processes of the buying company. Only few scientific papers address this theme of supplier assessment and supplier development. Krause and Handfield (1999) and Appelfeller (2005) regard the process of supplier development as the purchaser's task. In order to improve the supplier's capabilities up to a certain level of performance two strategies of the buying company can be differentiated: either a supplying company needs to get improved in some functions (case 1) or the buying company decides to source some components from a new supplier (case 2). In the first case, the buying company commonly has records and statistics that help to determine which issues need to be improved. Usually, risk assessment of the supplier is not required in case 1. Our research deals with the second case when the buying company decides to source some component from a new supplier.

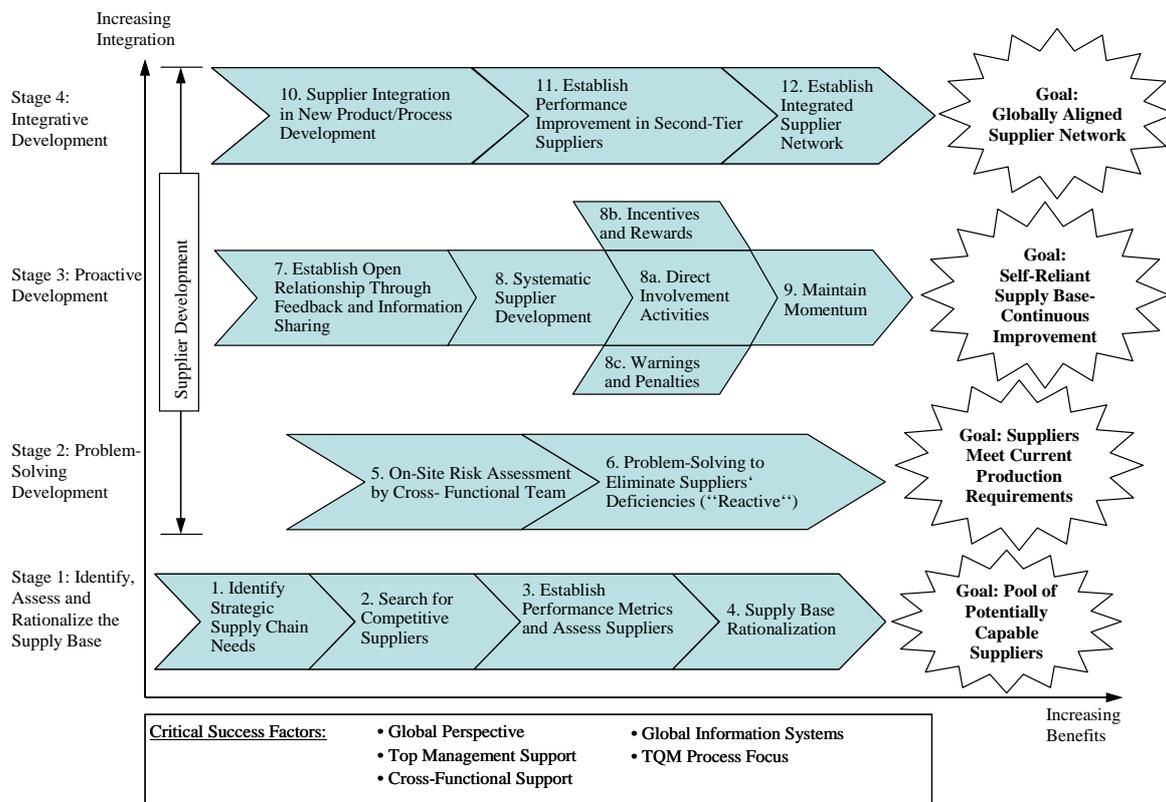


Fig. 2 Supplier Development (Krause and Handfield 1999)

The overall supplier development process by Krause and Handfield (1999) can be best compared to the characteristics of an assessment and development of a supplier from a low-cost country. The model can be segmented into elementary parts with related milestones, such as problem solving, proactive development and at last the integrative development (see fig. 2). This model is based on the findings of a case study involving companies that are striving to build a globally aligned network of suppliers. However, due to the elevated risk when sourcing from an unknown LCC supplier, the "problem solving development" (stage 2 in fig. 2) is crucial. Therefore, we recommend the execution of a supplier assessment before initiating the problem solving process. This additional supplier assessment reveals the main issues and risks in order to detect the bottlenecks that need to get improved. The reactive approach to development in step 6 is aiming at the weaknesses that require immediate action of improving the suppliers' capabilities to a minimum level, so that the organization can meet production and/or service requirements. The supplier's deficiencies that may cause systemic problems in the longer term may be represented in long-term objectives (Krause and Handfield 1999, p. 4-17).

