Numerical Analysis of the Strategies of the Competitive Behavior of Confectionery Enterprises of the Sverdlovsk Region: example of project approach to education process of master students in IT

Dmitry Berg[1], Bibigul Moldabekova[1] and Anastasia Galimzyanova[1]

[1] Ural Federal University, Yekaterinburg, Russian Federation
ovchinnickova.anast@gmail.com

Abstract. The article was directed to a comparative analysis of competitive strategies of behavior of large confectionery enterprises of the Sverdlovsk Region according to the financial statements for 2013-2017. The following research method was used in this article: a comparative analysis of the competitive strategies of behavior that was performed using the collected data. Based on the analysis built on the basis of revenue figures provided by the enterprises, the enterprises were classified according to their appropriate development strategies. The results of this information process can potentially improve the annual proceed of profitability of confectionery enterprises in the Sverdlovsk Region. This article described the behavior strategies of confectionary enterprises and the trends of its economic development. The article provides computational materials that also can be a remedy for economical education processes. This article is a part of students' laboratory work that will be further used in a graduation dissertation as a part of project approach in higher education process.

Keywords: Competitive Behavior Strategies, Comparative Analysis, Confectionery Enterprises, Higher Education, Project Approach to Education Process, Information Process, Computational Materials.

1 Introduction

Nowadays the project approach in higher education is widely developed. This approach is one of the most effective innovative ways to improve the activities of the university. As recent studies have shown, the project method is an effective tool for the development of innovative activities of the university in connection with the fact that it allows university to strengthen its position in the educational services market by quickly adapting to changes in the external environment, improving the quality and competitiveness of graduates, by combining several disciplines with the aim of their deeper practical application (interdisciplinary interaction). This paper considers the assessment of competitive strategies of small enterprises as a result of the conducted research for the interdisciplinary project.

Private business enterprises today are one of the most important aspects of economic development. However, along with a rich field of opportunities, this type of business

also has a huge number of difficulties and problems, which are encountered at the very early stages of its development. Usually, an organizational strategy should take into account the strengths, weaknesses of the company and its competitive capabilities. Strengths are especially significant for the strategic perspective of the organization, since they are the cornerstones of strategy and therefore the achievement of competitive advantages should be built upon them. At the same time, a good strategy requires intervention in the weaknesses that make the company vulnerable. In this paper we will consider several representatives of such enterprises in the field of confectionery.

Currently, economic development of enterprises is directly dependent on sales and financial estimations and in particular on the company's revenue. In order to have high value of sales, proceeds and revenues the company should be competitive.

Competition is an act between economic entities, which consists of the struggle for markets of goods to obtain higher profits and other income. Competition is one of the most effective mechanisms for regulating a market economy, as well as a civilized and legalized form of struggle for existence.

Two forms of competition can be distinguished: perfect and imperfect competition. Perfect competition is the state of the market in which there are a large number of buyers and sellers who are manufacturers, each of which occupies a relatively small market share and cannot dictate the conditions for the sale and purchase of goods. It is assumed that there is the necessary and affordable information about prices, their dynamics, sellers and buyers, not only in this place, but also in other regions and cities. The market of perfect competition implies the absence of producer power over the market and pricing not by the producer, but through the function of supply and demand. Features of an ideal market (market of perfect competition) are: lack of entry and exit barriers in a particular industry, lack of restrictions on the number of market participants, homogeneity of products of the same name on the market, lack of pressure, coercion on the part of some participants to others.

Imperfect competition – is a competition in the market where individual manufacturers have the ability to control prices for the products they produce. Perfect competition is not always possible on the market. Forms of imperfect competition are monopolistic competition, oligopoly, monopoly, oligopsony and monopsony. With monopoly, it is possible for the monopolist to push other firms out of the market. Features of imperfect competition are: dumping prices, creation of entry barriers to the market for any goods, price discrimination (selling the same product at different prices), use or disclosure of confidential scientific, technical, industrial and trade information, distribution of false information in advertising or other information regarding the method and place of manufacture or quantity of goods, silence of consumer-important information. [1]

In order to be competitive in the market of any goods or services, it is necessary to adhere to a certain strategy of behavior. This certain strategy of behavior is called competitive behavior strategy (CBS).

