Research of adaptive features of industrial enterprise crisis management system

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Abstract. Currently, there is a significant decrease of industrial production level in Russia. The Russian economy has entered a recession, a moderate economic downturn, which will last at least until 2020. In 2019, analysts predict a decline in turnover for the equipment manufacture by 10%. At the same time, banks, having studied the market, give forecasts from 15 to 25%. Retailers predict a decline in turnover of up to 30%. In this economic environment the researched enterprise JSC “R&D Zenith” will have to reduce production volumes. The article deals with the main features of the crisis management system at the enterprise such as flexibility and adaptability. The authors describe the method of analysis of the adaptive features of the crisis management system of the industrial enterprise, taking into account the specifics of its activities. This method is based on the key factors of the enterprise activity, which affect the adaptive features of the crisis management system, the nature of their changes and the relationship between them.

JSC «R&D Zenith» is one of the few Russian companies offering a full range of services for complex equipment manufacture and engineering for the enterprises of various industries: oil and gas, aviation, fuel and energy. The JSC success is primarily due to close interaction of the applied science and production. Today, the company has everything necessary for creating the most complex import-substituting equipment. This includes its own design base, and well-equipped production with modern technological processes, as well as test benches.

The main goal of JSC "R&D Zenith" is to gain a leading position in the market of specialized equipment for the oil and gas and aviation industries through the studying and meeting the requirements and expectations of consumers, the continuous improving of product quality and developing all the organization activity.

Actual technologies (Lean-technologies) are implemented in the enterprise management. These technologies have been successfully proved by the best foreign and Russian enterprises such as Toyota, Spirit Aero Systems, Novosibirsk branch “OKB Sukhoi” (NAPO named after V.P. Chkalov) and others.

JSC OKB Zenith in cooperation with a number of enterprises of the aerospace complex, having extensive experience with such materials as titanium, corrosion-resistant stainless and heat-resistant aircraft alloys, possessing modern technologies of electron beam welding, plasma-ion implantation, vacuum heat treatment, high-precision machining equipment, has successfully engaged in the manufacture of non-standard, including import-substituting equipment.

At a time when the main consumer markets for this enterprise are the markets for oil and gas production and aviation equipment, at the same time JSC “R&D Zenith” is a manufacturer of products
for other industries. The main consumers of non-standard equipment are mining, metallurgical, pulp and paper, energy and engineering industries.

The financial crisis had a negative impact on JSC "R&D Zenith" economic activity results, which negatively had affected the purchasing power of the population. Consumption rates at the end of 2018 have plummeted due to a sharp decline in household incomes and rising unemployment. In addition, the enterprise is geographically far from the western and central regions of Russia, where the highest population density and higher purchasing power and where the largest materials suppliers are located. Shipping costs in the expenses are significantly higher than those of competitors. Since the beginning of the year 2019, the increase in shipping costs reached 13.6%.

One of the main features of the crisis management system at JSC "R&D Zenith" is flexibility and adaptability, which are based on tracking signals of the coming crisis, mobility and dynamic use of resources, high speed of decision-making and implementation. Thus, on the basis of available information about the enterprise and the conducted research, we describe the following method of analysis of the adaptive features of the crisis management system of the industrial enterprise, taking into account the specifics of its activities. This method is based on the key factors of the enterprise activity, which affect the adaptive features of the crisis management system, the nature of their changes and the relationship between them. These include five key factors:

Finance factors:
- the profit characterizing the efficiency of the enterprise and its investment potential in creating an adaptive management system; for analysis are used profitability indicators;
- the cost characterizing the costs of the enterprise; its analysis using an indicator of production profitability allows identifying problems solved by the system of adaptive management;
- the value of equity characterizing the enterprise development sustainability, providing the ability to successful implementation of the adaptive management system; for the analysis, the indicator of return on equity is used, which reflects the efficiency of its use;
- the ratio of own and borrowed capital characterizing the degree of enterprise dependence on external financial sources, i.e. the stability of its position in the external environment; for the analysis, the coefficient of financial independence (autonomy) is used;
- the liquidity of assets characterizing the enterprise ability to repay its debts to external organizations in a timely manner; for the analysis, the asset turnover ratio is used;
- the value of assets characterizing the scale of the enterprise, its business activity and the scale of adaptive management technologies implementation; for the analysis, the asset turnover ratio is used.

