
Implementation of the Competitiveness Model in Terms of Cooperation with Suppliers

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Abstract:

Purpose: This article describes the concept of competitiveness and assesses the level of competitiveness of companies in relation to the number of suppliers with which they cooperate.

Approach/Methodology/Design: The strategic vendor development model proposed by Krause was implemented in the data set, and the Handfield index indicating a more detailed analysis of the implemented elements has been used.

Findings: Statistical research carried out in the form of correspondence analysis of the level of competitiveness and dynamics of the company clearly shows that the level of competition remains unchanged in companies that have maintained an unchanged level of relations.

Practical Implications: This above-average growth model can be a strategic weapon for the buying company. The purchasing function can play an important role in supporting a company's operational strategy. Competition is one of the important elements that can save a company from bankruptcy or simply make a meaningful assessment of the development.

Originality/Value: The implementation of the above model developed by foreign researchers made it possible to compare it with market expectations and to implement elements extending the model, thus enabling the implementation of elements facilitating building relationships with suppliers.

Keywords: Competitiveness, company, supplier, strategy, relationship.

JEL classification: L23, M1, A13.

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1. Introduction

An undertaking subject to market laws must ensure that its competitiveness is constantly developed, which contributes to achieving a competitive advantage. Competitiveness and competitive advantage allow for operational and strategic development of the company. Thanks to human resources (managers and subordinates) it is possible to shape soft competitiveness together with the behavioural competitive advantage of enterprises. In a detailed analysis, a person seems to be a behavioural and humanistic unit. What creates a person and how he behaves influences the success or failure of an organisation. The way in which management and subordinates implement the process of behaviouralisation and humanisation of changes taking place in the organisation (enterprise) and beyond, ultimately influences the competitiveness and competitive advantage of the economic unit.

The basis for constructing the goal and the theses in this study is the quality of the management and the quality of subordinates, that illustrate the quality of the business entity. It can be said that the quality of employees influences the quality of the organisation. The management staff, as the entity implementing the management process, has a direct influence on the direction of soft competitiveness in the behavioural and humanistic area, while the executive staff has an indirect influence by maintaining relations (cooperation) with the managers (Santos-Vijande and Alvarez-Gonzalez, 2009). The concept of the competitiveness model emphasises the importance and fundamentality of employees (human resources). The application of the method of interpretation of the subject matter of the literature leads to the following statements; the basic resource of an organisation is human resources (basic resources), human resources are the basis of the competitiveness model, the quality of human resources means success or failure of an organisation (Zhang *et al.*, 2003). These statements confirm that the source of soft competitiveness is employees (human resources) (Cavinato, 1992; Chen *et al.*, 2014).

The presented research contributes to the discussion on shaping competitiveness as a form of detailed competitiveness of an organisation in which the quality of employees is highlighted in the overall operational and strategic development of the operator.

2. Conceptual Characteristics of Competitiveness

The concept of competition is well known, but there is no uniform definition. The first attempts to define competition as a phenomenon were made by representatives of the classical school at the turn of the 17th and 18th century. According to this school, the primary link in the management process is production, and the most important factor of enrichment is work. The best known representative of this school and also the father of economics is Adam Smith. He believed that competition takes place in the area of market price. A change in supply will not

change demand. Smith together with Ricardo, Mill and Malthus believed that competition is an indispensable element of market economy, it is a determinant of setting the price level and a component of the *"invisible hand of the market"* (Yang *et al.*, 2013). According to Adam Smith, competition regulates demand and the supply of products and prices of goods. Adam Smith viewed competition as a process that essentially requires a large number of market participants (Yang *et al.*, 2013), both sellers as well as owners of resources, well-informed about profits, wages and pensions in the economy, consisting in the free movement of resources between elements of the economy (Smith, 1954). Similar views are also expressed by other representatives of the classical school. Malthus regarded competition as competition, while Mill defined competition as a price setting force (Kaleta, 2000). According to the classical school, competition was understood as a regulating force in the economy, analogous to gravity in physics (Luthra, Garg and Haleem, 2016).

The authors conclude that it can be assumed that competitiveness is the ability of an enterprise to compete, and thus to make profits and achieve objectives better than competitive enterprises. The concept of competitiveness has been present in economic literature since the eighties of the 20th century. This means that competitiveness research is a young field. The dictionary of the Polish language contains two definitions, *"competitive is that which refers to competition, especially in the field of the economy, competing with other companies, goods, etc.;"* and *"competitive is that which can to compete successfully because of their advantages"* (<https://sjp.pwn.pl>).

According to Porter (2001) *"Competitiveness is often referred to the international market, i.e. the open economy. It is a global market in which a given country, company, commodity, brand occurs. It is a view that success on the global market is determined by the competitive struggle that has been won on the local, regional and national market"*. This author presented his research on competitiveness for the first time in *The Competitive Advantage of Nations* in 1990 (Lee, 2009). Porter's model of competitiveness, to which many authors refer will be developed further later from this paper (Chen, 2014).

