

A quantitative evaluation of the company environment for the formation of its effective expansion strategy

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Abstract

The successful development of a company's expansion strategy, which determines the best corporate performance, is mainly affected by its environment which is defined by multidimensional assessment criteria acting in different directions. The incorporation of all such criteria into one generalizing and complex dimension is enabled by multi-criteria assessment methods. The article focuses on theoretical justification for the application of multi-criteria evaluation methods and their practical application in identifying the actual and forecast environmental situation of the company, and provides a solution for the formation of an effective expansion strategy using the complex evaluation results of the company environment. Through the examination of a specific company by employing the possibilities of the proposed analytical solution the expansion strategy is formed for an effective development.

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1. Introduction

For a company to develop in a successful manner, it has to continuously adapt to the ever-changing environment, and to understand the potential impact of environmental factors on the performance results of the company as early as possible. It is critical that the company's environment be fully assessed in order to develop an effective strategy. This assessment of where the company is now in terms of its environment determines the choice of strategy. In addition to the evaluation of the actual environmental situation of the company, it is necessary to

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understand how the environment may affect the company performance in the future. The aim of the article is to provide quantitative evaluation of the actual and forecast environment of the company using the multi-criteria evaluation methods and, on the basis of the findings, to generate an effective expansion strategy for the company.

A company's environment is a complicated and complex phenomenon from the point of view of developing an expansion strategy. To evaluate it quantitatively a hierarchy-based system of criteria (Ginevičius, 2007) must be developed. To this end the criteria used in theoretical models (Evans & Short, 2013; O'Shaughnessy, 2014; Everett, 2014; Zavadskas & Turskis, 2011; Bocken, Rana, & Short, 2015 and others) which affect the corporate environment in terms of strategy development were analysed. A company's environment was defined in an objective and structured manner using a hierarchical system of 43 different criteria, with different impact on a common result (Table 5). As criteria are multi-dimensional and act in different directions, multi-criteria assessment techniques enable them to be merged into one complex dimension which can then be used to develop a strategy.

2. Materials and methods for the formation of an effective company expansion strategy

Values and weights must be set for the criteria of the company's environment for the application of the multi-criteria assessment methods in developing its expansion strategy.

To set weights for the criteria subjective methods are used where specialists' (experts') opinions constitute the basis of assessment (Ginevičius & Podvezko, 2003, 2004a, 2004b; Hokkannen & Salminen, 1997; Zavadskas, Kazlauskas, Banaitis, & Kvedarytė, 2004; Ginevičius, Podvezko, & Mikelis, 2004) as well as objective ones – where specific values of weights depend on the structure of the block of criteria details (Hwang & Yoon, 1981; Ustinovičius, 2001). Furthermore, subjective and objective weights can be generalized and combined in an integral manner (Beuthe & Scanella, 2001; Fan, Ma, & Tian, 1977; Ustinovičius, 2001). Of these three, the subjective measurement is the main one; however, it requires high expert qualification since it determines the accuracy of their evaluation. Besides, if they are not sufficiently qualified, contradictory results may be obtained. For this reason, criteria weights may be adjusted to the multi-criteria assessment, if the degree of compatibility of expert assessment is fixed. This is determined by the coefficient of concordance which is calculated on the basis of ranking the compared objects. The result of expert evaluations is the matrix $E = \|c_{ij}\|$ ($i = 1, \dots, m$; $j=1, \dots, r$), where m is the number of compared criteria (objects), and r is the number of experts. Experts can assess the expected value in different ways. For the assessments, any scale of measurement can be applied, for example, measuring in criteria units, percentage, unit fractions, ten-grade system or Saaty's pair-wise comparison scale (Saaty, 2008). To calculate the dispersal coefficient of concordance, however, only the ranking of expert criteria can be used. Ranking is the procedure where the most important criterion is attributed the rank which is equal to one point, the second criterion in terms of importance is given two points, etc. and the least important criterion is given rank m ; where m is the number of compared criteria. Equivalent criteria are attributed the same value, namely, the arithmetic mean of ordinary ranks.