Marketing factors:
- the market position characterizing the adequacy of the enterprise response to the challenges of the external environment; for the analysis, the indicator of the market share occupied by the company is used;
- the sales volumes characterizing the success of product promotion on the market and enterprise adaptive reply to consumer needs; for the analysis the indicator of profitability of sales is used;
- the marketing costs characterizing the direction of the enterprise management to adapt to the crisis conditions and the degree of product commercial potential realization; for the analysis, the indicator of the share of marketing costs is used.

Inner business process factors:
- the production costs characterizing the efficiency of manufacture processes and determining the degree of crisis management system adaptation to changes in the internal and external environments; for the analysis, the indicator of the cost share in the revenue from sales is used;
- the main funds characterizing the scale of manufacture activities, the security of manufacture processes and ensuring the enterprise competitiveness; for the analysis the effectiveness of the use of fixed assets, the capital productivity index is used;
the defect characterizing the presence of problems in manufacture process and the degree of modern technologies implementation ensuring the product quality; for the analysis the manufacture defect level indicator is used.

Personnel factors:
- the movement of personnel, characterizing the company's employees adherence and the level of organizational knowledge loss by employees dismissing; for the analysis the employee turnover rate is used;
- the salary characterizing the degree of satisfaction and motivation of employees, their interest in improving the enterprise efficiency and in implementation of modern technologies of adaptive management; for the analysis the indicator of the average monthly salary is used;
- the effectiveness of employees, characterizing the staff qualification, the degree of modern technologies implementation; for the analysis, an indicator of labor productivity is used (output per worker);
- the qualification of personnel, characterizing the employees skills, abilities and competencies, allowing to adapt to the external environment and organizational changes requirements; for the analysis the indicator of workers with the higher and secondary specialized professional education is used;
- the training costs characterizing the enterprise knowledge management system, allowing adequately respond to changes in the external and internal environment and to accumulate valuable experience; for the analysis, the indicator of the share of staff training costs is used.

Innovative activity factors:
- R&D costs characterizing the focus of enterprise management on scientific and technical development to meet the increasing demands of consumers and ensuring the enterprises competitiveness in the market; for the analysis, the indicator of the manufacture knowledge intensity is used (the share of R&D expenses);
- the product updating characterizing the innovative activity in the adaptive management system; for the analysis, the coefficient of product updating is used;
- the personnel structure characterizing the desire to improve the enterprise efficiency at the expense of the specialists involved in the development of adaptive management processes; for the analysis the indicator of a share of experts in total number of the personnel is used.

Thus, based on a set of the above identified key factors and the proposed indicators, the adaptive features of the crisis management system of the industrial enterprise JSC "R&D Zenith" for the period from 2016 to 2019 was researched using the index method. For the base indicators are taken indicators of the enterprise for previous years. The importance of the indicators in each of the five enterprise economic activities (the factors), as well as the weight of the integrated indices of these activities in the total index of changes in the adaptive features of the crisis management system is determined by expert means.

To detail and identify the factors that have had the greatest impact on the change in the total index of changes in the adaptive features of the enterprise crisis management system, the dynamics of integrated indices for five activities for the researched period is presented in table 1.

