SUPPLIER EVALUATION: A COMPARISON OF THE APPROACH OF CZECH AND GERMAN INDUSTRIAL COMPANIES

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Abstract: The present article deals with supplier evaluation in Czech and German companies. It addresses the question of whether there are differences in evaluation criteria and methods between Czech and German companies. The article consists of three interconnected parts. The first part presents the results of a literature review that focused on the current trends in supplier evaluation. The subsequent part describes the research methodology. The research was conducted through a questionnaire survey of a sample of 180 Czech and 70 German companies operating in the automotive and related industries. The next part presents the results of the research. The research results have shown that the completeness and timeliness of deliveries is the most important criterion for companies in both countries. Compared to German companies, Czech companies put more emphasis on the price level, the openness of calculations and the supplier's communication. German companies attach greater importance to quality, indemnity insurance and soft criteria such as an ethical approach. In terms of evaluation methods, it can be concluded that companies in both countries apply rather simpler approaches. In both countries, the same three evaluation methods are most commonly used – scoring model, ABC method and point evaluation.

Introduction

The present article focuses on a comparison of approaches to supplier evaluation in Czech and German companies. Germany is the Czech Republic's most important trading partner. In 2015 Germany accounted for nearly a third the Czech Republic's total exports. At the same time, Germany is also the most important partner in terms of imports. Its share in total imports was 26%. In mutual trade, road vehicles are the most important commodity, accounting for 20% of Czech exports and 14% of Czech imports to/from Germany (Král, 2016).

The objective of the research is to compare supplier evaluation methods, including the criteria used in such evaluations, between Czech and German industrial companies. The research was mainly carried out in companies related to the automotive industry, which is an important sector of the Czech economy. The automotive industry represents roughly a quarter of Czech industrial production and accounts for almost 7.5% of GDP (AIA, 2015). At the same time, given the ownership structure (Škoda Auto is part of the VW Group), there is strong cooperation between Czech and German companies in this sector.

1 Theoretical background

Given the specific nature of the industrial market – namely the close links between suppliers and customers – supplier selection and evaluation is a very important step for every industrial company. In a company, supplier evaluation is usually first carried out as early as supplier selection, but certain routine reviews of the company's current suppliers are also carried out. Routine evaluations mainly determine compliance with pre-defined criteria and requirements. A positive evaluation of current suppliers is a prerequisite for continued cooperation. A negative evaluation results in modifications to or complete termination of the business relationship (Nenadál, 2006).

On the customer's side, supplier selection is based on defining certain criteria, which are specified using basic indicators that follow from the company's line of business. This specification is a prerequisite for the actual evaluation process (Pffefferli, 2002). The main criteria for supplier evaluation include finance, logistics, competitiveness, quality and supplier services (Simić, Svirčević and Simić, 2015). These criteria can be described as traditional. A very important component of supplier evaluation is trust between the supplier and the customer and willingness to share information (Yang, Zhang and Xie, 2017). In addition to traditional criteria, new criteria such as process orientation, efficiency, project management orientation, solution orientation or sustainability are attracting increasing attention during evaluation (Schätzle and Jacob, 2017). For some customers with an environmental focus, the supplier's environmental image plays an important role in evaluation, as it contributes to the supplier's overall value to the customer (Hänninen and Karjaluoto, 2017). Supplier evaluation can be extended to include criteria such as the introduction of an environmental management system, waste disposal programme, energy performance, green design or recycling rate (Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

Some criteria can be considered universal in that they are applied across all industries. However, each industry has some specificity, which is also reflected in supplier evaluation. In the automotive industry, which is largely the focus of this article, great emphasis is placed on innovation. The driving force of these innovations is key suppliers in the supply chain (Chang, 2017). An important criterion in supplier selection can thus be the supplier's innovation performance, which can be measured by the number of patents (Trautrims, MacCarthy and Okade, 2017). In addition, as stated in the article of Schätzle and Jacob (2017), evaluation in the automotive industry is most often carried out by the procurement manager, who has a broad understanding of the supplier industry.