The strategy (or behavior strategy) is a senior management plan to achieve long-term results consistent with the goals and objectives of the organization (intended strategy, target strategy), a guide or direction of development that characterizes the movement from the present to the future; and also a principle of behavior, following a certain model of behavior, (ongoing strategy, behavior strategy). It characterizes the direction

from the past to the present and shows how well the organization has adapted to the conditions of a constantly changing market.

The objective of this study is to assess the competitive behavior strategies of confectionery enterprises. The subject of research is confectionery enterprises.

The methods that were used during writing this article are the collection and analysis of data through the methodology of constructing a three-component phase diagram. In this paper, a numerical analysis of the competitive behavior strategies of confectionery enterprises is carried out according to the financial statements. For this study, six (6) operating confectionery enterprises specializing in the manufacture of cakes with the largest revenue indicators for 2013-2017 were selected in the Sverdlovsk Region. These are such enterprises as: LLC “Dobriy Pekar”, LLC “Slada+”, LLC CA “Sladial”, LLC “Ekma-Confi”, LLC “Podsolnuhi” and LLC “Biscvitniy Dvor”.

The purpose of the article is to analyze the competitive strategies of confectionery enterprises for further description of their economic development trends.

2 Methods

This article uses several research methods. First of all, the collection of data published in an open source on the Internet resource was performed. [2] Subsequently, a numerical analysis of the CBS was performed using this data. The next step was to describe the trends in the economic development of these enterprises.

This study identifies 3 types of optimal CBS economic agents:

1) Ruderals (R) - agents who make use of their monopoly on production and set high prices for goods. This strategy allows firms to get high profits in a short time at high risk. This strategy allows you to get high returns on invested capital, even with a small market share. This strategy is often adhered to by firms created for a short-term project and disappearing when competitors appear (for instance, venture firms). This situation occurs as a result of the emergence (opening) of a new market (for example, banking services) or a significant change in economic conditions, which can be considered as a stage of market capture and division.

2) Competitors (C) - agents who have methods of reducing of the prime cost by reducing cost values or investing in production improvement. It requires certain reserves to reduce costs or significant continuous investment in the rationalization of production in order to obtain a permanent valuable advantage and expand the marketing of products. They are adapted to exist in resource-rich, densely populated systems (where the market is divided). In the economic space, true competitors are firms that, due to crowding out all competitors from the market, have achieved an almost unbreakable position in these conditions and in terms of volume of operations are several times superior to their closest competitors (for example, Google company).

3) Stress-tolerants (S) - agents that avoid competition by creating their own specific exclusive niche. They are characterized by a slow growth rate due to severe resource constraints. In essence, this is a strategy of small innovations related to the retention of a market niche and market share, the costs of which are recouped by increasing the price. They are characterized by a low relative growth rate. Stress-tolerants are small

firms that are firmly established (due to unique technologies, natural conditions, geographical location, etc.) in any small market of original or high-class products or in a certain territory (for instance, medium-sized grocery stores) whose activities are aimed at serving narrow groups of customers.

Agent companies with clearly defined primary strategies are not actually represented on the market. Most often, agents with secondary strategies take place - these agents are a superposition of primary ones. [3]

The relative contribution of each of the three basic types of strategies to the behavior of one agent can be graphically depicted in a three-dimensional diagram in figure 1.