The results of the determination of criteria ranks can be applied in practice, if a sufficient level of compatibility of expert opinions is set. Expert opinions and attitudes to the problem being solved often differ and can even be controversial. The compatibility of opinions is determined by the coefficient of concordance which is calculated on the basis of the ranking of compared criteria. The dispersal coefficient of concordance was defined by Kendall (1970). The idea of the coefficient was linked to the number of ranks of each criterion c_i with regard to all experts:

$$c_i = \sum_{j=1}^r c_{ij}, \quad (1)$$

to be precise, (it was linked) to the variation of dimensions c_i from the total mean \bar{c} by the total sum of squares S (the analogue of dispersion):

$$S = \sum_{i=1}^m (c_i - \bar{c})^2. \quad (2)$$

The total mean value \bar{c} is calculated according to the formula:

$$\bar{c} = \frac{\sum_{i=1}^m c_i}{m} = \frac{\sum_{i=1}^m \sum_{j=1}^r c_{ij}}{m}. \quad (3)$$

If S is a real amount of squares calculated in accordance with formula (2), the concordance coefficient W is calculated in accordance with the following formula (Kendall, 1970):

$$W = \frac{12S}{r^2 m(m^2 - 1)}. \quad (4)$$

If the opinions of experts are harmonized, the value of the concordance coefficient W is close to 1, whereas, if the assessment differ considerably, the value of W is close to zero.

Kendall (1970) proved that if the number of objects $m > 7$, the significance of the concordance coefficient may be determined using the criterion χ^2 :

$$\chi^2 = Wr(m - 1) = \frac{12S}{rm(m + 1)}. \quad (5)$$

A random value is distributed according to the distribution χ^2 with the degree of freedom $\nu = m - 1$. The number of freedom degrees ν of distribution χ^2 does not depend on the number of experts r because it is used to measure the difference between the total number of rankings only. The critical value χ_{kr}^2 is determined according to the level of importance α (in practice, the value α usually equals to 0.05 or 0.01) chosen from the table of the distribution χ^2 with the degree of freedom $\nu = m - 1$. If the value of χ^2 calculated according to formula (5) is higher than χ_{kr}^2 , then the evaluations of the experts are coordinated (Podvezko, 2005).

The basis of quantitative methods is the matrix of statistical data (or expert assessments) of the ratios that characterize the objects under comparison $R = \|r_{ij}\|$ and ratio weights ω_i , ($i = 1, \dots, m$; $j = 1, \dots, n$), where m – is the number of ratios, n – the number of objects (alternatives) under comparison. Applied quantitative multicriteria methods show the nature of each ratio – maximizing or minimizing. The best values for maximizing ratios are the highest values and for minimizing – the lowest. The criteria of qualitative multicriteria methods most often combine the non-dimensional (normalized) ratio values \tilde{r}_{ij} and the weights of ratios ω_i . Most methods use different specific normalization or data transformation of initial data (ratio values). Each method has its own advantage and highlight different features of these values.

The typical, most know known and widespread method is SAW (Simple Additive Weighing). The criterion S_j of this method reflects well the idea of multicriteria methods – the aggregation of ratio values and their weights into one value (Ginevičius et al., 2004; Hwang & Yoon, 1981; Ginevičius & Podvezko, 2007; Ginevičius, Butkevicius, & Podvezko, 2006).

The sum S_j of weighted normalized values of all ratios for each object j is calculated. It is determined according to the formula (Ginevičius & Podvezko, 2006; Ginevičius et al., 2006; Hwang & Yoon, 1981):

$$S_j = \sum_{i=1}^m \omega_i \tilde{r}_{ij}, \quad (6)$$

where ω_i is the weight of ratio i ; \tilde{r}_{ij} – the normalized value of ratio i for object j ($\sum_{i=1}^m \omega_i = 1$).

The normalization of raw data in this case is possible according to the formula (Ginevičius & Podvezko, 2001; Ginevičius et al., 2006):

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sum_{i=1}^m r_{ij}}, \quad (7)$$

where r_{ij} is the value of ratio i for object j .

The best value S_j of the criterion is the highest value.

Using the SAW method, the maximizing criteria of raw data can be normalized by (Ginevičius, 2008):

$$\tilde{r}_{ij} = \frac{r_{ij}}{\max_j r_{ij}}, \quad (8)$$

where $\max_j r_{ij}$ – the highest value of the criterion under maximization.

However, the condition precedent to applying this method is a prior identification of the nature of ratios (maximizing or minimizing) or it is possible to restructure minimizing ratios into maximizing according to the

Table 1
The competitive advantage criteria – ranking results.