Due to the focus on technical purchase in our research we consider the facilitation of the buyer's current production requirements by the new supplier as the main objective. Hence, a stronger subdivision of the process of "problem solving" is recommended. Since the sourced commodity and the supplying company itself are fundamental drivers of risk, the integration of these two factors into the development process is suggested. Furthermore, in order to present the key steps to accomplish when developing a new supplier, milestones and main processes have to be appointed and an integrative and extensive model is required. The goal consists in creating and validating a process model which may be used as guideline, beginning by the decision to source from a LCC and ending with after-sales service.

### **Literature Review (Risk Assessment)**

An approach of risk measurement is undertaken in a study by Zsidisin (2001) based on a case study from the communication and information industry. In this study, the evaluation of the supply risks is done by evaluating all commodities for their impact on the *Earnings Before Interest and Taxes (EBIT)*, thus all purchased items are being analyzed for their potential to affect EBIT. The estimated impact on EBIT for each item was derived by quantifying the probabilities of the occurrence of different scenarios. Furthermore, measures and activities in order to avoid risks for each supplier are listed. The advantage of this supply-risk-measurement is the quantification in financial terms of the impact of the possible risks. Hence, it supports communication to top management and facilitates planning for the next fiscal year.

A second approach is the concept of risk management by Wildemann (2006), which shows the four main elements of the risk-management-cycle: risk identification (1), risk assessment and risk analysis (2), risk measures (3) and, risk control (4) in a closed loop. This cycle has to be repeated by the buying organization up to a suitable detail on all relevant divisions and functions of the company. In addition, Wildemann (2006) describes multiple strategies of action to lower the appeared risks. The *Failure Modes and Effects Analysis (FMEA)* method is a systematic and structured study of potential failures/risks that might occur in any part of a system to determine the probable operational success, with the aim of improvement in design, product and process development (British Standard Institute 1991). After the identification of all possible failure modes (or risks) in a further step a rating scale is used to assess the severity (1) of each factor, its chance of occurrence (2) and the likelihood of its detection (3). The multiplication of these three figures makes the *Risk Priority Number (RPN)* which is used for prioritizing the different failures modes (or risks). Hence, in a FMEA-near process Wildemann (2006) prioritizes the measures of interest: First, it is determined whether the actual RPN is acceptable. If this is not the case the relation between costs and impacts of the probable measures has to be deduced for finally choosing the best fitting one.

Both of these methods handle risks and their probable severity and represent the state of the art in research concerning risk assessment. However, the major limit of these approaches is that none can cover the entire risk-field related to supplier assessment. Accordingly, the study by Zsidisin (2001) shows the possibility of calculating the commodity-specific costs for the next fiscal year only. Simultaneously, by calculating the risks in financial terms this method neglects the risks, which can not be expressed reliably and monetarily. In addition, due to the high effort and the annual commodity risk evaluation this approach lacks flexibility. On the other hand the main disadvantage of risk management concepts like the presented one is the missing monetary reflection. The measure costs are estimated so that the measures can be weighed by those and their impact on the RPN. However, this assessment of measures does not include the measure's impact on the probable overall costs (caused e.g. through occurrence of an issue), and therefore, the assessment is insufficient.

Evidently, the presented methods are beneficial in supporting risk assessment in specific cases. In contrast, a method for the application of supplier development requires both cost and risk assessment. The approach conducted in this study yearns for the combination of the advantages of both of the presented assessment methods. Consequently, the objective is the development of a tool that allows an overall risk assessment.