In turn, Dzikowska and Gorynia (2012) state that *"competitiveness is the ability to compete, and thus to act and survive in a competitive environment"*. *"Competitiveness"* means the ability to achieve or maintain a competitive advantage, and as such can be treated as a synonym for a company's competitive ability. Therefore, according to Dzikowska and Gorynia (2012) competitiveness is an attribute of only some of the entities taking part in the competitive struggle. Zirconia (2000) perceives competitiveness as a process, in which market participants seek to pursue their interests by attempting to make more favourable offers of price, quality or other features which influence their trading decisions than others.

Ring (2003) describes competitiveness as an attribute *"Competitiveness is understood as an attribute of a company expressed in terms of effectiveness,*

efficiency and efficiency". Similarly, Ambastha and Momaya (2004) saw competitiveness as an ability *"The competitiveness of an enterprise is the ability of a company to design, manufacture and sell better products and services than those offered by its competitors, taking into account price and non-price quality criteria in the assessment"*. Lisowska (2013) describes the competitiveness of small and medium-sized enterprises *"The competitiveness of small and medium-sized enterprises is the ability to undertake fast and adequate to the situation of actions to manage resources effectively"*.

3. Structure of Manufacturing Companies' Sample in Terms of Length of Operation in the Market

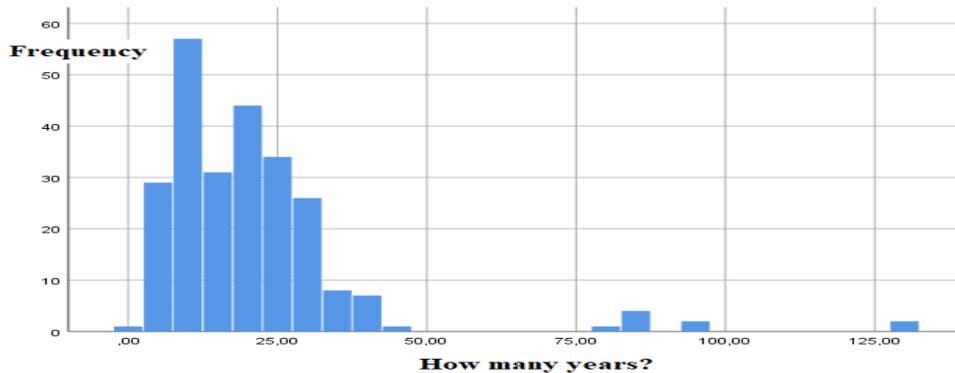
The owners and managers of 247 manufacturing companies operating in the Silesian Province were surveyed. These enterprises were drawn from the population of all manufacturing enterprises operating in the Silesian Voivodeship. The appropriate sample size and its randomness makes it representative. The companies selected for the sample are further diversified in terms of diversity of industries and length of operations in the market.

Figure 1 shows the histogram of the empirical frequencies for the duration of the companies' operations in the market. The shape of the graph and the value of the asymmetry coefficient ($A_s = 1.51$) indicate a right-handed asymmetry in the distribution of the companies' market time in the sample. This means that most of the surveyed companies operate on the market below the average time in the surveyed sample, which was 21 years ($\bar{x} = 20.92$). The value of standard deviation at the level of $s = 17.65$ years indicates that, on average, in the surveyed sample of companies, their operating time in the market differs from the average time by 17.65 years. When calculating the coefficient of variation for the results obtained from the formula $V_s = (s/\bar{x}) * 100 \%$, let us obtain the result of the variability of the surveyed variable in the form of the company's operating time on the market at the level of 84.4 %. On this basis, it can be concluded that the surveyed group of enterprises is strongly differentiated in terms of their operating time in the market. This is indicated by the high value of the coefficient of variation.

Additionally, on the basis of the value of the coefficient of variation it can be concluded that the variability of the characteristic (variable) in the form of time of functioning on the market of enterprises is statistically significant ($V_s > 10\%$), which proves that enterprises are adequately diversified in terms of this characteristic and conclusions on their basis will be statistically significant. The median value for the surveyed characteristic (variable) in the sample is 18 years, which means that in the surveyed group of enterprises at least half of them have been operating on the market for not more than 18 years and at the same time at least half of them for not less than 18 years. The largest number of enterprises among the surveyed operates in the market between 10 and 15 years. The dominant value of the

surveyed feature is 14.2 years and is the value of the dominant in the surveyed sample, with average = 20.92 and standard deviation = 17.655, N = 247.

Figure 1. Histogram of empirical frequency distribution for the duration of enterprises operation on the market



Source: Own study.

4. Analysis of Competition Level Correspondence

The analysis of the survey data was conducted in two stages. In the first stage, the hypotheses concerning the relationships between the selected variables were verified. In the second stage, for the selected pairs of qualitative variables in the first stage correspondence analysis was carried out in this stage.

