THE LAWS OF DEVELOPMENT OF ORGANIZATIONAL STRUCTURE OF COMMERCIAL ENTITIES IN THE CZECH REPUBLIC

Alexander Bobkov – Igor Denisov – Ekaterina Tsenina

Abstract

The aim of the study is to prove the repeatability of changes in the organizational structure of commercial organizations of various activities. The hypothesis of the authors is that these two types of structures – sequential and parallel – dialectically replace each other, qualitatively changing in the process of growth and development of organizations, but at each new level of development organizations retain their defining properties.

Organizations of similar size (in terms of number of employees and sales), as well as having similar (sequential or parallel) organizational structures, according to the authors, can form groups that constitute the entire set of commercial organizations within the same industry, as well as the national economy as a whole.

Data of retail trade organizations and private educational organizations of the Czech Republic and their comparison was used for the analysis. IBM SPSS Statistics software was used to identify clusters.

The results of the cluster analysis of both retail trade and private educational organizations of the Czech Republic in general confirmed the hypothesis and showed coincidence with the corresponding theoretical models of organizational structure evolution. This allows the authors to propose a theoretical model of the development of commercial organizations.

Key words: organizational structures, retail, education

JEL Code: L2, D21, C38

Introduction

The authors have already investigated the mechanism of development of the organizational structure of organizational structures of commercial organizations of various activities. In particular, there were carried out studies of the enterprises of retail enterprises of the Czech Republic (Bobkov, Denisov, 2017) and private educational institutions of the Czech Republic

(Bobkov, Denisov, Kuchmaeva, 2017). The results of the study showed that the development of the corporate sector of the economy occurs through the transition from sequential organizational structures to parallel and, then, again, sequential.

From earlier studies of organizational structures researchers note that the organizational structure is determined by the basic technology and that there are only three types of structures. (Thompson, 2017). The first one is the "pooled interdependence", in which individual elements of an organization are not linked, but each element contributes to the whole. Visually, such elements can be represented as a parallel circuit. Another type of structure is "sequential interdependence", in which the input of one element is the output of the previous element. The schema in this case will look like a sequence of elements. The third type of structure is the "mutual interdependence" of all elements. According to J. O'Shaughnessy, organizations of this type necessarily include the first two types (O'Shaughnessy, 2013). In this article, we will try, firstly, to prove the alternation of the first two basic types of structures, since the proof of their existence can be determined by statistical methods. Secondly, to identify a list of indicators of commercial organizations that have the greatest impact on organizational structure change. The change in organizational structure is related to the concepts of flexibility and agility of the organization, namely, the ability of the organization to identify opportunities and take advantage of them faster than its competitors. There are three different forms of agility: operational, structural, and strategic (Tsenina, 2014). Structural agility consists in the ability to rapidly and effectively reallocate resources, including cash, talent and managerial attention, from less promising units to more attractive ones. It sometimes requires leaders to make difficult and unpopular decisions (Tsenina, 2014).

This approach was previously used by researchers to identify patterns of development of commercial organizations for certain quantitative indicators. In particular, it was considered in the works of (Hanks, Watson, Jansen, Chandler, 1993; Kunisch, 2017; Naveed, Jantan, Saidu, 2017; Daft, 2016; Schmitt, Raisch, Volberda, 2018; Velinov, 2017). However, the results of the research did not allow drawing a clear conclusion about the laws of the development of commercial organizations.

In order to prove the hypothesis that the growth of commercial organizations takes place in accordance with objectively determined laws (patterns) of evolution and consists in the repeated change of sequential (vertical) and parallel (horizontal) organizational structures, the authors carried out cluster analysis for the selection of relatively homogeneous groups of commercial organizations combining elements with similar characteristics, and subsequently

analyzed the obtained results. In order to carry out cluster analysis of commercial organizations, the authors selected organizations of two sectors – the organization of retail trade, and educational organizations of the Czech Republic.