Various methods can be used to select and routinely evaluate a supplier. In principle, the methods can be divided into empirical and algorithmic ones. Empirical methods are those evaluation methods that are based mainly on experience, intuition and logical judgment. By contrast, algorithmic methods are based on mathematical methods and model problem solving (Pernica, 2004). Recently, advanced methods which use genetic algorithms (Simić, Svirčević and Simić, 2015) or fuzzy multi-criteria decision-making (Wang, 2015) can also be encountered in supplier selection and evaluation. An extensive literature review (see Wetzstein, Hartmann, Benton and Hohenstein, 2016) has shown a certain conflict between the complexity of supplier evaluation and the applicability of methodologies. Greater objectivity of information

usually means that the evaluation uses a more complex methodology and is more time consuming, and vice versa. Wetzstein, Hartmann, Benton and Hohenstein (2016) have also pointed out that, in the past 10 years, research into supplier evaluation has been dominated by mathematical models. Green, sustainability and strategic oriented supplier-selection are becoming new evaluation themes (Schätzle and Jacob, 2017; Hänninen and Karjaluoto, 2017; Wetzstein, Hartmann, Benton and Hohenstein, 2016; Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

In principle, the supplier evaluation and selection process can be divided into three phases: determining (the weights of) the evaluation criteria, determining the performance score, and ranking suppliers according to the calculated scores. This is a typical multi-criteria decision-making task (Wang, 2015; Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

In terms of the further focus of the research in this article, selected evaluation methods are characterized: point evaluation, multi-criteria evaluation (AHP), scoring model, ABC method, graphical evaluation, Gordon's rating model, comparative method and profile analysis. These methods have been selected on the basis of the literature research as most frequently occurring (e.g. Pfefferli, 2002; Tomek and Vávrová, 2014).

Point evaluation consists in assigning a certain number of points to each individual evaluation criterion, according to its significance. The result is the supplier's total number for all criteria (Venkata, 2013).

In an evaluation using the scoring model, each criterion is multiplied by its weight and the sub-results are added up (Azambuja and O´Brien, 2012). Also, it should be taken into account that some of the criteria are minimization-type criteria, and some are maximization-type criteria. This contradiction can be resolved for example through applying a weighted sum approach, see e.g. Jablonský and Dlouhý (2004).

The ABC method is an evaluation approach that uses the Pareto principle to divide suppliers in order to adopt a differentiated approach to them. The letters A, B, C are used to classify suppliers depending on how important they are for achieving the company's objectives. These suppliers, which are classified as A, are thus more important to the company than the other suppliers (Hoffmann, Beck and Füger, 2012).

Graphical evaluation is based on a graph consisting of a circle whose centre represents the lowest number of points that can be achieved for all evaluation criteria for the given supplier. There are lines running from the centre of the circle to its edge, which show the various evaluation criteria. Depending on the degree to which the criteria have been fulfilled for the supplier, points are placed within the circle. The size of the area determines the final evaluation of the suppliers. The larger the area, the better the quality of the supplier (Irlinger, 2012).

Gordon's rating model works with five areas: timeliness of deliveries, delivery time, product quality, purchase price and payment deadline. The supplier receives a certain number of points for each area and is placed in the respective category depending on the total number of points. The company's rating provides information on the extent to which the supplier meets its requirements and how it is doing compared with other suppliers (Gordon, 2008).

Next, there is the comparative method, which is based on assigning of a certain number of points to the indicators being evaluated, where the evaluation depends on the resulting value achieved. The key to successfully using the comparative method lies in assigning the primary number of points to each criterion and setting the limits for the evaluation of the resulting values. The largest number of points is assigned to the most important criterion (Pekarčíková and Trebuňa, 2011).

In profile analysis, all suppliers are taken into account. The objective is to identify the best ones. At the same time, profile analysis also points out the minimum requirements that the customer requires to be met by the supplier. It helps identify the suppliers that best meet these requirements (Janker, 2009).