Seq. no.	Expert\Criterion	1	2	3	4	5	6	7	8	9	10	The total of the rankings	Ranking
1	The share taken by the industry	8	6	9	3	9	1	1	1	6	4	48	6
2	The general level of the company's competences	7	7	3	7	2	5	2	9	4	6	52	7
3	Technological advantage of the company	6	4	1	4	1	7	4	2	3	2	34	1
4	Flexibility	3	3	2	2	3	6	3	6	2	9	39	2
5	The potential to compete by means of price and quality	2	5	6	5	4	3	5	5	5	1	41	3
6	The strength of the brand	9	2	4	6	7	2	6	3	1	3	43	4
7	The level of client satisfaction	1	1	7	1	5	4	7	7	7	5	45	5
8	The potential of the manufacturing capacity	4	8	8	8	8	8	9	4	8	7	72	8
9	The company's access to funding	5	9	5	9	6	9	8	8	9	8	76	9

formula (Hwang & Yoon, 1981; Ustinovičius & Zavadskas, 2004; Ginevičius & Podvezko, 2004a; Ginevičius & Podvezko, 2007; Ginevičius et al., 2006):

$$\tilde{r}_{ij} = \frac{\min_j r_{ij}}{r_{ij}}, \quad (9)$$

where r_{ij} is the value of ratio i for object j , when the lowest value of the ratio will acquire the highest value equal to one.

The environment of the company for the formation of an effective expansion strategy is divided into actual environment and the forecast environment. In order to form an effective strategy, the environmental ratio of the company calculated as the ratio of the forecast to actual environmental values is proposed:

$$P = \frac{P_f}{P_a}, \quad (10)$$

where P_f is the value of the forecast company environment and P_a is the value of the actual company environmental situation.

The effective expansion strategy of the company is determined by evaluating the company environment and is selected depending on the value of the environmental ratio of the company. The research has showed a close relationship between expansion strategies and the environmental situation of the company: with the deterioration of the environmental situation and shrinking markets the need for diversification increases and, conversely, with the market expansion the need for the said strategies decreases. When the market is well established, diversification is useful in certain markets (Ginevičius, 2009). Thus, if the value of the environmental ratio of the company is less than one, diversification strategies are applied. With the improvement in the environmental situation and market expansion, the importance of integration and concentration increases; when the markets shrink the importance of the said strategy decreases, so if the value of the environmental ratio of the company is one, integration strategies are applied. If the value of the environmental ratio of the company is more than one, concentration strategies are applied.

3. Findings of the empirical research

The hierarchical structure of the system of the company's environment criteria in order to develop an effective strategy provided in Table 5 was used to draw up a ranking questionnaire which had to be completed by highly qualified experts of strategic management who had to evaluate the significance of the rankings of the environment criteria (internal and external, competitive advantage, financial situation, structure of the industry, economic, technological, social and political environment). The importance of the company's environment criteria was measured by 10 highly qualified specialists. Every criterion was given a rank from 1 (to the first most significant) to m (to the least significant). The compatibility of experts' opinions was also verified.

The ranking results of the criteria of the company's competitive advantage are provided in Table 1.

Referring to Table 1, it was determined that the sum of the variations of squares S , which was calculated according to formula (2), amounts to $S=1700$, the coefficient of concordance W calculated according to formula

Table 2
The weights of criteria of competitive advantage.

Seq. no.	Expert/Criterion	1	2	3	4	5	6	7	8	9	10	Mean of weights
1	The share taken by the industry	0.1	0.12	0.04	0.09	0.09	0.06	0.08	0.07	0.04	0.1	0.079
2	The general level of the company's competences	0.06	0.08	0.02	0.08	0.08	0.05	0.07	0.06	0.03	0.06	0.059
3	Technological advantage of the company	0.2	0.17	0.3	0.16	0.2	0.3	0.2	0.21	0.5	0.19	0.243
4	Flexibility	0.19	0.16	0.3	0.15	0.19	0.29	0.15	0.2	0.15	0.18	0.196
5	The potential to compete by means of price and quality	0.15	0.15	0.2	0.15	0.15	0.08	0.14	0.2	0.1	0.17	0.149
6	The strength of the brand	0.14	0.15	0.06	0.14	0.1	0.08	0.13	0.09	0.1	0.15	0.114
7	The level of client satisfaction	0.13	0.14	0.05	0.11	0.1	0.07	0.12	0.08	0.05	0.12	0.097
8	The potential of the manufacturing capacity	0.02	0.02	0.02	0.07	0.05	0.04	0.06	0.05	0.02	0.02	0.037
9	The company's access to funding	0.01	0.01	0.01	0.05	0.04	0.03	0.05	0.04	0.01	0.01	0.026

Table 3
Min and max values of criteria of actual competitive advantage for the development of an effective expansion strategy.