### **Company Interviews**

In order to figure out the state of the art in sourcing from low-cost countries 14 global companies were extensively interviewed. The interview guideline is divided into four sections. First the importance of

sourcing from low-cost countries including today's purchasing volumes, planned volume shifting and supplier structure is discussed by facts. Most companies link the location of sourcing to their own sales markets either to increase the local content without shifting the own production or to gain experience in the country of interest. But the reasons for shifting the value added also depends the specific country. Eastern Europe is seen as the location for cost reduction in mechanical engineering especially for the European market while most of the companies are interested in China because of its growing market. Also the expectations for cost reduction in shifting purchasing volume vary strongly. It is seen between 0% and 40%. Astonishing is that the local content requirements are varying from 0-70% of the sales volume when selling into emerging markets. The second step of the survey makes the experience with low-cost suppliers subject of discussion. Because the purchasing volume from low-cost countries is near to zero none of the interviewed company has extensive experience in handling low-cost-suppliers. Of interest is that the management seem to resign itself very often that cost savings are not realizable in Asian countries because risks happen. The sections three and four of the study regard supplier assessment and development. The focus lies on the tools and methods applied in the supplier development process. All interviewed company's rate supplier development as very important with an upward trend. The experience with supplier development is between 0 and 7 years. To define the status quo of a potential supplier all companies use supplier audits. The expenses for a supplier audit are estimated as 12 working days in average while at least two audits are necessary to come to a new supplier. Because of the high expenses most companies see a key factor in building up a local purchasing department. Supplier audits are normally conducted on basis of a standard question guideline. But only some of the interviewed companies use software to support all the business processes around supplier development. Internal supplier databases to increase transparency and information efficiency do not exist or are not used commonly. Also astonishing is that the expenses for supplier development are not considered within the overall cost calculations.

### Research Findings

#### Supplier development in seven stages

As mentioned above, most research concerning supplier development aims to present and discuss the total of the required actions for reaching a specific level of the suppliers' capabilities. However, in the case of sourcing from a LCC the supplier development approach needs to get enlarged with thereby further steps: First, the appropriate product to be sourced has to be chosen. The next step consists in identifying the proper supplier. The process of LCC sourcing is completed by the integration of a supplier assessment process. Summarizing we propose a supplier development process model for low-cost countries that consists of seven stages (see fig. 3). This supplier development process presented is differentiated in three task responsibilities: supplier activities, purchaser activities, and joint activities.