1. Model of evolution of organizational structure of retail trade organizations

To confirm the hypothesis of alternation of two basic types of organizational structures - sequential (vertical) and parallel (horizontal), the authors proposed a theoretical model of the levels of development of retail trade organizations. When creating the theoretical model, the authors proceeded from the assumption that in the process of development of the organization and improvement of its operational activities in a certain period of time the limit of existing technological limitations is achieved. The owner or manager of the organization then needs to make structural changes. These changes can be implemented in one of two ways – either by duplicating core activities (i.e., moving to a parallel organizational structure), or by combining core and support activities within one larger organization or by creating vertically integrated structures. Organizational characteristics of each level of development are presented in Table 1.

Tab. 1: Levels of development of retail trade organizations

Level of development	Type of retail trade organization	Type of organizational structure
1	retailer / small shop (kiosk)	sequential
2	network of small shops (kiosks)	parallel
3	supermarket	sequential
4	network of supermarkets	parallel

Source: Bobkov, Denisov (2017)

In order to confirm the hypothesis we used cluster analysis of retail organizations of the Czech Republic, conducted with the use of IBM SPSS. Initial data were obtained from the Albertina Gold Edition database (company Bisnode Česká republika, a.s.). Initially, 2,249 retail trade organizations were selected for the study based on the results of their economic activity for the calendar year 2014 (from 01.01.2014 to 31.12.2014). The choice of the year was conditioned by the completeness of information. According to the results of primary processing, 554 trade organizations were expelled due to the lack of necessary indicators for the analysis. The financial figures were calculated in the original currency – Czech crown – CZK.

During the cluster analysis the following variables characterizing the activity of a particular organization were selected:

- ✓ X_1 – number of retail units;
- ✓ X_2 -the average number of employees total (pers.);
- ✓ X_3 - the average number of employees in one retail unit (pers.);
- ✓ X_4 - value-added labour productivity (thous. CZK / person);
- ✓ X_5 - amount of revenue per retail unit (thous. CZK);
- ✓ X_6 - total assets (thous. CZK);
- ✓ X_7 - amount of depreciation (thous. CZK);
- ✓ X_8 - age of an organization (total number of years).

The calculation of the matrix of corresponding Pearson correlation coefficients (table 2) showed that the age of the organization does not affect the economic performance and is not associated with the average number of personnel. The indicator was therefore excluded from further analysis. It should be noted that further calculation of the average age for a set of organizations that fell into a particular cluster differed very slightly (14.0-15.5 years). This fact confirmed the hypothesis that the age of enterprise does not determine the affiliation of the trade organization to a particular cluster.

Tab. 2: Matrix of corresponding Pearson correlation coefficients for retail trade organizations

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
X_1	1	0.788**	0.060**	0.026	0.023	0.797**	0.769**	0.018
X_2	0.788**	1	0.296**	0.007	0.096**	0.824**	0.915**	0.026
X_3	0.060**	0,296**	1	0.042*	0.580**	0.134**	0.200**	0.039**
X_4	0.026	0.007	0.042*	1	0.274**	0.044*	0.038	0.040
X_5	0.023	0.096**	0.580**	0.274**	1	0.092**	0.082**	0.037
X_6	0.797**	0.824**	0.134**	0.044*	0.092**	1	0.903	0.003**
X_7	0.769**	0.915**	0.200**	0.038	0.082**	0.903	1	0.012**
X_8	0.018	0.026	0.039**	0.040	0.037	0.003**	0.012**	1

*. Correlation is significant at the 0.05 level (double-sided).

**. Correlation is significant at the 0.01 level (double-sided).

Source: Bobkov, Denisov (2017)

Since the attributes are equally informative and significant for further analysis, the distance between the objects was calculated using the Euclidean distance formula (1):

$$\rho_E(x_i, x_j) = \sqrt{\sum_{e=1}^{k} (x_{ie} - x_{je})^2} \qquad (1),$$

where: x_{ie}, x_{je} - value of the e component of the i (j) object ($e=1,2,\ldots, k$), ($i\, j= 1,2,\ldots n$).

Cluster analysis was carried out by Ward's method, which allows dividing the set into a sufficient number of clusters corresponding to the economic essence of the studied phenomena. Due to the difference of units of measurement, preliminary standardization of the data was carried out in the studied indicators. Objects with data gaps, as well as objects with abnormally high values of added value and total assets against the background of other organizations were excluded from the analysis. Accordingly, the cluster analysis was carried out on a sample of 1695 trade organizations.