Seq. no.	Expert/Criterion	1	2	3	Mean of min and max values
1	The share taken by the industry	–	–	–	11.0
2	The general level of the company's competences	60;80	70;100	40;80	71.7
3	Technological advantage of the company	50;70	40;60	40;80	56.7
4	Flexibility	20;40	10;30	40;80	36.7
5	The potential to compete by means of price and quality	20;40	40;70	40;80	48.3
6	The strength of the brand	20;50	30;70	30;50	41.7
7	The level of client satisfaction	70;80	50;80	80;100	76.7
8	The potential of the manufacturing capacity	70;80	70;100	40;80	73.3
9	The company's access to funding	80;90	80;100	80;100	88.3

Table 4
Min and max values of criteria of forecast competitive advantage for the development of an effective expansion strategy.

Seq. no.	Expert/Criterion	1	2	3	Mean of min and max values
1	The share taken by the industry	11;12	11;12	11;11.5	11.4
2	The general level of the company's competences	80;80	80;100	60;80	80.0
3	Technological advantage of the company	60;70	40;60	40;80	58.3
4	Flexibility	30;40	10;30	40;80	38.3
5	The potential to compete by means of price and quality	30;50	40;70	40;80	51.7
6	The strength of the brand	20;50	30;70	30;50	41.7
7	The level of client satisfaction	80;90	50;80	80;100	80.0
8	The potential of the manufacturing capacity	70;80	70;100	40;80	73.3
9	The company's access to funding	80;90	80;100	80;100	88.3

(3) amounts to $W = 0.283$, the value of $\ln\chi^2$ according to formula (5), which is $\chi^2 = 22.667$, exceeds the critical $\chi^2 = 15.507$ with the level of importance $\alpha = 0.05$ and degree of freedom $\nu = 9 - 1 = 8$. All this shows that the opinions of the experts were harmonized.

The criteria of the financial situation, structure of the industry, economic environment, technological environment, social environment, political environment, internal and external environment were ranked in the same way.

Following the check of the compatibility of the experts' opinions according to the collected data of the ranking questionnaire, a second questionnaire was designed for highly qualified experts to determine the values of the analyzed criteria weights by fractions of a unit and the technique of direct assessment was adapted.

The weights of the criteria defining the competitive advantage of a company by fractions of a unit specified by the experts are provided in Table 2. The criteria of the company's technological advantage, flexibility, potential to

Table 5
Weights and values of criteria of corporate environment for the formation of an effective expansion strategy.