2 Methodology

The research was conducted using the questionnaire survey method. The questionnaire consisted of a total of 27 questions, which were mostly closed-ended or semi-open-ended, only one (the final) question was designed as open-ended. The questionnaire was developed in Czech and subsequently translated into German so that both Czech and German companies could be approached with the same questionnaire.

The research focused mainly evaluation process documentation, supplier evaluation methods and selected evaluation criteria. 180 companies from the Czech Republic and 70 companies from Germany were approached, i.e. the sample comprised a total of 250 companies. These were mostly companies from the automotive and related industries, such as the glass and plastics industries. The companies were approached based on the author's professional contacts – the purpose of this was to ensure, among other things, a higher response rate and greater trust among the companies when completing the questionnaire. Therefore, this is not a random sample that would be representative in terms of statistical data processing. On the other hand, the research collected internal, relatively sensitive information that is not publicly available and companies have no obligation to publish it. In such a case, simple random sampling was not possible. The questionnaire was distributed electronically (by e-mail) to industrial companies, which were given 30 days to complete the questionnaire. Companies that failed to return a completed questionnaire within this time limit were asked again by e-mail or phone to complete it and were given an additional time limit for completing it (approximately 14 days). Data collection took place in the period from September to December 2016.

Of the 250 companies that had been approached, 181 companies responded to the questionnaire. The response rate was thus 72%, which is an above-average rate for a questionnaire survey. The high response rate can be attributed to the very fact that the companies were contacted based on the author's professional contacts. Of the 181 questionnaires received, 75% (135 companies) were from the Czech Republic and 25% (46 companies) were from Germany.

Both small enterprises and medium-sized and large enterprises participated in the research. Classification into the different categories was carried out according to EC Regulation No 800/2008. The structure of respondents by size is shown in Tab. 1. In both countries, most companies were classified in the category of medium-sized and large enterprises. This was due to the branch of business. In order to operate in the

automotive industry and the supplier industries, adequate human and capital resources are required, which is reflected in the size of the companies.

Tab. 1: Structure of respondents by country

Registered offices	Micro	Small	Medium-sized	Large	Sum
CZ	3	9	39	84	135
DE	0	6	18	22	46
Sum	3	15	57	106	181

Source: Authors

The questionnaires received were subsequently evaluated using MS Excel and the STATGRAPHICS Centurion XVII statistical software. Since the variables do not meet the assumption of a normal distribution, the non-parametric binomial test was used to assess the significance of the differences between Czech and German companies. In this case, the null hypothesis that the relative frequencies in both samples are the same at a given significance level (alpha 5%) is tested.
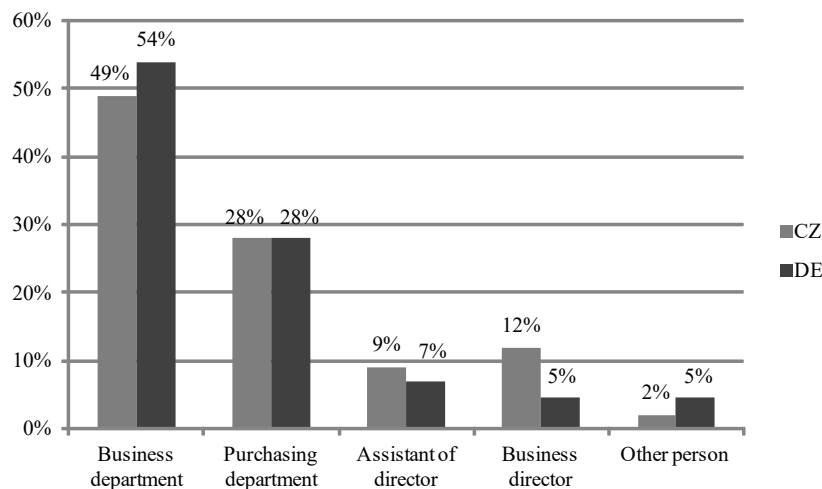
3   Results of the research

Since all companies answered a total of 27 questions in the questionnaire, a large number of both similarities and differences were identified in supplier evaluation by Czech and German companies. Given the scope of this article, only the most important findings have been selected.