The hypothesis of the equality of variances within and between clusters is rejected for all variables at 5 and 1689 degrees of freedom. P value - probability of error in the hypothesis of variance inequality is extremely low, no more than 0.001 (F-test is significant for all variables at the level of at least 0.01). This suggests that the hypothesis about the inequality of variances is accepted and, accordingly, clusters are formed correctly.

The cluster analysis resulted in the division of 1695 retail organizations into 6 clusters (table 3).

Tab. 3: The average values of the variables in the clusters, sorted in terms of the value of total assets (X_6)

Cluster	X_1	X_2	X_3	X_4	X_5	X_6	X_7
4 N=1105	1.8	5.4	3.2	318.2	5079.6	3895.8	140.8
1 N=358	2.4	13.5	6.8	556.1	20393.4	13868.8	432.2
5 N=61	1.4	15.1	12.4	745.4	85292.4	34667.5	915.8
2 N=133	8.0	42.7	7.7	534.1	20085.6	54027.0	1806.6
6 N=9	2.0	29.7	21.2	1424.5	298744.4	98770.7	2879.3
3 N=29	23.2	214.5	11.5	566.2	38054.2	204094.4	7617.2
Total N=1695	2.8	14.1	4.9	410.9	14501.6	14972.2	503.4

Source: Bobkov, Denisov (2017)

When assessing the results of cluster distribution after sorting by the value of total assets (X_6) (see table 3), it can be noted a consistent increase and decrease in the values of the indicator number of retail units (X_1). For example, if in cluster 4, which includes small trading organizations (1105 organizations) the average number of retail units is 1.8, then in the next cluster (cluster 1 – 358 organizations) the average number of retail units increased to 2.4.

Further, in cluster 5 (61 organizations) the average number of retail units decreased to 1.4. This pattern remains for subsequent clusters.

The existence of such a pattern confirms indirectly the hypothesis of alternation of sequential and parallel structure of the organization of production (operating) activities.

Another factor that confirms this hypothesis is the extensive growth of organizations that have parallel structure of organization of operating activities (the value of revenue per retail unit for the organizations of the first and second clusters has not changed). They also slightly differ in the value of the average number of employees at one retail unit. So, the organizations included in the first and second clusters have comparable specific indicators and differ significantly only in the number of retail units.

A comparison of the average values of the organizations of the fifth and sixth clusters shows that, despite their significant differences, there were most likely grouped quite large individual stores (supermarkets). The values of the indicator the average number of employees in one retail unit (pers.) (X_3) of these organizations show that with a significant increase in their absolute values, the estimated number of retail units (if you calculate it by the average number as X_2 / X_3) has changed insignificantly.

2. Model of evolution of organizational structure of private educational organizations

In order to confirm the hypothesis of alternation of two basic types of organizational structures in the field of education, the authors proposed a theoretical model of the levels of development of educational institutions (table 4).

Unfortunately, the peculiarities of the formation of the database Albertina Gold Edition of Bisnode Česká republika a.s. prevented from conducting a research of the sample from the pooled data of educational institutions, and limited to only private educational institutions. It is derived from the lack of financial and economic indicators for state and municipal educational organizations in the database used.

Tab. 4: Levels of development of educational institutions

Level of development	Type of educational institution	Type of organizational structure
1	individual rendering of educational services (tutor)	sequential
2	educational center in the field of additional education	parallel
3	school / educational centre providing interdisciplinary or multi-level education	sequential
4	network of educational centers providing interdisciplinary or multi-level education	parallel
5	organization of higher education (institute, university) / large education center	sequential
6	higher education organizations (institutes, universities)	parallel

	with a branch network	

Source: Bobkov, Denisov, Kuchmaeva (2017)

In addition, it is difficult to ensure the precise allocation of organizations of the first level of development (individual provision of educational services) the database used. It is caused, according to the authors, by the lack of legal status of a significant number of persons providing educational services (ie not all persons engaged in the provision of educational services are registered as individual entrepreneurs).

Thus, 588 private educational organizations were initially selected for the study based on the results of their economic activity for the calendar year 2015 (from 01.01.2015 to 31.12.2015). The choice of the year was conditioned by the completeness of information. According to the results of primary processing, 211 educational institutions were excluded in connection with absence of necessary indicators for the analysis. Thereby, the analysis was based at indicators of 377 organizations. The financial figures were calculated in the original currency – Czech crown – CZK.