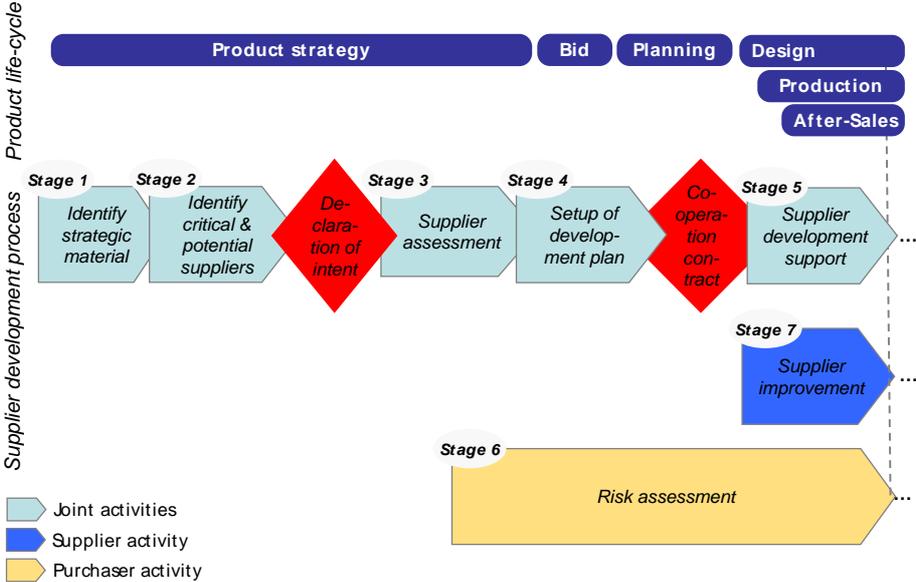


Fig. 3 Supplier development process

The decision of sourcing from a low-cost country may be made on account of a well suited commodity or the choice is based on the organization's strategy. The latter case requires the finding of a proper commodity, which ideally has a big potential of saving costs and at the same time does take in as less risks as possible. Accordingly, stage 1 ("*identify strategic material*") is influenced significantly by the three factors purchasing volume (1), complexity of the sourced commodity (2) and complexity of technology of manufacturing this commodity (3). These factors contain a main influence on the savings that can be achieved in the end. Especially the third point "technology" has to be recognized due to the danger of violation of patents. In case of plagiarism the achieved savings might get diminished dramatically. In addition, product characteristics such as logistics, quality attainment, cost structure, a need for R&D, cooperation as well as after-sales and environmental issues play an elementary role in choosing the proper commodity. Since the commodity to deliver is one of the main drivers for both risk and costs, an integrative view of the supplier development process is essential. In stage 2 ("*identify critical & potential suppliers*") an appropriate supplier has to be found in the country of preference. This procedure is similar to the commodity properties mainly influenced by the strategy and the risk management of the buying organization (Wagner 2001). Having identified an appropriate supplier a meeting between the supplier top management and the buying organizations' cross-functional team has to be realized. A paperwork that may be called "declaration of intent" ratifies the required steps of action, both for the supplier and the buying organization and represents the start of the future collaboration. Now, the cooperation can start and at the same time stage 3 ("*supplier assessment*") as the main part of supplier development begins. In order to find the suppliers' critical characteristics, we recommend the accomplishment of a joint assessment of the supplying organization at first (similar to Handfield 1998). Supplier risk assessment is an important task of the supplier development team: The cross-functional team completes a questionnaire after having spent some days at the supplier's site, ascertaining the personnel's knowledge and evaluating their processes. At the end of the visit, the supplier receives the results of the audit, and follow-up visits are scheduled as necessary. In stage 4 ("*setup of development plan*") a supplier development plan including the duties of both companies has to be formulated. We recommend a roadmap in order to coordinate and ratify the activities of the two organizations. The most important capabilities like quality, ability to deliver and stable prices are prioritized for the fast achievement of a minimum level of the demanded competency. Once having achieved such a minimum level of demanded competency a cooperation contract is created and has to be ratified. In stage 5 ("*supplier development support*") the substantial development of the suppliers' capabilities starts. This process persists for the entire time of supplier-buyer relationship. After the first main improvement of capabilities it might be referred to as supplier monitoring or supplier controlling.

Since the *supplier assessment* aims to identify the suppliers' capabilities and to estimate possible bottlenecks, stage 3 is the crucial point regarding the supplier/buyer risk management. Therefore, at this point *risk assessment* (stage 6) starts as well and has to be continued until the end of our proposed supplier development process. However, for approaching the possible risks by themselves - actively and reactively- there is a need for a tool that helps to identify, evaluate and finally prevent risks. Therefore, we developed the Risk-FMEA method which is presented in the following paragraph. In contrast the internal *supplier improvement* (stage 7) as a responsibility of the LCC supplier is not further specified in our paper.

### **Risk-FMEA Approach**

In the last years risk management of the supply chain especially of the suppliers became more important. The reasons are the increasing material content of technical products, the improved utilization of the economies of scale and the trend to source more and more from low-cost-countries either to reduce costs or to get access to emerging markets via local content. Most of the existing approaches for risk management in companies propose general processes for the handling of risk. But the high abstract level does not support a precise quantification of the risks. However, in order to assess the risks arising through purchasing from low-cost countries new approaches are required. Compared to sourcing from experienced strategic suppliers, new suppliers especially from low-cost-countries offer high cost reduction potential but also higher risks: No cost saving without taking chances. From the suppliers point of view the new international customers bring in higher requirements to their products as known from their former customers which their cost calculation is based on. The root cause for problems in customer-supplier relationships is often to be seen in the lacking experience and missing understanding of the perception of the business partner on both sides. It gets obvious that the efficient utilization of the existing knowledge from different departments is necessary to effectively prevent risks. In product development a standard method is known to solve

this task – the *Failure Modes and Effects Analysis (FMEA)*, which was already mentioned in the literature review. It is commonly used for the prioritization of potential product failures (=risks) in order to minimize consequential costs. A similar aim is followed within the application to purchasing from low-cost-countries. Here it is necessary to prioritize and quantify risks that are dependent on a particular case. An adaptation of the standard FMEA procedure is necessary although some of the basic steps are applicable as well. The adapted FMEA is in the following referred to as the Risk-FMEA. The necessary adaptation mainly regards four aspects:

- **Preliminary steps:** Compared to the preparation phase of a standard FMEA the preparatory steps are completely different. First the examination of the boundary conditions is necessary. That regards to the definition of cost reduction targets, the purchasing volume, the assessment of the technical complexity and the country specific specialties. From there risks need to be identified that may occur during the purchasing project.
- **Rating scale for assessment:** The standard FMEA rates the occurrence probability, severity and probability of detection. A scale from 1-10 is used while a lower degree describes a less important risk. The description of the rating scale need to refer to the application case. The severity of a risk for example mostly depends on when it would be discovered and the consequences. What is the potential loss of money?
- **Quantification scale:** After the qualitative assessment of the occurrence probability, severity and probability of detection, their quantification follows. Therefore the occurrence probability is linked to a specific failure rate and the severity monetarily quantified in connection to the qualitative scale (see fig. 5)
- **Result analysis:** Normally the prioritization within the FMEA procedure is done by the *Risk Priority Number (RPN)* which is calculated through the multiplication of the occurrence probability, severity and probability of detection. Its values are between 1 and 1000. Now the quantification of the occurrence probability and the severity enables the calculation of the monetarily expressed risk height. It is defined as the risk height weighted by its occurrence probability. Ergo the calculation is possible through the multiplication of the occurrence probability and the severity. The advantage is that risk costs get considerable within the calculation of cost savings during a purchasing reorganization process.

The whole process of the Risk-FMEA is structured into five steps. An overview gives fig. 4. The single steps are explained in the following although single aspects are already mentioned in the summary of the adaptation steps.



Fig. 4 Steps of the Risk-FMEA

The **first step** is to identify the risks that are linked to a certain purchasing project or a supplier. This is done in team meetings while the configuration of the team plays an important role. The competences need to be interdisciplinary. Normally such a team consists of purchasing, production, engineering, logistic, finance and after-sales representatives while the whole process should be led by the purchasing function. To cover all sources of risk a clear structure helps. We propose the following categories as headlines: design, production, operational quality, purchasing, logistics, after-sales-service, management, finance and general risks. Important is to consider especially the country and culture specific aspects. Additionally, it is helpful to develop a database of the risks once identified to improve efficiency. The resulting catalogue from step 1 builds the basis part for the risk-evaluation.

The identified risks from step 1 need to be assessed in **step 2**. This includes 3 figures for every single risk in the first assessment round: occurrence probability, severity and probability of detection. The

quantification is also done in a team meeting in which either the same members of the risk identification can attend or even better the respective experts can give more input. Essential for the consistency is a stringent standard rating scale for the three figures. Each scale reaches from 1-10. The rating for the quantification of the occurrence probability is further on linked to a certain probability of occurrence quantified in percent. Important is to define the reference time, project or amount of bought-in-parts. In this context we propose to refer the occurrence probability to projects. In this case one percent means that the risks occurs every 100 projects. The severity is linked to the risk height expressed by the potential loss of money in case the risk occurs. The risk quantification steps results in a rating of the monetary risk height and the qualitative RPN. The procedure is shown in columns on the left side in fig. 5 (Step 1 and Step 2).