In terms of supplier evaluation documentation, the research showed that in most companies that evaluate their suppliers the supplier evaluation process is documented in some way. This was true in both countries. The supplier evaluation process was documented in 85% and 91% of the companies in the CR and Germany respectively. In this case, the difference that was identified between Czech and German companies is statistically insignificant (at an alpha level of 5%, p-value = 0.3034). In principle, it can be concluded that no significant difference was found in the documentation of the supplier evaluation process between Czech and German companies. In both countries, the standard is that supplier evaluation is documented, and it is rarely otherwise.

In terms of evaluation, the issue of responsibility for this process is crucial. The results of the research have shown that – in companies in both countries – the business department is most often responsible for supplier evaluation (see Fig. 1). The second most common response was the purchasing department. In terms of responsibility for evaluation, the differences between Czech and German companies are not statistically significant (for the commercial department, p-value = 0.5580).
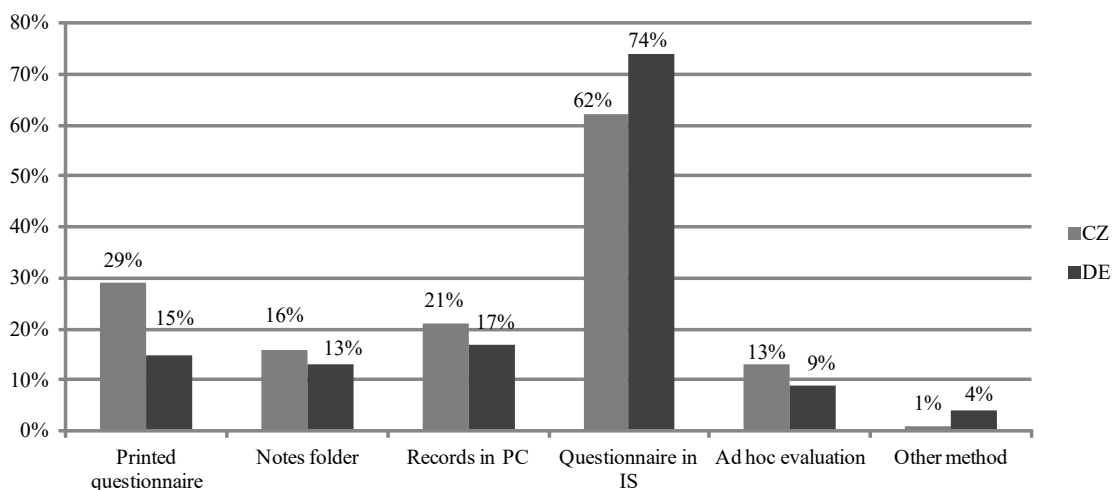
The next question focused on the technical aspects of supplier evaluation. During the development of the questionnaire, it was assumed that companies may use various technical resources. Therefore, companies were allowed to choose up to two responses. The results showed that evaluation is most often carried out using an information system (see Fig. 2). This is the most common option in both countries, and the slightly higher share in German companies is not statistically significant (p-value = 0.1404).