When conducting the cluster analysis the following variables characterizing the activity of a particular organization were selected:

- ✓ X_1 – age of an organization (total number of years);
- ✓ X_2 – the average number of employees total (pers.);
- ✓ X_3 – number of places of educational activity;
- ✓ X_4 – total assets (thous. CZK);
- ✓ X_5 – amount of depreciation (thous. CZK);
- ✓ X_6 – value-added labour productivity (thous. CZK / person);
- ✓ X_7 – the average number of employees in one place for rendering educational services (pers.);
- ✓ X_8 – amount of revenue per one place for rendering educational services (thous. CZK).

The calculation of the matrix of corresponding Pearson correlation coefficients (table 5) showed the presence of a certain relationship between all the analyzed attributes.

This enables using them in the cluster analysis and testing the hypothesis of the impact on the division of the set of educational organizations into groups, taking into account differences in the age of organization, the number of personnel, the number of branches and economic efficiency indicators.

Tab. 5: Matrix of corresponding Pearson correlation coefficients for educational organizations

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
X_1	1	0.165**	0.170**	-0.244**	-0.123*	-0.113*	0.159**	-0.104
X_2	0.165**	1	0.222**	0.553	0.630**	-0.217**	0.866**	0.569**
X_3	0.170**	0.222**	1	0.211**	0.154*	0.134**	-0.254**	-0.168**
X_4	-0.244**	0.553**	0.211**	1	0.640**	-0.106*	0.642**	0.900**
X_5	-0.123*	0.630**	0.154*	0.640**	1	0.224**	0.762**	0.535**
X_6	-0.113*	-0.217**	0.134*	-0.106*	-0.224**	1	-0.216**	-0.112*
X_7	0.159**	0.866**	-0.254**	0.642**	0.762**	-0.216**	1	0.684**
X_8	-0.104	0.569**	-0.168**	0.900**	0.535**	-0.112*	0.684**	1

*. Correlation is significant at the 0.05 level (double-sided).

**. Correlation is significant at the 0.01 level (double-sided).

Source: Bobkov, Denisov, Kuchmaeva (2017)

Cluster analysis was carried out by Ward's method. Due to the difference of units of measurement, preliminary standardization of the data was carried out in the studied indicators. Objects with data gaps, as well as objects with abnormally high values of added value and total assets against the background of other organizations were excluded from the analysis.

The hypothesis of the equality of variances within and between clusters is rejected for all variables at 6 and 370 degrees of freedom. P value - probability of error when making hypotheses about the inequality of the variances was very low, not more than 0.001 (F-criterion significant for all variables at a level not less than 0.001). This suggests that the hypothesis about the inequality of variances is accepted and, accordingly, clusters are formed correctly.

The cluster analysis resulted in the division of 377 private educational organizations into 6 clusters. Distribution of the analyzed educational organizations by clusters and average values of variables are presented in table 6.

Tab. 6: The average values of the variables in the clusters, sorted in terms of the value of total assets (X_4)

Cluster	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
7 N=75	3.4	2.1	1.2	1,188	104	782	1.9	2,744
6 N=37	8.7	1.0	1.9	4,067	318	3,048	0.7	4,789
2 N=104	8.7	6.5	1.2	7,018	295	609	5.7	9,083
5 N=28	16.5	1.3	1.3	7,454	254	2,662	1.2	8,077
4 N=127	18.7	13.1	1.3	7,472	333	382	11.7	9,015
3 N=3	13.7	126.7	8.3	37,851	589	281	22.0	11,435

1 N=3	5.7	139.7	1.0	540,701	19,946	736	139.7	216,667

Source: Bobkov, Denisov, Kuchmaeva (2017)

Analyzing the results of cluster analysis (table 6), the tendency of alternation of values of the indicator X_3 (number of places of educational activity) becomes obvious. For organizations included in cluster 7, the value of this indicator is slightly greater than 1. For organizations in cluster 6, the Value of X_3 is almost 2. Then, for the organizations included in clusters 2, 4 and 5, its value is stabilized within 1.2 – 1.3. For organizations in cluster 3, the Value of X_3 increases sharply to 8.3. Finally, for organizations in cluster 1, its value decreases again to 1.