The test of chi independence - square showed the relationship between two qualitative variables measured on the order scale, but did not describe the nature of the relationship between the categories subject to analysis of qualitative variables. In order to identify in detail the relations between the categories of the analyzed variables, a descriptive and exploratory technique of correspondence analysis will be conducted. The analysis allows for a simple and intuitive conclusion about the relations between columns and rows of the bipartite Table. The correspondence analysis procedure is carried out in seven main steps (Stanisz, 2007):

- 1) Determination of line and column profiles.
- 2) Determination of row and column masses.
- 3) Calculate the distance between rows (columns) using the chi-quadrant metric.
- 4) Presentation of line (column) profiles in the space generated by columns (rows) of the correspondence matrix.
- 5) Determination of average row and column profiles.
- 6) Reduction of space dimensions and then rotation of the newly created system in such a way that the part of the variance explained by successive coordinates of the space is as large as possible.

7) Creating a common graph of line and column profiles using main coordinates. Such a graph gives the possibility to quickly interpret the relationships between rows and columns in the multi-chart matrix.

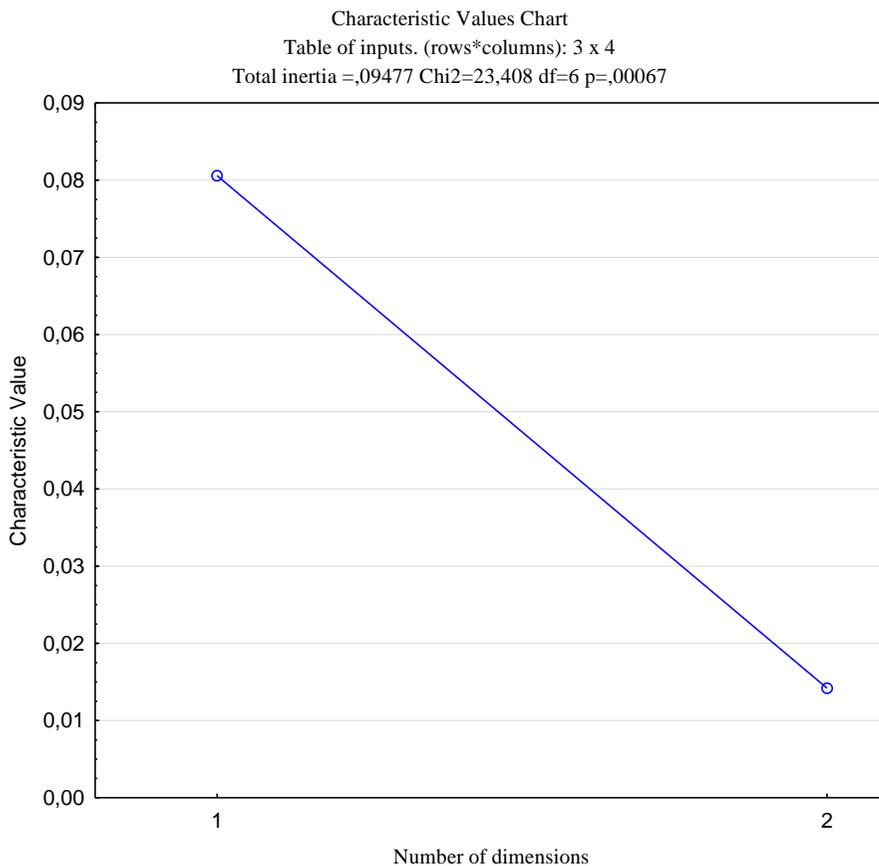
First, the analysis of the correspondence will be performed for the variables:

X_3 - (subjective) assessment of the level of enterprise competitiveness.

X_{11} - evaluation of the dynamics of cooperation with customers in the last 5 years.

First of all, the dimension of space will be determined, which will best reflect the actual relationships between the different categories of qualitative variables. There is no unambiguous criterion for selecting the number of space dimensions here, it is an individual issue. Gartner and Walesiak (2004) in their work propose three criteria that can be helpful in determining the number of dimensions. These are settlements, interpretability and similarity (Figure 2).

Figure 2. Characteristic Values settlement diagram



Source: Own study.

In order to determine the dimension, using the eigenvalue settlement diagram, it is necessary to search for the point where the eigenvalue drop changes its slope from steep to very close to horizontal. In the analyzed case there is no such change in the graph because there are only two eigenvalues. Therefore, it is assumed that two-dimensional space will be optimal.