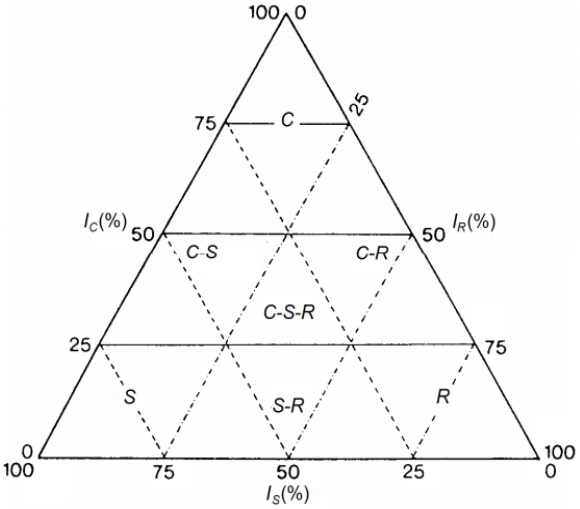

Fig. 1. The classification diagram of competitive agent behavior strategies that quantitatively characterizes the relationships between competition, stress, and disruption, that corresponds to strategies of various types.

The methodology for describing competitive strategies for agent behavior uses a three-component phase diagram. The classification diagram is a range of values depending on external influences - stress, disturbances and competitors (S-, R-, C-strategies). Taking the values of the total magnitude of the efforts for 100%, we can obtain the formula:

$$I_S+I_R+I_C=100\%, \quad (1)$$

where I is the intensity of efforts to implement the corresponding (S, R, C) agent behavior strategies.

Only two of these three parameters - stress and disturbances - are independent, so we can use the mathematical basis for constructing three-component phase diagrams, well known in the natural sciences. Two major limiting factors are situated along the chart axes. All agents studied can be located in an equilateral triangle, at the vertices of which competition, stress and violation reach their maximum values.

Agents with primary strategies are located in the corners (R, S, or C), and the triangle field is divided into zones corresponding to secondary (mixed) strategies for agent behavior. The triangular diagram was successfully used to analyze competitive strategies of confectionary enterprises' behavior, the calculation was carried out according to the value of the confectionary enterprises' annual proceeds during researched period.

The need to focus on the economic field competition requires appropriate techniques for identifying the behavior of surrounding competing agents. In order to move from a theoretical model to practical methods for determining CBS, it is necessary to find the corresponding characteristics of agents. Through this process it becomes possible to identify competitive strategies for agent behavior based on empirical data based on only two independent parameters.

During the constructing of classification diagram, the absolute value of the economic parameter M is used as a competition index, and its relative growth M', calculated by the formula, is used as the violation index:

$$M_i' = \frac{100(M_i - M_{i-1})}{M_{i-1}} \quad (2)$$

3 Results

The scale of the chart is a set from the range of values of M and M' source data. Marking lines are drawn parallel to the axes: on the left oblique line are drawn parallel to the horizontal, and on the horizontal - parallel to the left oblique.

In order to build a diagram, it is necessary to calculate the corresponding indexes M and M', based on the obtained economic data. To carry out calculations using the chart, it is necessary to select economic parameters corresponding to the indices I_C, I_R, and I_S. For confectionary enterprises the volume of annual revenue was chosen as I_C parameter, and the relative rate of their growth was chosen as I_S. Having postponed the obtained values on the corresponding axes of the diagram, at their intersection we obtain the location of the object on the static diagram [4].

The simplest characteristics for an agent are:

1) Agent's assets - competition index (vertical inclined axis);

2) Its growth rate is the stress index (horizontal axis).

Thereby it becomes possible to identify competitive behavior strategies by empirical data evidence on just two independent parameters.

Figure 2 shows a static diagram, each agent of which is presented in the form of a point, constructed according to the last value of M revenue for the researched period and the average M' annual rate of its growth M'.