However, the results require further investigation. First of all, it concerns the organizations included in clusters 2, 4 and 5. At comparable values of indicators X_3 (number of places of educational activity) and X_4 (total assets), the educational organizations enclosed in the specified clusters significantly differ on X_2 (the average number of employees total) and X_8 (amount of revenue per one place for rendering educational services).

Based on the value of the average measures of the variables in clusters 2, 4 and 5, the authors made a supposition that significant differences in the efficiency of educational organizations of comparable sizes (average values of X_4 - total assets - are almost the same), can be connected with peculiar properties of personnel records in organizations (in small organizations, some employees can be hired on the contractual basis without adding to the staff of the organization and, accordingly, not considered in X_2 calculation - the average number of employees), and with the type of educational services provided.

3. Development of a model of evolution of the organizational structure of commercial organizations

Summarizing the results of the conducted researches it can be concluded that the hypothesis of alternation of two basic types of organizational structures – sequential (vertical) and parallel (horizontal), put forward by the authors, is generally confirmed. At the same time, the alternation of sequential (vertical) and parallel (horizontal) organizational structures is typical for organizations of various sectors of the economy – for both sectors retail trade and education.

The analysis of matrices of corresponding Pearson correlation coefficients (tables 2 and 5) showed the existence of a certain relationship between all the analyzed attributes for each of the studied sector of the economy except for the indicator "age of an organization

(total number of years))", which had no impact on the economic performance of retail organizations and is not connected with the average number of employees.

Thus, for the two studied sectors of the economy, the set of indicators in the proposed models almost completely coincided (with the exception of the indicator "age of an organization (total number of years)" for the retail sector) and included the following indicators:

- ✓ number of retail units / number of places of educational activity;
- ✓ the average number of employees total (pers.);
- ✓ the average number of employees in one retail unit / one place for rendering educational services (pers.);
- ✓ value-added labour productivity (thous. CZK / person);
- ✓ amount of revenue per retail unit / one place for rendering educational services (thous. CZK);
- ✓ total assets (thous. CZK);
- ✓ amount of depreciation (thous. CZK).

In other words, the model of organizational structure evolution proposed by the authors can be seen as universal one. This allows the authors to propose a universal model of development of commercial organizations (table 7).

Tab. 7: Levels of development of commercial organizations

Level of development	Type of commercial organization	Type of organizational structure
1	individual entrepreneur / small organization consisting of an entrepreneur and one or few employees	sequential
2	network of small organizations, each organization consists of one or few employees	parallel
3	single enterprise (organization)	sequential
4	group of organizations (enterprises) implementing similar business processes / network organization (organization with branch network)	parallel
5	vertically integrated structure / large enterprise (organization)	sequential
6	horizontally integrated structure	parallel

Source: own elaboration

When analyzing the average values of variables in clusters sorted by the indicator total assets, in becomes evident the tendency of alternating values of the indicator number of retail units / number of places of educational activities.

However, the results of the study of the evolution of the organizational structure of retail trade organizations showed a better match with the theoretical model of their development in comparison with private educational organizations. According to the authors, this fact can be explained by the following factors:

1. The cluster analysis used a larger sample size (1695 retail organizations and only 377 private educational organizations);
2. Sample 1,695 retail trade organizations was drawn from the whole set of retail trade organizations (2249 organizations) that are present in the database Albertina Gold Edition of Bisnode Česká republika a.s. Sample 377 private educational institutions was taken from 588 private educational institutions, despite the fact that in the database Albertina Gold Edition of Bisnode Česká republika a.s. there are 11,288 educational organizations of all forms of ownership. This fact is tied to the lack of financial and economic indicators for state and municipal educational organizations.

Nevertheless, the results suggest that there is a universal model of evolution of the organizational structure of commercial organizations. However, a further research of organizations from other sectors of the economy is required.