Table 1. *Characteristic values, total inertia and singular characteristic values for variables X_3 and X_{11} .*

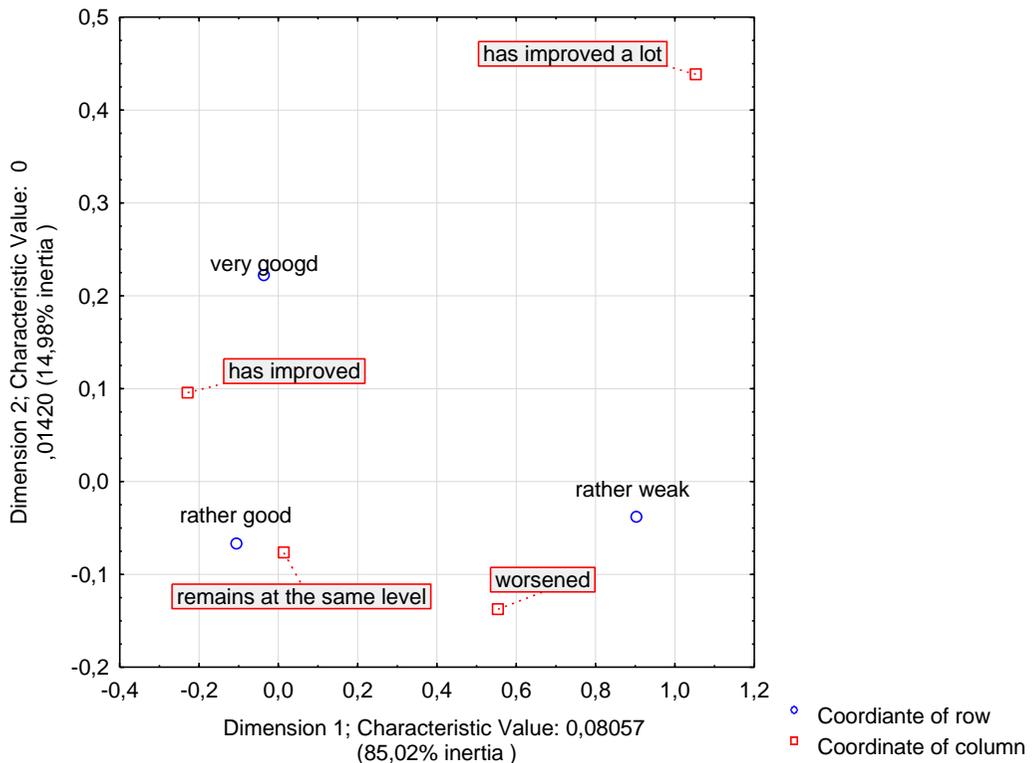
| Number dimensions | Characteristic values and inertia (all dimensions) (Test data 12_03_2020) | | | | |
|-------------------|--|-----------------------|--------------------|------------------|------------|
| | Table of inputs (rows*columns): 3 x 4 Total inertia =,09477 Chi2=23,408 df=6 p=,00067 | | | | |
| | singular characteristic values | characteristic values | percent of inertia | cumulate percent | chi square |
| 1 | 0,283853 | 0,080573 | 85,02116 | 85,0212 | 19,90144 |
| 2 | 0,119143 | 0,014195 | 14,97884 | 100,0000 | 3,50619 |

Source: Own study.

Analysing the results from Table 1 containing generalized peculiar values and own values (second column), it can be seen that already the first dimension allows to reproduce 85,02 % of total inertia. By contrast, the second dimension increases the percentage of the explained inertia to 100%. This criterion also confirms that the profiles are correctly embedded in the two-dimensional space.

In the next step it is time to calculate the coordinates of row (column) profiles in the new orthogonal coordinate system determined by peculiar vectors. The interpretation of coordinates of points, which represent rows and columns, will be done by the standardization method. You can analyze points representing rows, columns and rows and columns simultaneously. In this example we are interested in the joint analysis of points representing both profiles.

In Figure 3, the horizontal axis has the largest share (85,02%) of the total inertia and is therefore a dimension that explains the major part between rows and between columns. Comparing the lines we see that the horizontal axis in Figure 3 distinguishes two groups. Strongly shifted to the right from its centre are the companies that have assessed their competitiveness rather poorly. To the left to its centre, however, there are companies that assessed their competitiveness very well and rather well. When comparing the columns through the prism of the horizontal axis, one can see that on its right side there are companies that think that in the last 5 years their cooperation with customers has significantly improved (the point furthest to the right from the centre of the axis) or deteriorated. On the left side of the horizontal axis, on the other hand, there are enterprises according to which the cooperation with suppliers has improved in the last 5 years.

Figure 3. Graph of coordinates of rows and columns for variables X_3 i X_{11} 

Source: Own study.

The vertical axis, which has a 14.98% share in total inertia, divides the group of companies into those (point above the centre of the axis) which rate their level of competitiveness very well and those which rate this level as rather good or rather weak (points below the centre of the axis). Comparing the position of the points representing the columns in relation to the vertical axis, it can be seen that this axis divides the companies into a group that has seen an improvement and significant improvement in its relations with its suppliers in the last 5 years (points above the centre of the vertical axis) and into companies that have deteriorated or remained unchanged in their relations with suppliers in recent years (points below the centre of the vertical axis).