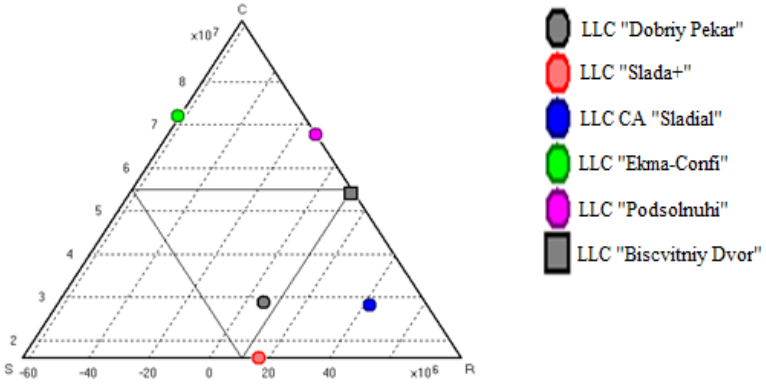

Fig. 2. The statistical diagram of the CBS of the confectionery enterprises of the Sverdlovsk Region by revenue for 2013-2017.

The scale of the chart is set taking into account the values of M and M' source data. Using the data for each agent at different points in time, we can build a dynamic diagram. In the dynamic diagram (Fig. 3), each agent is represented as a chain of points, each of which reflects its state at certain points in time. Points are built on the annual values of the company's revenue and the values of its growth for the same period. The resulting vectors reflect a change in agent strategies. Point numbers correspond to years.

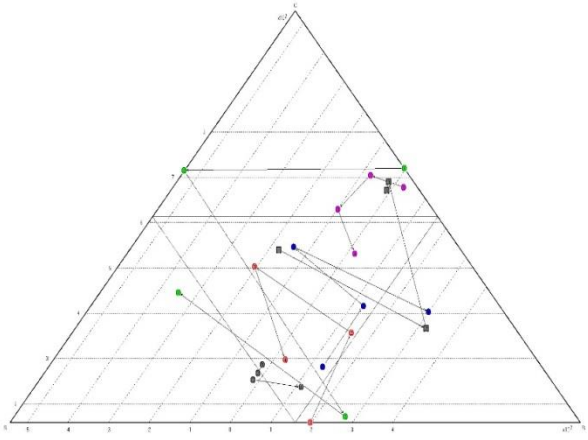

Fig. 3. The dynamic diagram of the CBS of the confectionery enterprises of the Sverdlovsk Region by annual proceeds for 2013-2017.

In the dynamic diagram (Fig. 3), agents are represented in the form of a chain of points, each of which reflects its state at fixed points in time. Points are plotted by annual absolute values and relative growth rates for the same period. The resulting vectors reflect the change in agent strategies depending on the year, which can be traced in the selected industry of confectionary enterprises.

The dynamic life cycle diagram of confectionary enterprises presented in Fig. 3, corresponds to the stage of unlimited growth of demand of the confectionary enterprises' market and is governed by the laws of imperfect competition. The diagram shows individual deviations from the characteristic values of sales volumes, which is associated with the need to change the competitive strategy of agents' behavior in the market when consumer demand fluctuates in individual industries.

Thereby the construction of a classification diagram competitive behavioral strategies is one of the methods for assessing the competitive environment and positioning organizations in it. When calculating according to the methodology for identifying CBSs, organizations are grouped by type of strategy.