Corporate environment for the formation of an effective expansion strategy	Criterion	Weight	Criterion	Weight	Criterion	Weight	Actual value	Forecast value
	Internal environment	0.387	Competitive advantage	0.418	The share taken by the industry	0.079	0.236	0.243
					The general level of the company's competences	0.059	0.187	0.196
					Technological advantage of the company	0.243	0.139	0.149
					Flexibility	0.196	0.114	0.114
					The potential to compete by means of price and quality	0.149	0.093	0.097
					The strength of the brand	0.114	0.076	0.079
					The level of client satisfaction	0.097	0.053	0.059
					The potential of the manufacturing capacity	0.037	0.037	0.037
			Financial situation	0.582	The company's access to funding	0.026	0.026	0.026
					Return on investment	0.109	0.253	0.264
					Profit margin	0.142	0.198	0.214
					Debt-to-equity ratio	0.089	0.137	0.142
					Sales	0.214	0.104	0.109
					Profitability	0.264	0.064	0.089
					Asset strength index	0.064	0.071	0.078
	External environment	0.613	Structure of the industry	0.250	The company's susceptibility to R&D	0.068	0.223	0.212
					Entrance barriers	0.190	0.190	0.180
					Elasticity of demand	0.076	0.133	0.143
					Seasonality of the industry	0.038	0.108	0.118
					Level of competition	0.223	0.088	0.083
					Price level	0.056	0.076	0.062
					Size of the industry	0.143	0.068	0.068
					General risk level	0.088	0.056	0.055
			Economic environment	0.304	Level of profitability of the industry	0.118	0.036	0.038
					Interest rate	0.111	0.251	0.275
					Government expenditure	0.077	0.211	0.017
					Economic growth	0.275	0.153	0.180
					Unemployment	0.180	0.147	0.147
					Inflation	0.211	0.111	0.111
			Technological environment	0.204	Economic recession and its effects	0.147	0.077	0.077
					Patent protection	0.139	0.308	0.324
					IT developments	0.240	0.240	0.240
					R&D activity	0.184	0.184	0.184
Social environment	0.133	Energy resource prices	0.112	0.139	0.139			
		Technology transfer level	0.324	0.098	0.112			
		Purchasing power	0.317	0.286	0.338			
Political environment	0.109	Income distribution	0.338	0.299	0.317			
		Pace of population growth	0.196	0.196	0.196			
		Supply of labour power	0.149	0.149	0.149			
		R&D regulation	0.301	0.673	0.699			
		Government regulation	0.699	0.278	0.301			

compete by means of price and quality and the strength of a brand were measured as the most important ones, meanwhile, the weights of other criteria differ only slightly. The criteria of the potential of the manufacturing capacity and the company's access to funding were indicated as having the least significance.

The weights of the criteria of the company's environment for the development of a strategy were measured in the same way; they are provided in Table 5 below.

Following the determination of ranks and weights which define the environment of a company, it is possible to carry out the quantitative assessment of the criteria of the corporate environment for the development of an effective strategy using multi-criteria assessment techniques.

Quantitative evaluation of the company environment for the formation of its effective expansion strategy started after the questionnaire on values had been prepared. The questionnaire was drawn up on the basis of the structure of the indicator system of the company environment. Three experts of the company under analysis filled in the values of the company actual and forecast environment. Since the majority of indicators could not be expressed in specific units, scores on a 100-point scale were used in the research where the minimum value of the indicator was one and the maximum value was 100. As a result, the tree experts allocated minimum and maximum values to all indicators that could not be expressed in specific units. The arithmetic mean was subsequently calculated for the criteria that defined minimum and maximum values (Tables 3 and 4).

The initial data criteria provided in Tables 3 and 4 of were normalized using (7–9) formulas; the results of criteria normalization are provided in Table 5.

According to the environmental normalized values and weights of the company for the formation of an effective development strategy provided in Table 5, using SAW method (formula 6) the estimated value of the actual competitive advantage of the company environment was 0.962 and the value of the forecast competitive advantage of the company environment was 1.000.

By analogy the values of the financial situation, structure of the industry, economic environment, technological environment, social environment, political environment, and internal and external environment were calculated. The final estimated value of the actual situation of the company environment was 0.951 and the value of the forecast situation of the company environment was 0.958. Subsequently, these could be used to form the expansion strategy.

The company environmental ratio is calculated (formula 10) according to the actual and forecast environmental values of the company estimated in this chapter. The value of this ratio is one (1.0), so the integration strategy should be applied for effective development of the company under analysis.

4. Conclusions

An effective corporate expansion strategy is developed after an objective assessment of its environment is carried out. For this, techniques which allow a phenomenon to be objectively evaluated and decisions to be made, which would ensure the best results of corporate performance, are required.

A company's environment is a complex phenomenon for the development of an expansion strategy. To assess it in a quantitative manner, a hierarchical structure of the criteria of a company's environment intended for the development of an effective strategy was developed. The hierarchical structure of criteria describes the corporate environment in detail, and enables the most important aspects of the environment to be defined in a structured way, and the impact which the analysed criteria might have on the common result to be anticipated.

In order to evaluate the environment of the company for the formation of an effective development strategy by using multi-criteria evaluation methods, all environmental criteria must be combined to a single general value, the weights of the phenomenon must be identified by ranking them and verifying their compatibility, and the values of the actual and forecast situation of the phenomenon must be identified which serve the basis for the formation of the expansion strategy of the company.

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