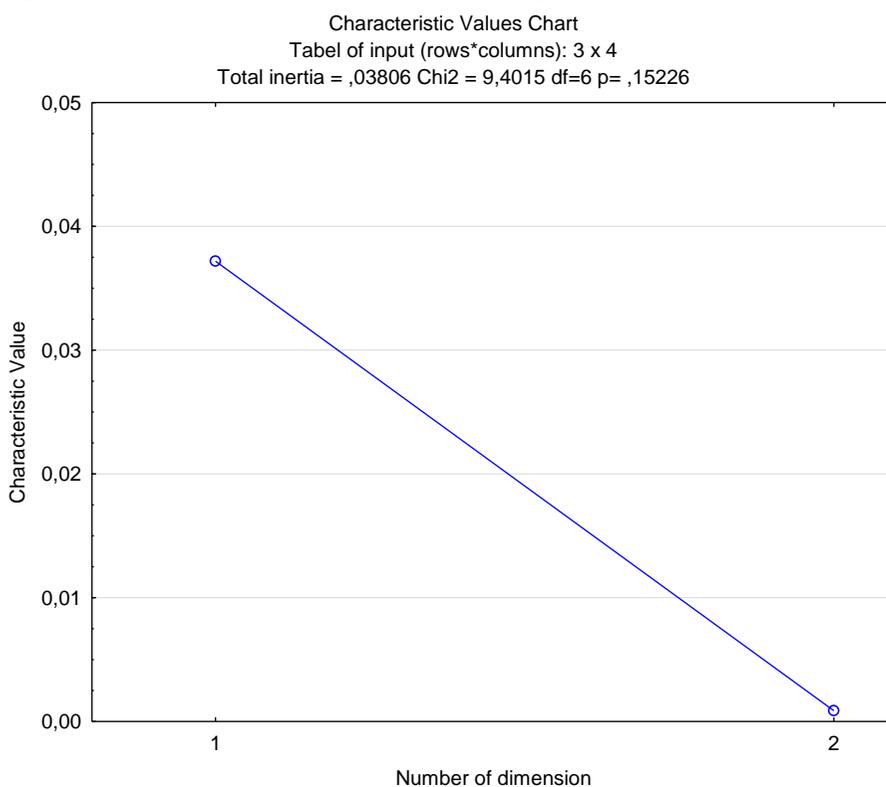
Analysing the combined chart of points representing row and column profiles, we can conclude that there are relatively more companies that are rather competitive among companies that have maintained unchanged levels of relations in the last 5 years. On the other hand, there are more companies with poor competitiveness among those that have worsened their relations with suppliers in recent years. Thus, the largest number of enterprises that are very well competitive is among enterprises that have improved their relations with suppliers in the last 5 years.

X_3 - (subjective) assessment of the level of enterprise competitiveness.

X_6 - number of suppliers with which the company cooperates.

We determine the dimension of the space on the basis of the analysis of the settlement diagram and on the basis of a table with generalized peculiar and eigenvalues. Analyzing the settlement diagram and the percentage of inertia explained by successive eigenvalues, it is possible to assume for the analysis of a pair of variables X_3 and X_6 a two-dimensional space even though, as shown in the table, the first dimension itself explains 97,7 % of total inertia.

Figure 4. Characteritic Values settlement diagram



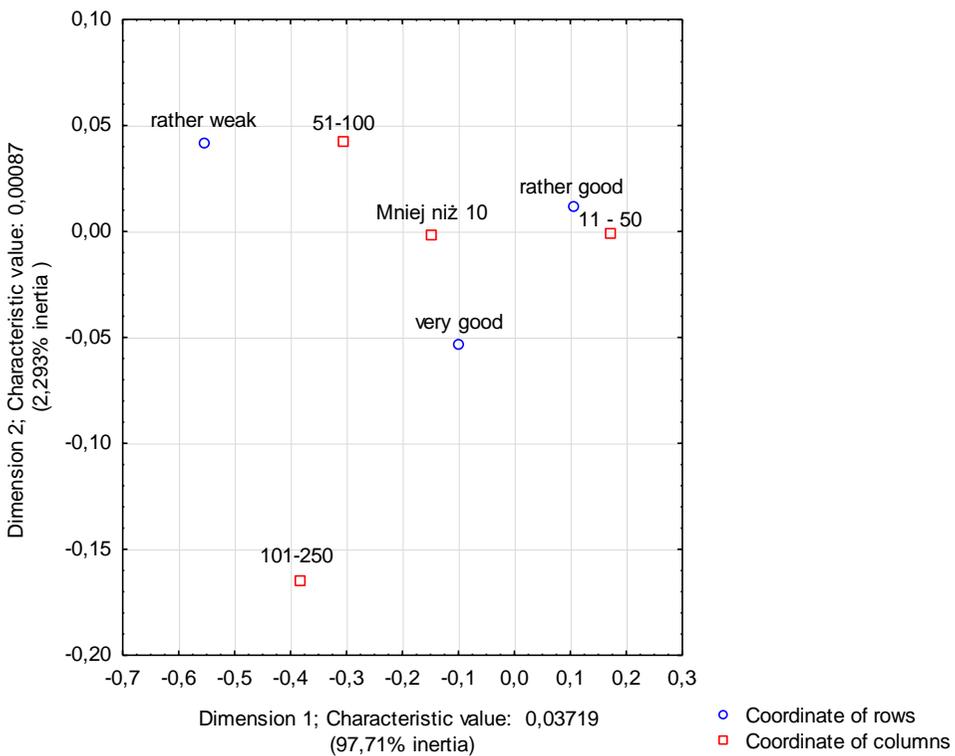
Source: Own results.