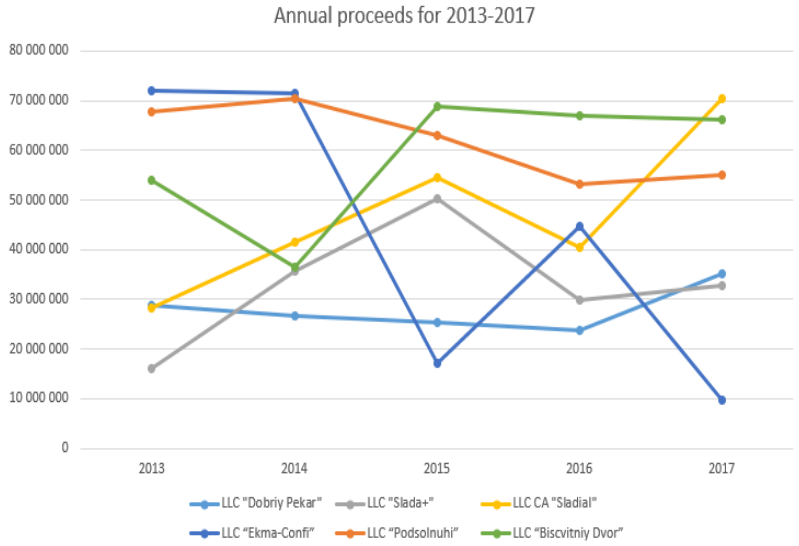

Fig. 4. The values of the annual proceeds of each enterprise between the periods of 2013 to 2017.

Figure 4 shows the time series of the annual proceeds values of each enterprise, according to which it can be concluded that LLC "Dobriy Pekar" and LLC "Podsolnuhi" practically did not change their proceeds indicators. At the same time, the enterprises of LLC CA "Sladial" and LLC "Biscvitniy Dvor" increased proceeds values after 2014, and LLC "Ekma-Confi" tended to decrease the same year under observation.

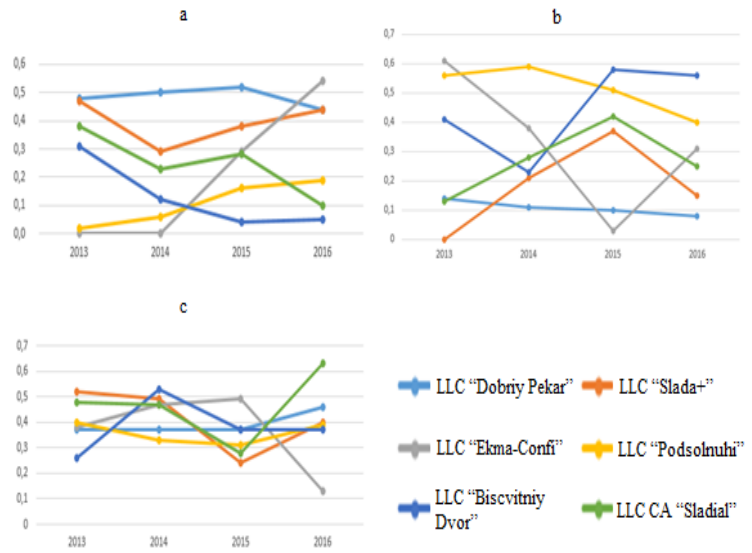

Fig. 5. Time series of proceeds values for each of the basic CBSs of confectionery enterprises in the period from 2013 to 2017. a) S-strategy; b) R-strategy; c) C-strategy.

Figure 5 illustrates the graphs of the values of each of the strategies (a – S strategy, b – R strategy, c – C strategy) versus time, which are based on the annual proceeds of enterprises from 2013 to 2017. From these graphs it is clear that LLC "Podsolnuhi" and LLC "Dobriy Pekar" adhered to the same strategy for the entire observed period: C-R and R-S, appropriately. The companies LLC "Slada+" and LLC "Ekma-Confi" have twice changed their strategy: LLC "Slada+" had R-S strategy for the whole 2014, and C-S for 2015 and returned to R-S strategy by the end of 2016; by the time when LLC "Ekma-Confi" had a clean C-R strategy from 2013 to 2014, then changed it to R-S strategy, and by 2016 came to C-S strategy. The following companies changed their strategy once for the entire period: LLC KO "Sladial" - R-S strategy for the whole 2014, after - C-R and LLC "Biscvitniy Dvor" - C-S strategy for 2014, and after - C-R strategy.