Next, we calculate the total index change of the adaptive features of the JSC "R&D Zenith" crisis management system for the period 2017-2018. To do this, first calculate the values of integral indexes on the five component activities of the enterprise.

\[
\begin{align*}
\text{I Finance} &= 0.03 \times 0.35 - 0.76 \times 0.20 + 0.25 \times 0.05 + 0.76 \times 0.15 = 0.21, \text{ weight 0.15} \\
\text{I Marketing} &= 0.95 \times 0.40 + 0.03 \times 0.25 + 0.97 \times 0.35 = 0.73, \text{ weight 0.25} \\
\text{I Business Processes} &= 1.02 \times 0.35 + 0.81 \times 0.25 + 1.22 \times 0.40 = 1.05, \text{ weight 0.20} \\
\text{I Personnel} &= 0.67 \times 0.30 + 1.12 \times 0.20 + 1.10 \times 0.25 + 0.98 \times 0.10 + 0.52 \times 0.15 = 0.88, \text{ weight 0.25} \\
\text{I Innovation} &= 0.57 \times 0.40 + 0.50 \times 0.45 + 0.91 \times 0.15 = 0.59, \text{ weight 0.15}
\end{align*}
\]

So, the total index change of the adaptive features of the JSC "R&D Zenith" crisis management system \( IA = 0.21 \times 0.15 + 0.73 \times 0.25 + 1.05 \times 0.20 + 0.88 \times 0.25 + 0.59 \times 0.15 = 0.52 \)
Table 1. Total index of changes in the adaptive features of the JSC "R&D Zenith" crisis management system for the period 2017-2018.

| Enterprise Activity                              | 2017  | 2018  | Index | Weight |
|-------------------------------------------------|-------|-------|-------|--------|
| **Finance**                                     |       |       |       |        |
| - profitability of production, %                | 6.45  | 0.20  | 0.03  | 0.35   |
| - return on equity, %                           | 11.91 | -9.00 | 0.76  | 0.20   |
| - coefficient of autonomy                       | 0.39  | 0.31  | 0.79  | 0.25   |
| - current ratio                                 | 0.91  | 0.69  | 0.76  | 0.05   |
| - asset turnover ratio                          | 2.59  | 1.96  | 0.76  | 0.15   |
| **Marketing**                                   |       |       |       |        |
| -market share, %                                | 9.2   | 8.7   | 0.95  | 0.4    |
| -profitability of sales, %                      | 5.77  | 0.17  | 0.03  | 0.25   |
| - share of marketing costs, %                   | 2.32  | 2.26  | 0.97  | 0.35   |
| **Business Processes**                          |       |       |       |        |
| - share of cost in sales revenue, %             | 89.47 | 87.44 | 1.02  | 0.35   |
| - capital productivity, %                       | 6.03  | 4.86  | 0.81  | 0.25   |
| - the level of marriage, %                      | 11.0  | 9.0   | 1.22  | 0.40   |
| **Personnel**                                   |       |       |       |        |
| - staff turnover                                | 0.02  | 0.03  | 0.67  | 0.30   |
| - average monthly salary, RUB                   | 13130 | 14715 | 1.12  | 0.20   |
| - annual labor productivity, RUB                | 973269 | 1070596 | 1.10 | 0.25   |
| - share of employees with higher and secondary special professional education, % | 62.0 | 60.7 | 0.98 | 0.10 |
| - share of staff training costs, %              | 0.023 | 0.012 | 0.52 | 0.15   |
| **Innovation**                                  |       |       |       |        |
| - knowledge intensity of production (share of R&D costs), % | 0.114 | 0.065 | 0.57 | 0.40   |
| - the rate of renewal of the model range of products | 0.127 | 0.063 | 0.50 | 0.45   |
| - share of specialists in the total number of personnel, % | 14.0 | 12.7 | 0.91 | 0.15   |

It is obvious that the analysis characterizes the changes regarding the activities of the enterprise. As calculation showed, for transferring the enterprise from the current state to the desired, it is necessary to strengthen the adaptive features of the crisis management system by two times, since $1A = 0.52$ ($1A < 1$).

It is necessary to focus on the development of the above-mentioned five activities, not forgetting to improve the personnel and internal component of the activity. To ensure the integrated development of all activities of JSC "R&D Zenith", a special approach is needed to organize a crisis management system, which is primarily due to the need for enterprises to respond flexibly and adapt to changes in the external and internal environment in order to prevent a crisis situation and ensure sustainable development. Prospects for growth and development are now determined not only by the accumulated production capacity in the past, but also largely by the presence of an adaptive enterprise management system and its capabilities, due to the availability of adaptation mechanisms.

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