Table 2. Characteristic values, total inertia and singular characteristic values for variables X_3 and X_6

| Number dimensions | Characteristic values and inertia (all dimensions) Table of inputs (rows*columns): 3 x 4 Total inertia= ,03806 Chi2=9,4015 df=6 p=,15226 | | | | |
|-------------------|--|------------------------|--------------------|------------------|------------|
| | singular characteristics values | characteristics values | percent of inertia | cumulate percent | chi square |
| 1 | 0,192847 | 0,037190 | 97,70651 | 97,7065 | 9,185903 |
| 2 | 0,029546 | 0,000873 | 2,29349 | 100,0000 | 0,215623 |

Source: Own study.

Figure 5. Plot of coordinates rows and columns for variables X_3 and X_6 .



Source: Own study.

Analysing Figure 5 of common points from the profiles of rows and columns, it can be seen that among the companies that rated their competitiveness rather well the most cooperate with the number of suppliers between 11 and 50. On the other hand, among the companies that are very well competitive, companies that cooperate with

less than 10 suppliers prevail. Enterprises that see themselves as rather poorly competitive are most often companies that cooperate with the number of suppliers from 51 to 100.

5. The International Competitive Environment

The international environment has a significant impact on competitiveness, both for suppliers located abroad and within the country. It appears that there is an increased dependence of suppliers on effective management, quality of supply and reductions in cost service. Foreign reports allow us to state unequivocally that cooperative relations between the purchasing company and its suppliers are characterized by information exchange, long-term agreements for mutual benefit. Increased competition has led to the adoption of comprehensive TQM quality management systems (Handfield and Ghosh, 1994).

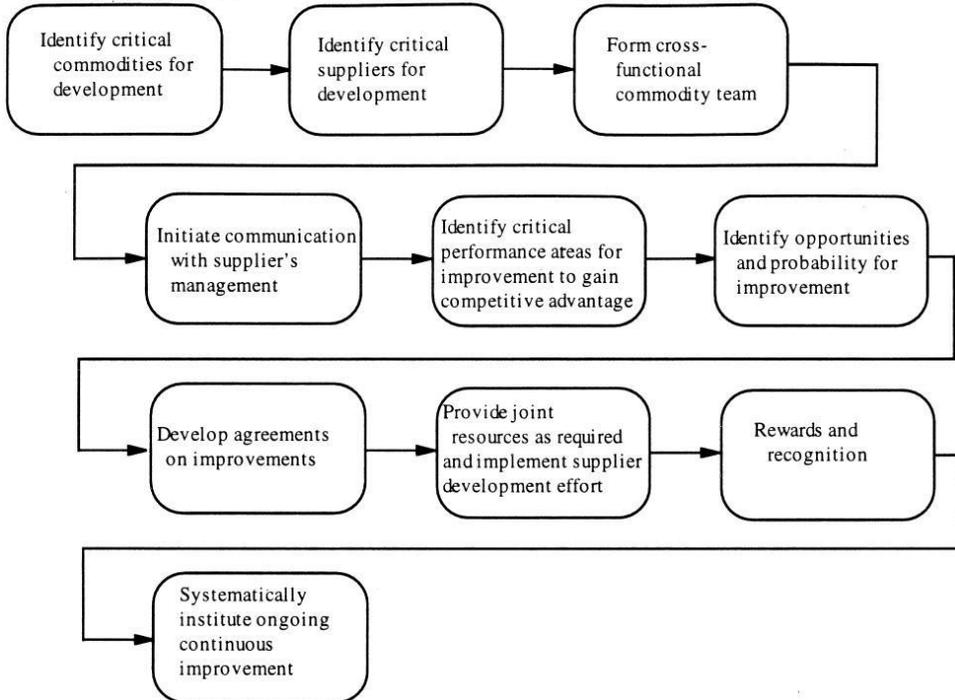
In their article Krause and Handfield (1995) aptly pointed out that Hackman and Wageman (1995) are about to establishing good relationships with suppliers, problem-solving teams, scientific methods for measuring performance and others. Krause and Handfield (1995) emphasize that there is a lot of research on buyer-supplier relationships in terms of needs, development and benefits. They point to Gambetta (1912), Nishiguchi (1994), McAllister (1995), Yoshino and Rsmgan (1995). They also point to case studies by Leenders (1966), Bum (1989), Halm *et al.* (1989), Lamelles and Dale (1991), Hines (1994) and MacDuffe and Helper (1997).