CBS diagram allows us to observe the change in the optimal agent behavior strategies during the changes of environmental conditions and also as a result of the use of system resources by agents. Evolutionary changes in the system due to agent competition (under constant external conditions) correspond to different stages of market development. Moreover, the development trajectory of the system as a whole substantially depends on the amount of resources, the duration of the destructive periods, etc.

Thus, for the confectionery enterprises under consideration during the study period (2013-2017) the following types of competitive behavior are characterized:

1) "Ruderals-stress-tolerants (R-S)" - enterprises with revenue growth of less than 20 million rubles for a year. This is the most numerous type of confectionery enterprises in the Sverdlovsk Region. This is the company LLC "Dobriy Pekar" for the entire period, as well as LLC "Slada+" and LLC CA "Sladial" - until 2014;

2) “Competitors-ruderals (C-R)” - is an enterprise of LLC “Podsolnuhi” for the entire period, as well as LLC CA “Sladial” and LLC “Biscvitniy Dvor” - after 2014;

3) “Competitors-stress-tolerants (C-S)” - these are enterprises with an average growth rate that have adapted to the constant lack of resources: LLC “Slada+” for 2015, LLC “Ekma-Confi” for 2016 and LLC “Biscvitniy Dvor” for 2014.

4 Discussion

Based on the analysis of the data presented by the diagrams, it can be noted that the enterprises of LLC “Dobriy Pekar” and LLC “Podsolnuhi” did not change their behavior strategy. At the same time, chaotically arranged elements symbolizing other companies indicate changes in strategies over this period of time. The stability of the economy of a single enterprise is manifested in the stability of existing trends in the dynamics of its development. In this way, there is a correlation between a constant strategy of behavior and stable revenue. However, it should be noted that enterprises with the highest revenue growth tend to repeatedly experience changes of behavioral strategies, which allows us to conclude that they are adaptable to external market influences.

The objective of strategic management is to determine transition points - those moments when the enterprise needs to change its strategy. If a ruderal enterprise in a competitive market will not change its strategy and will continue to work with high costs and investments, it will soon leave the market. On the contrary, more successful companies will go along a higher trajectory. The concept of a life cycle (LC) is widely used in economics and is aimed to visually represent the development of industry, technology, enterprise, product (service), innovation and other. According to the basic model of life cycle any LC is characterized by a successive change of the following stages: nucleation and growth, stable existence, degradation and death. At different stages of the development of the life cycle, obviously, agent behavior strategies also differ. The life cycle of each market may reach several decades and or may have place within 2 or 3 years. It depends on the speed of technology updates, the emergence of new products, changes in consumer demand etc.

5 Conclusion

The aim of the article was to conduct a numerical analysis of the competitive strategies of confectionery enterprises for further description of their economic development trends. In the course of this study, an analysis of the enterprises' CBSs was carried out, the main types of competitive behavior of these enterprises were determined and their development trends were described. In the analysis in this article it can be noted that chaotically arranged elements symbolizing some of the companies indicate changes in strategies over this period of time. Since the stability of the economy is manifested in the stability of existing trends in the dynamics of its development - there is a correlation between a constant strategy of behavior and stable revenue. In spite of this, it should be mentioned that enterprises with the highest proceed growth tend to repeatedly change their behavioral strategies, which means that they are more adaptable to external market

influences. Further the results of this conducted research will be used in a graduate work as a part of project approach in higher education.

References

1. Encyclopedia of Economics, https://economy-ru.info/, last accessed 2019/10/11.
2. Service for verification and analysis of Russian counterparties, https://www.rusprofile.ru, last accessed 2019/10/24.
3. Lapshina S. N., Berg D. B. System analysis of competitive strategies. Textbook. Economic Theories, pp. 8-19, 24-35. Ural, Ekaterinburg (2014).
4. Lapshina S.N. The use of simulation models in predicting the development of economic agents in shock conditions, pp. 5-23. XII International scientific and practical conference on the problems of economic development in the modern world «Sustainable Development of Russian Regions: Economic Policy in terms of external and internal shocks (2015).