Fig. 1: Responsibility for supplier evaluation

Source: Authors
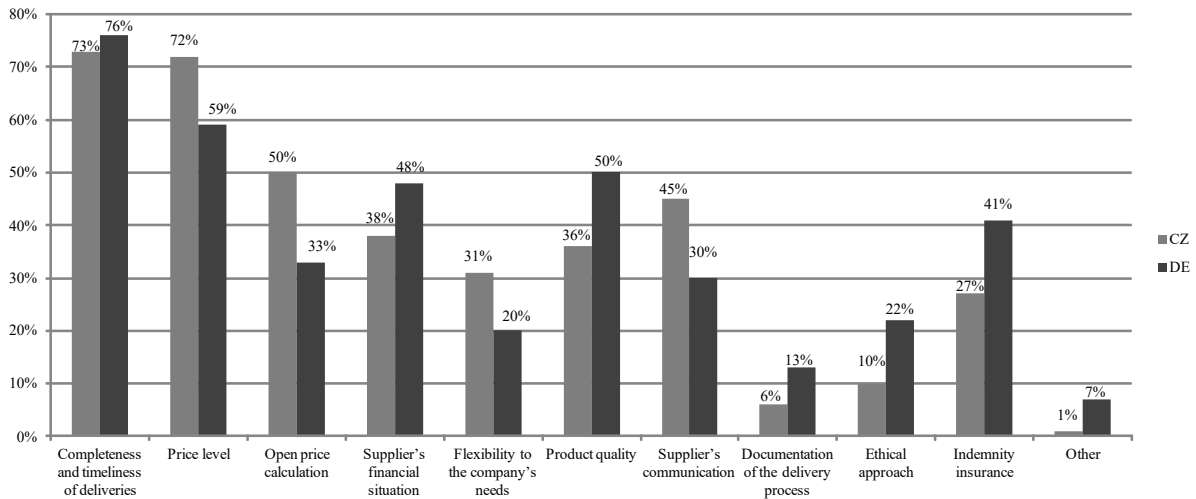
Fig. 2: Technical method of evaluation

Source: Authors

The criteria for supplier evaluation were an important area of the survey. In the questionnaire, each company was asked to list all criteria that were used by the company to evaluate suppliers. It was found that only one company uses mono-criteria evaluation. On the other hand, there were also companies that listed 5 or 6 criteria in supplier evaluation. From the perspective of the various criteria, it can be concluded that the vast majority of companies in both countries place consistent emphasis on the completeness and timeliness of deliveries. However, for other criteria, some differences were identified (see Fig. 3) which are also statistically significant.

This applies to the 'open price calculation' criterion, which is more frequently used by Czech companies (p-value = 0.0456). By contrast, the 'ethical approach' criterion is more frequently applied in evaluation by German companies (p-value = 0.0369). A statistically significant difference at an alpha level of 5% in favour of German companies was also found in the 'other' criterion (p-value = 0.0251), but it only represents a small group. At a significance level of 10%, there are also statistically significant differences in the 'product quality' criterion (more frequent in German companies, p-value = 0.0935), the 'supplier's communication' criterion (more frequent in Czech companies, p-value = 0.0575) and the 'indemnity insurance' criterion (more frequent in German companies, p-value = 0.0750).
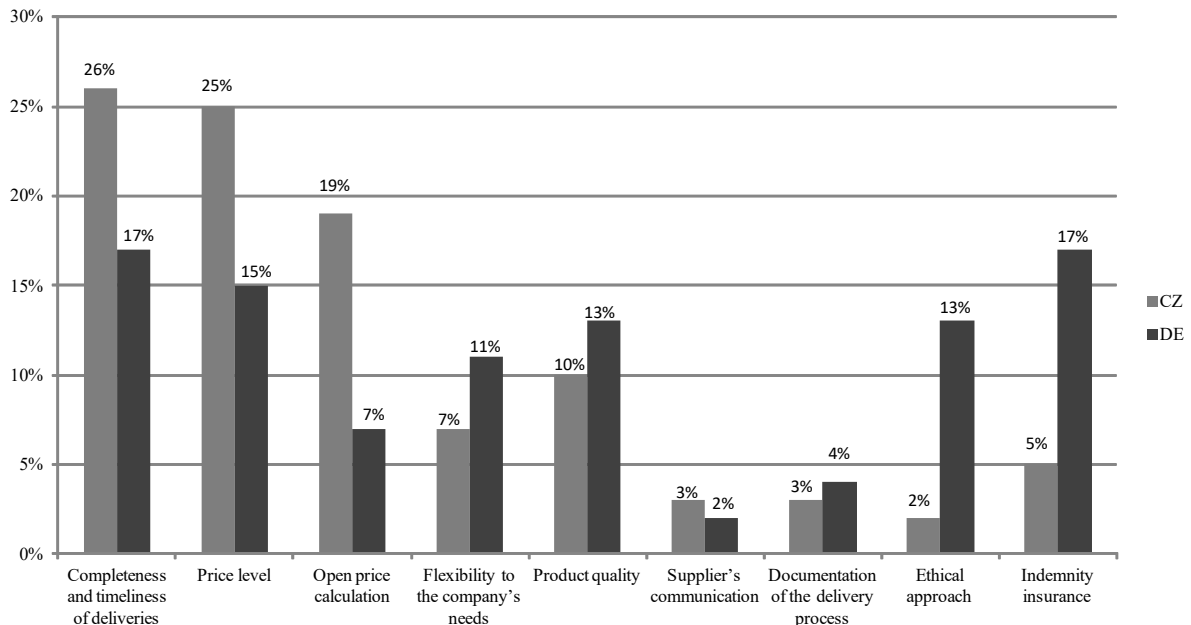
Fig. 3: Supplier evaluation criteria