6. Analysis of Strategic Supplier Development Model

The qualitative data was used to build a process model and operationalise two different approaches to supplier development strategic and reactive. Quantitative data was used for statistical validation and differentiation between strategic and reactive approaches to supplier development. In the course of multiple statistical analyses, scientists interpreted individual tests in a way that develops the Bonferonni Method for multiple pair comparisons suggests that in order to maintain an error rate of 0.05 with n comparisons, the threshold p for individual comparisons should be 0.05 (Krause and Handfield *et al.* based on Flynn *et al.*, 1990). This method keeps the error rate at the desired level in individual relationships differences considered to be material are at a more stringent level considered to be material. Where appropriate, it uses the Bonferonni method (Krause and Handfield 1998). Figure 6 below shows the original development model for strategic suppliers.

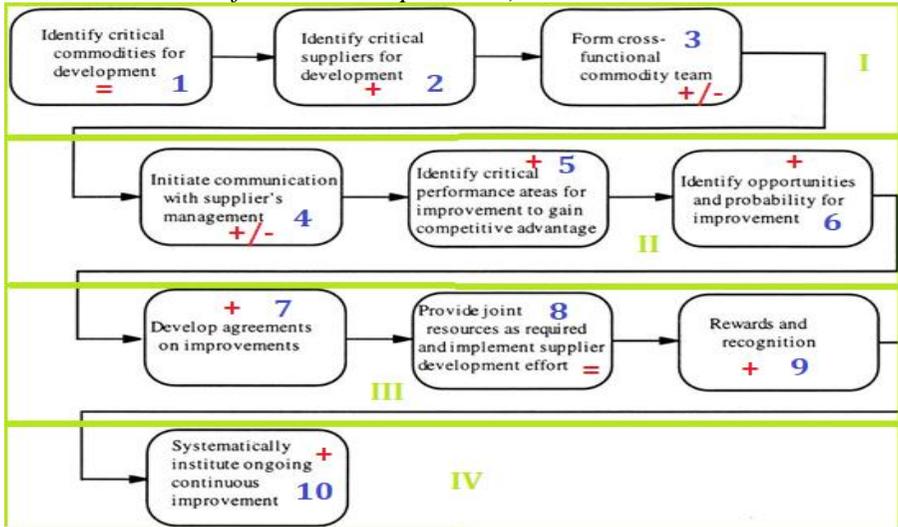
For a more detailed analysis of the implemented elements having a resultant impact (=) and the added value (+) and the obvious, even required (+/-) were divided into 4 parts (I, II, III, IV).

Figure 6. Strategic supplier development model (original)



Source: Krause, D.R., Handfield, R.B., Scannell, T.V. (1998). An empirical investigation of supplier development: reactive and strategic processes. *Journal of operations management*, 17(1), 44.

Figure 7. Strategic supplier development model (original with elements of expected outcome and division to facilitate interpretation)



Source: Own study.

Table 3. *Tabular matrix - resulting with implementation suggestions*

| | Element of the implemented model | Suggestion of adding actions in accordance with looking forward | Expected result |
|----|---|--|------------------------|
| 1 | Identify critical commodities for development | At this stage, bilateral relations should already be examined | = |
| 2 | Identify critical suppliers for development | Additionally, think about who can aspire and treat everyone equally | + |
| 3 | forum cross functional commodity team | Task-based, inspiring innovative | +/- |
| 4 | Initiate communication stub supplier's management | Communication is one of the basic elements of cooperation | +/- |
| 5 | Identify critical performance areas for improvement to gain competitive advantage | Critical areas should be identified not only to improve competitiveness | + |
| 6 | Identify oppormities and probability for improvement | Perform SWOT analysis, mainly pointing out opportunities and threats in order to improve overall cooperation | + |
| 7 | Develop agreenerus on improvements | In addition, point out those that are also at risk and need improvement | + |
| 8 | Provide joint resources as required and implement supplier development effort | The implementation of development actions is one of the essential elements | = |
| 9 | Rewards and recognition | Here, it is important to point to motivation, which is one of the basic elements of management | + |
| 10 | Systematically institute ongoing continuous improvement | It should also be remembered that this should be implemented in a sustainable manner | + |

Source: *Strategic supplier development model implemented on the basis of Krause, D.R., Handfield, R.B., Scannell, T.V. (1998). An empirical investigation of supplier development: reactive and strategic processes. Journal of operations management, 17(1), 44.*

On the basis of the above table X, the implemented elements having the resultant influence (=) and the added value (+) and the obvious, even required (+/-) were listed, divided into 4 parts, where as in the first part in Figure 8.