Conclusion

The results of the cluster analysis of both retail and private educational organizations of the Czech Republic as a whole confirmed the hypothesis and showed coincidence with the theoretical models of organizational structure evolution for retail trade organizations and private educational organizations. A comparison of the results obtained for these sectors of economy showed that the set of indicators in the proposed models almost completely coincided (except for the indicator "age of an organization (total number of years)" for the retail trade sector) and included the following indicators:

- ✓ number of retail units / number of places of educational activity;
- ✓ the average number of employees total (pers.);
- ✓ the average number of employees in one retail unit / one place for rendering educational services (pers.);
- ✓ value-added labour productivity (thous. CZK / person);
- ✓ amount of revenue per retail unit / one place for rendering educational services (thous. CZK);
- ✓ total assets (thous. CZK);

- ✓ amount of depreciation (thous. CZK).

This allows the authors to assume that the model of organizational structure evolution for commercial organizations can be universal and propose a theoretical model of the development of commercial organizations.

In spite of the fact that for confirmation of universality of the offered model of evolution of organizational structure of commercial organizations it is necessary to carry out similar researches of commercial organizations of other sectors of economy, the obtained results allow to draw a conclusion about possible existence of the General laws of development of commercial organizations in the countries with market economy or separate regions

Confirmation of the hypothesis that different types of organizational structures of companies are reduced to two basic ones, replacing each other at a new dialectical level of development, and the definition of a set of their quantitative characteristics can allow management to make optimal decisions, since in this case there is a possibility of a better choice from a limited, not an infinite number of development options.

References

1. Bobkov, A.; Denisov, I; Kuchmaeva, O. 2017. Cluster analysis of financial, economic, organizational and structural indicators of educational institutions of the Czech Republic, *Mezhdunarodnaya torgovlya i torgovaya politika [International trade and trade policy]* no.4(12): 133-148. (in Russian).

2. Daft, R. L. 2016. *Organization theory &* design. Boston, MA : Cengage Learning.

3. Denisov I.; Bobkov A. 2017. Organizational development: case of retail enterprise structure. *Proceedings of the 5th International Conference Innovation management, entrepreneurship and sustainability (IMES)*: 125-135

4. Hanks, S.H.; Watson, C.J.; Jansen, E.; Chandler, G.N. 1993. Tightening the life-cycle construct: A taxonomic study of growth stage configurations in high-technology organizations, *Entrepreneurship: Theory & Practice*, Vol. 18. № 2: 5-30.

5. Kunisch S. 2017. Does headquarter structure follow corporate strategy? An empirical study of antecedents and consequences of changes in the size of corporate headquarters. Journal of Business Economics and Management, 18(3), 390-411. https://doi.org/10.3846/16111699.2017.1295277

6. Naveed, R. T.; Jantan, A. H.; Saidu, M. B. 2017. The validation of the organizational change construct using confirmatory factor analysis. *Cogent Business & Management* Vol. 4 (1)

7. O'Shaughnessy, J. 2013 *Patterns of Business Organization*. London: Routledge.

8. Schmitt, A.; Raisch, S.; Volberda, H. W. 2018 Strategic renewal: past research, theoretical tensions and future challenges. *International Journal of management reviews*, Vol. 20. № 1: 81-98

9. Thompson, J. 2017. *Organizations in action: Social science bases of administrative theory*. S.l.: Routledge.

10. Tsenina, E.; Tsenina, T. 2014. Approaches to uncertainty management in unstable markets. *Logistika i torgovaya politika [Proc. of the Logistics and trade policy]*, no 1 (12): 109-111. (in Russian)

11. Velinov, E.; Maly, M.; Vasilev, V. 2015. Industry impact on structure and gender diversity of company boards: evidence from the Czech Republic. *Proceedings of The 9th International Days of Statistics and Economics*: 1643-1651

Contact

Alexander L. Bobkov

PhD, Associate Professor, Department of Industrial Economics, Plekhanov Russian University of Economics, Stremyannyy Pereulok, 36, Moscow, Russia

a.l.bobkov@gmail.com

Igor V. Denisov

Doctor of Economics, Professor, Department of Management, Plekhanov Russian University of Economics, Stremyannyy Pereulok, 36, Moscow, Russia

idennis@rambler.ru

Ekaterina V. Tsenina

PhD, Associate Professor, Department of Entrepreneurship and Logistics, Plekhanov Russian University of Economics, Stremyannyy Pereulok, 36, Moscow, Russia

cakie@yandex.ru