Source: Authors

The subsequent question focused on the most important criterion in supplier evaluation. The results are broadly in line with the above findings, as this is the 'completeness and timeliness of deliveries' criterion (see Fig. 4). Nevertheless, even in this area, differences between Czech and German companies were identified. Czech customers are more price-sensitive, because they view the 'price level' and 'open price calculation' criteria as more important. However, the difference is only significant at an alpha level of 10%. By contrast, the 'ethical approach' criterion (p-value = 0.0026) and the 'liability insurance' criterion (p-value = 0.0098) were found to be more important to German companies.

Fig. 4: The most important evaluation criterion

Source: Authors

An additional question focused on whether the companies surveyed had an ISO-certified quality management system and whether they also took this into account in evaluating their suppliers. The survey showed that 59% of the companies surveyed in the Czech Republic had an ISO-certified quality management system in place. In Germany, the percentage was as high as 93% of the companies surveyed. The difference

is significant (p-value <0.0000). At the same time, the survey showed that even if Czech companies have an ISO system in place, only 30% of these companies evaluated this factor in their suppliers. For German companies with an ISO system, 52% evaluated this parameter in their suppliers. Again, the difference is statistically significant (p-value = 0.0071). This means that German companies are more often interested in ISO certification and, at the same time, more often require it from their suppliers.

The next question examined whether companies were interested in quality management systems other than ISO. In the case of Czech companies, half of respondents indicated that they did not consider other quality systems in their suppliers. For German companies, a negative response was only received from about a quarter of respondents. The difference is significant (p-value <0.0046). At the same time, German companies not only more frequently investigate and, where relevant, require other certified quality systems, but they also more frequently take this criterion into account in their own supplier evaluation.