Figure 8. *First segment of the split model to be implemented with suggestions*



Source: *Own study.*

In the first phase, the key element initiating the suggestion of adding activities in line with the expected outcome was to establish that in the first link (at this initial stage) it is crucial to explore obscure relationships and treat everyone with respect and aspiration for service promotions. It is also important that the team should be task-based, inspiring and innovative (Figure 9).

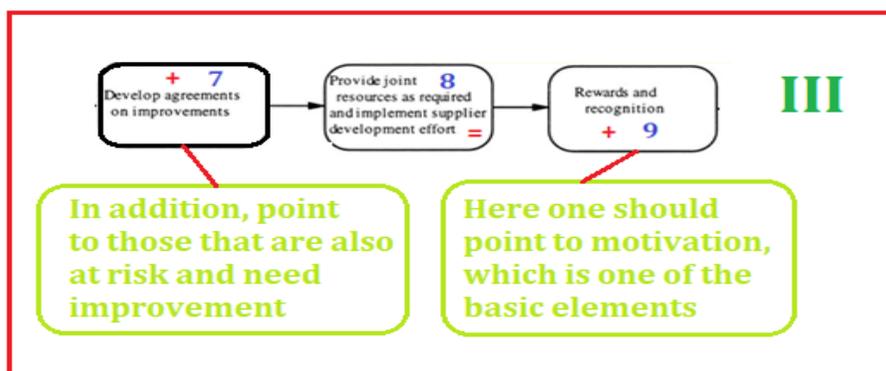
Figure 9. Second segment of the split model to be implemented with suggestions



Source: Own study.

The last section indicates that it is important to be aware of this in order to implement all this in a balanced way. Communication is one of the basic elements of cooperation and critical areas should be identified not only to improve competitiveness, but also to improve teamwork and external relations. A SWOT analysis should also be carried out, mainly pointing to opportunities and threats in order to improve the overall cooperation.

Figure 10. Third segment of the split model to be implemented with suggestions

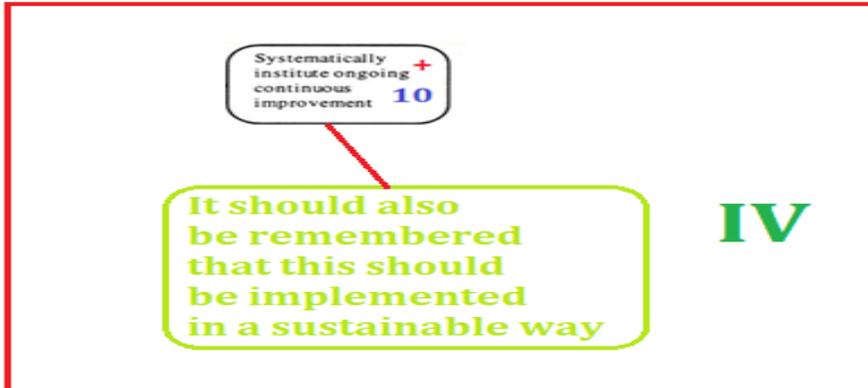


Source: Own study.

In this section, it would also be appropriate to point out the elements that are also at risk and need improvement. Development activities should also be carried out as one

of the key elements. The important role of motivation, which is one of the basic elements of governance, should be highlighted

Figure 11. *The fourth segment of the split model to be implemented with suggestions*



Source: *Own study.*

By implementing the Strategic Supplier Development Model, we can indicate that this model has been improved with elements that can significantly increase global competitiveness in terms of improved supplier relationships.

7. Concluding Remarks

From a broad perspective, this above-average development can be a strategic weapon for the purchasing company. The purchasing function can play an important role in supporting a company's operational strategy. Competition is one of the important elements that can save a company from bankruptcy or simply make a significant evaluation towards development. The statistical surveys carried out in the form of correspondence analysis of the level of the company's competitiveness and dynamics clearly show that the level of competition remains unchanged in companies that have maintained an unchanged level of relations.

Analysing the combined chart of points representing row and column profiles, we can conclude that there are relatively more companies that are rather competitive among companies that have maintained unchanged levels of relations.

On the other hand, there are more companies with poor competitiveness among those that have worsened their relations with suppliers in recent years. Thus, the largest number of enterprises that are very well competitive is among enterprises that have improved their relations with suppliers in the last 5 years. Analysing the common chart of points from the profiles of rows and columns, it can be seen that among enterprises that have assessed their competitiveness rather well, the most

cooperate with the number of suppliers between 11 and 50. On the other hand, among enterprises that are very well competitive, enterprises that cooperate with less than 10 suppliers prevail. Enterprises that see themselves as rather poorly competitive are most often companies that cooperate with the number of suppliers from 51 to 100.

The implementation of the above mentioned model developed by foreign researchers has allowed to compare it with market expectations and to implement elements extending the model, and thus enabling the implementation of elements facilitating the establishment of building relationships with suppliers in order to identify with a company with a great competitive advantage.

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