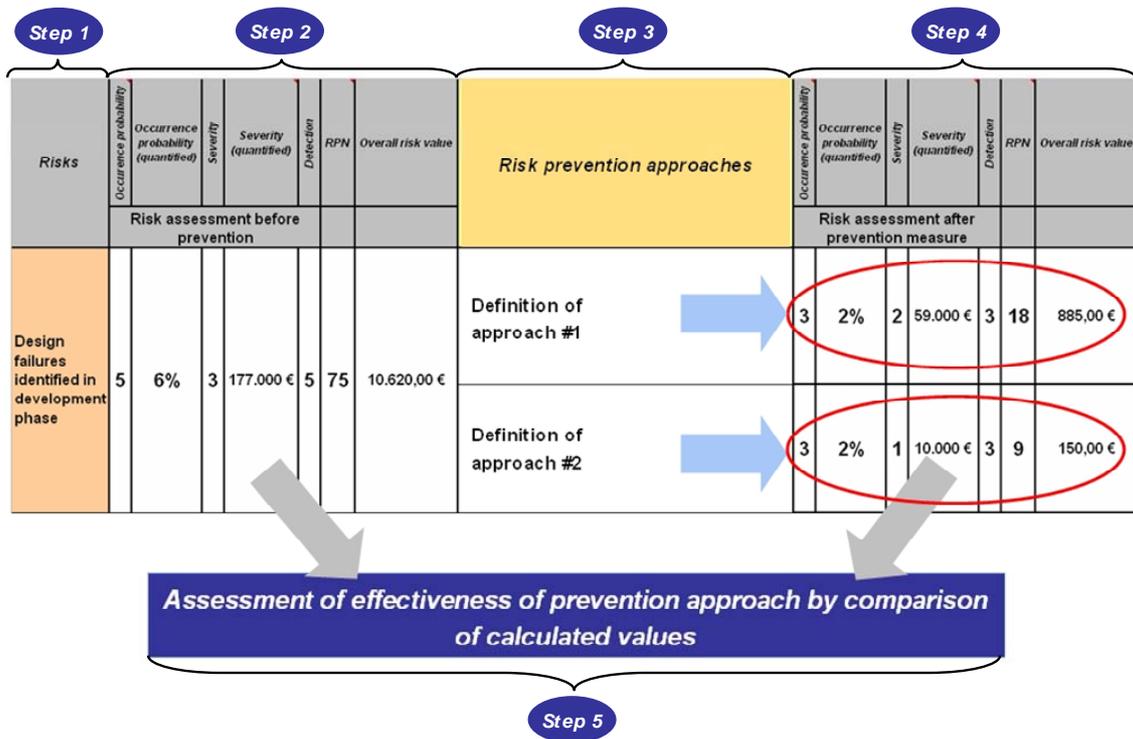


Fig. 5 Risk quantification and assessment of risk sharing approaches

The analysis of the risk quantification results in a ranking of the risks. It is recommendable to rank by the monetary risk height in order to consider to most important aspects. The advantage is also that a monetary risk height is understandable for everybody while it is difficult to assess the significance of a certain RPN. However, in order to divide the risks into different classes the ABC analyses is the method to use. Fig. 6 shows both, the monetary risk height compared to the RPN in an ABC ranking. The A-level risks form 80% of the risk height. Another commonly used visualization for risks is the risk map. The axes of the diagram are the risk height and the occurrence probability while the diameter is linked to the detection probability.

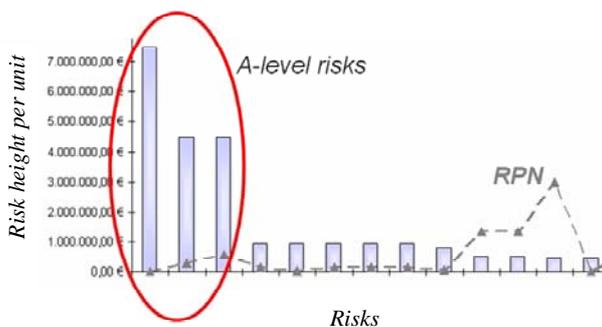


Fig. 6 ABC ranking of risks

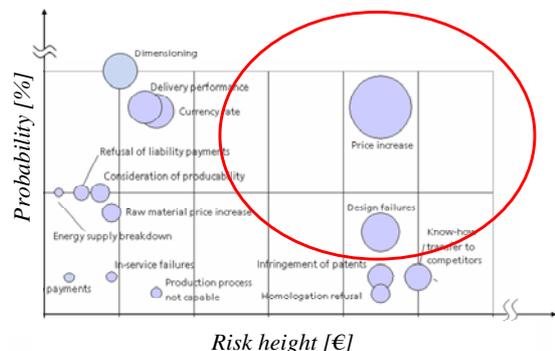


Fig. 7 Risk map

**Step 3** targets the risk prevention. The probable expenses caused by risks have to be decreased by appropriate prevention measures, which, once developed and implemented, can reduce the probability of occurrence of an issue, prevent it or lessen the possible severity. However, how to find proper actions in order to achieve the planned goal of savings? The identification of risk sharing approaches depends very much on the organization, its products and the main risks located. Both the identification and quantification of risks and the following development of measures have to be accomplished by experienced and cross-functional teams. For the achievement of the best possible results a separation of the functions quantification and prevention finding and thus the separation into two teams is suggested. This disconnection has the advantage that risks and measures are judged independently and therefore the impact of subjectivity is lessened. In order to quantify risks monetarily, attention has to be paid to both hard and soft factors. Hard factors can often be expressed easily in costs in opposition to soft factors. But for the proposed procedure it is necessary to quantify also soft factors in order to make them comparable to the hard factors. In order to increase efficiency risk sharing approaches are defined top down for all A-level risks. This is a team task as well but only the specialists from the functions regarding the risks need to assist. In most cases more than one risk prevention approach is possible.