Suppliers' financial situation is a very often-used evaluation criterion, as it may affect the timeliness, quality and reliability of deliveries. This is a commonly used supplier evaluation criterion in both countries, see Fig. 3. The difference in the frequency of use of this criterion is not statistically significant (p-value = 0.2329). The survey also investigated how suppliers were reviewed in financial terms. The conclusions are practically identical for companies in both countries. Companies most frequently obtain data from public registers such as the commercial register or the insolvency register. This option was indicated by 46% of Czech and 50% of German companies, followed by the 'combination of different methods' option (37% of Czech and 45% of German companies).
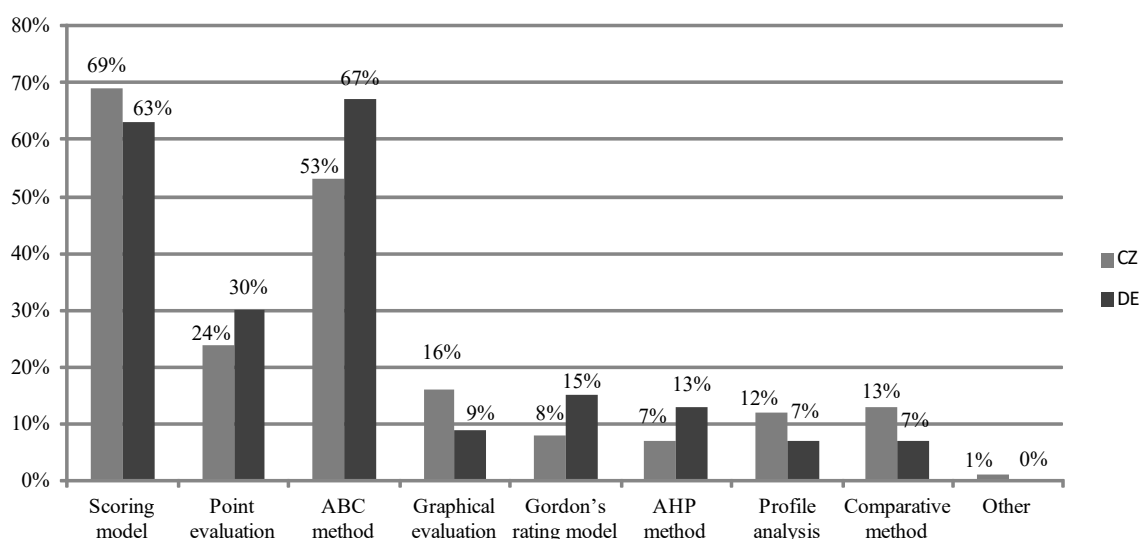
The next question focused on audit by customer as part of supplier evaluation. The responses showed that 45% of respondents in the Czech Republic carried out audits at their suppliers. For German companies, this was a half of the companies – the difference is not statistically significant (p-value = 0.5569).

In the subsequent part of the research, certain sub-aspects of evaluation were investigated. For example, it was found that 36% of Czech and 30% of German companies carried out tests and inspections of deliveries in their own laboratories. Given the size of the samples, the difference cannot be considered significant (p-value = 0.4596). Inspections of packaging are conducted by 84% of Czech respondents and 93% of German respondents. Again, the difference is not significant (p-value = 0.1254). In addition, no significant differences were found in the certified competence of some employees. Most Czech (72%) and German (67%) respondents do not evaluate this factor in their suppliers. P-value is 0.5198; the difference thus cannot be considered significant.

Setting the evaluation criteria must only be considered to be the first step of an evaluation. The second important step is the evaluation method used. As part of the research, it was investigated which evaluation methods were applied by companies in practice. Given that companies can combine various evaluation methods, multiple response options could be chosen. Companies indicated one to three responses. The results are shown in Fig. 5.

Fig. 5: Supplier evaluation methods used

Fig. 5 shows that only three evaluation methods are widely used in practice. For Czech respondents, these are the scoring model, followed by the ABC method and the point method. For German respondents, the most commonly used methods are the ABC method, followed by the scoring model and point evaluation. In terms of differences between Czech and German respondents, the only difference that is significant is the higher share of the use of the ABC method by German companies (p-value = 0.0980), but it is only significant at an alpha level of 10%.

Additionally, it was investigated whether companies also used some form of visualization of the evaluation. It was found that the vast majority of Czech (93%) and German (96%) companies used a graphical depiction of evaluation results; most often these were graphs and diagrams. In this respect, there are no major differences between Czech and German companies.

The last question was designed as open-ended. Respondents were given the opportunity to briefly describe the way supplier evaluation was conducted in their company. Unfortunately, it turned out that most Czech and German companies were either unwilling to disclose this information or decided not to share it for time or other reasons. In total, 52% of Czech and 61% of German respondents gave no response at all. Only 7 Czech and 2 German companies provided detailed information. However, this sample is so small that it cannot be reliably evaluated. Rather, the responses received can serve as case studies of supplier evaluation procedures.

4 Discussion

Based on the results of the research carried out, it can be concluded that even though there are differences in approaches to supplier evaluation between industrial companies in the CR and Germany, these differences are not substantial. Therefore, the discussion will mainly focus on the question of what may be the causes for the differences between Czech and German companies. It has to be borne in mind that both countries have strong ties resulting from their geographic proximity, a strong tradition of mutual trade and – in particular in the automotive industry – the interconnectedness of supplier-customer relationships. Given the above factors, it

could be assumed (based on the author's experience in automotive industry) that many Czech companies adapt – to a certain degree – their standards and procedures to their key customers. If both the supplier and the customer have similar procedures, standards and customs, their cooperation in deliveries is usually easier in terms of communication, contractual documentation etc.

The research showed that, in some areas, there are no substantial differences in supplier evaluation between Czech and German companies. This applies e.g. to the documentation of the entire evaluation process, the persons responsible for carrying out evaluations and certain evaluation criteria.

In evaluating their suppliers, customers in both countries place consistent emphasis on the completeness and timeliness of deliveries. This was not only the most frequently indicated criterion, but it was also considered the most important criterion in both countries. Similarly, no major differences were found in the evaluation of suppliers' financial situation, audits conducted by customers, technical evaluation tools, and visualization of the evaluation results.

However, some differences have been identified as well. In evaluating their suppliers, Czech companies attached greater importance to price factors. This means not only the price as an amount, but also suppliers' openness in calculating product prices. A more frequently used factor to Czech customers is also communication with suppliers. By contrast, it was found that German companies attached greater importance to ethical principles (social responsibility), quality and indemnity insurance. Furthermore, German companies are more likely to have a certified quality management system in place and they are also more likely to require such a system from their suppliers.

At the same time, the assumption based on literature (Wetzstein, Hartmann, Benton and Hohenstein, 2016) has been confirmed that – for evaluation – companies prefer rather simple and easily applicable evaluation methods to more comprehensive yet also more complex evaluation systems. It came as a bit of a surprise that companies in both countries did not indicate green and environmental evaluation criteria more frequently. This points to the conclusion that even though companies outwardly declare a policy of social responsibility, they neither monitor nor evaluate such a policy in their suppliers.

Conclusion

The present article aimed to compare supplier evaluation criteria and methods in Czech and German companies that operate mainly in the automotive industry. In terms of criteria, it can be concluded that traditional evaluation measures such as the price, quality, timeliness and completeness of deliveries and the financial situation of the supplier tend to be applied in both countries. Modern criteria in the area of environmental and social responsibility are not required by Czech companies virtually at all. For German companies, modern criteria (ethical approach plus the 'other criteria' category) were indicated more frequently, but they can only be viewed as secondary in terms of importance. In evaluating their suppliers, Czech companies also attach greater importance to price and calculations. German companies place more emphasis on the soft factors mentioned above, namely the quality and insurance. In terms of evaluation methods, comparatively simple methods were the most common in

companies in both countries. In both countries, the same three methods are most commonly used – scoring model, ABC method and point evaluation.

In conclusion, it can be noted that a certain degree of similarity between approaches to supplier evaluation was assumed at the beginning of the research, given the relatively close ties between the Czech and German economies and the cooperation between companies from both countries. However, the results of the research also indicated certain differences which may be connected e.g. with trust within supplier-customer relationships and economic factors. The former factor can be deduced from the fact that – during evaluations – Czech companies put greater emphasis on the element of communication with suppliers. At the same time, they give more attention to the price of deliveries, which may be related to profit margins and added value of Czech production.

Also, the limitations of the research need to be pointed out. The results may be influenced by the selection of companies. However, supplier selection and evaluation policy is a sensitive issue that companies are unwilling to disclose, even under assurance of confidentiality of information. For this reason, the selection of respondents could not be designed as completely random, but rather a purposive selection of respondents had to be used, because such respondents were more likely to be willing to cooperate.

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