Besides the identification of the risk prevention approaches it is necessary to repeat the risk quantification after the potential application of the prevention measures in **step 4**. Since risks are often connected with each other in a complex and problematic way, this step is often very difficult. However, the principle of implementation of this step is similar to step 2. The comparison to the original risk assessment and the assessment after the application of risk prevention shows the effectiveness of the measures. The estimation of the costs for the application of the measures builds the basis for the calculation of the *Return on Invest (RoI)* with which the efficiency of the measures can be checked.

The selection of the measures in **step 5** is on the one hand based on their effectiveness. Does the measure help to prevent risks sufficiently? If this question can be answered yes, the efficiency of the measures must be questioned. Is it worth to prevent the risk by the proposed measure? The sum of costs for risk prevention needs to be integrated into the cost calculation of the supplier development process. These costs are to be considered when the cost saving potential of a low-cost supplier is estimated.

### ***Application results of a Risk-FMEA***

The presented Risk-FMEA approach was applied and verified within the development of a Chinese supplier in the rubber-to-metal industry. The customer in the case at hand is a global playing company with mechanical engineering background. The cost pressure from international competition led to the claim for an overall cost reduction of 30% in the whole company. The target for the reduction of the bought-in parts cost was deducted to 30% as well. At this time (2004) the purchasing volume from low-cost suppliers was near to zero. From there the management decided to shift 40% of the supply chain to suppliers from low-cost countries especially in China. The lacking experience of these suppliers should be tackled by an effective and efficient risk management approach. Although a lot of risks were not obvious at this time the potentially increasing after-sales-costs through weaker quality of the supplied parts was defined an issue: the after-sales costs must not increase. It was decided to use a stringent risk management approach to gain sustainable success in sourcing from low-cost countries. In this context the application of the proposed Risk-FMEA procedure gave good results. It resulted in the identification of 48 risks within 10 categories. The overall risk height was estimated to 622,000 € which is 47% of the projects' purchasing sum. Through 15 risk prevention measures the risk height could be reduced by 61%. The expenses for risk prevention were estimated to 28,000€. Thereby effectiveness as well as efficiency of the method was proven.

## **Conclusion**

Procurement gets more and more important for industrial companies. On the one hand the production content decreases while the cost pressure increases. Most western companies have already focused on their core production processes so that a significant increase of efficiency is rarely possible. The focus moves to bought-in parts and a closer supplier/buyer relationship. Driven by cost reduction programs many companies decide to source a considerable volume from low-cost countries. In order to compensate the lacking experience of the new suppliers and to control them, support programs are

necessary. These support programs are normally organized by the strategic purchasing department within the supplier development processes. Because the success of supplier development depends to a high degree on the negotiation skills of the purchasing employee, the standardization of the supplier development process is important. In this context the detailed definition of the process steps including the application of methods to assure quality in purchasing is essential. Literature review and practical experience led to the perception that seven stages are necessary for supplier development in low-cost countries. Although sourcing from low-cost countries is often seen as a standard procedure in companies, studies reveal that a large number of purchasing projects fail or do not bring the expected cost savings. Analysis show, that this can often be led back to unforeseen problems emerging from different root causes. These unforeseen problems can also be named risks as risks are defined as a combination of the probability of an event and its consequences. A common mistake is that the company wide existing knowledge to predict risks is underestimated and not enough time is invested into brainstorming of risks and their communication. Although many companies are aware of the changed risk situation in the context of sourcing from low-cost countries, it is mostly unclear what the specific risks are and what their significance is and how to handle them. From there it gets very obvious that a stringent process procedure for the risk management of low-cost suppliers is required. The Risk-FMEA procedure offers high potential regarding this. As shown above its application is easy, effective and efficient. The developed method Risk-FMEA is an essential and useful completion to the supplier development process itself and is crucial, especially when developing low-cost country suppliers. Therewith risk evaluation is one key factor of supplier assessment and development in low-cost countries.

Future research work concentrates on the stages 1-5 of the proposed supplier development process. The supplier assessment and the deduction of development roadmaps are of special interest. The target is to develop an integrated approach that automatically delivers development roadmaps and cost breakdowns from supplier assessments. In order to identify today's the best practice in the young field of supplier development a survey among global playing companies and low-cost country suppliers is currently conducted.

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