Problems of increasing the innovation activity of industrial enterprises in the context of global competition

H-Ch Brauweiler¹, V V Kurchenko², O V Fetisova², L V Ponomareva² and E A Kurchenkova²

¹Western Saxon University of Applied Sciences, Kornmarkt 1, D-08056, Zwickau, Germany
²Volgograd State University, Universitetskiy av., 100, 400062, Volgograd, Russia

E-mail: kurchenkov@volsu.ru

Abstract. The article deals with the increasing innovation activity of Russian enterprises in the context of global competition. It describes the rise in intensity of competition as a result of the decrease in the main market players and the increase in the scale of their economic activity. The authors analyze the tendency of growth of the incubation cycle duration of new developments in industrial enterprises of high-tech industries which makes it commensurate with the life cycle of new technology or a new product. It is proved that innovation activity of the industrial enterprise, on the one hand, can, under certain conditions, bring extra income due to the growth of labor productivity and reduction of internal costs. On the other hand, extra income is brought by obtaining a new market segment through the implementation of the innovation product. The article also describes the influence of innovation activity of industrial enterprises on the structure of investments in fixed assets and the duration of the investment cycle.

1. Introduction

In modern conditions, innovation is becoming the major factor in the competitiveness among large industrial enterprises. In the face of growing global competition, major transnational corporations with significant market shares, high concentration of capital, and substantial scientific and innovative potential often become major players in the world markets. Indeed, industrial enterprises in the leading countries of the world show the high level of innovation activity. In particular, in Germany more than 70% of enterprises are actively innovating [1], in France they are more than 65%, and in the EU as a whole they constitute 60%. Unfortunately, in Russia today this indicator is not high enough and does not exceed 30-40% [2].

The main reasons for low innovation activity of enterprises and organizations in Russia include lack of investment resources for innovation, lack of motivation of the major stakeholders for production process updating, lack of the innovation infrastructure development, and the legal vulnerability of innovation-active enterprises.

Also, along with the above-mentioned reasons for the low innovation activity of Russian industrial enterprises, we should highlight underdevelopment of full-fledged competitive relations and high level of monopolization within the country, especially among large manufacturers. In this connection, a somewhat paradoxical situation arises. Namely, large enterprises are able to concentrate significant financial and material resources that can be used for innovation development, but do not have an
external competitive factor due to the monopolistic position. While small and medium enterprises exist in a competitive environment, but do not have enough resources, primarily investment ones, for innovation development.

This situation significantly inhibits the growth in innovation activity of economic entities in various scales of economic activity in the modern Russian economy [3].

However, it should be assumed that global competition can become an external factor of increasing the innovation activity of large domestic industrial enterprises. At the same time, under certain conditions related to the extension of the innovation cycle, on the one hand, and shortening of the life cycle of the new product on the market, on the other hand, this competition can restrain the growth of innovation activity, compensating for the obtaining additional income by the growth of aggregate costs of advanced innovative development.

2. Results and discussion

As it was noted before, in the global economy, large industrial corporations prove to be the most innovative ones [4]. This is due, on the one hand, to the high concentration of financial capital in them, which is used for innovation development. On the other hand, the presence of the external stimulating factor associated with competitive relations. The aggravation of global competition forces or stimulates large companies to use their super-profits for new developments. As J. Schumpeter wrote: “Frequently, if not in most cases, a going concern does not simply face the question whether or not to adopt a definite new method of production that is the best thing out and, in the form immediately available, can be expected to retain that position for some length of time. A new type of machine is in general but a link in a chain of improvements and may presently become obsolete” [5].

Indeed, today the intensity of R & D in large industrial companies is increasing significantly. At the same time, this trend persists steadily over the last time, starting from the second half of the last century. In particular, already in the late 1970s, the share of the 100 largest corporations in developed countries accounted from 55% to 90% of industry expenditures on research and development [6], and eight powerful concerns accounted for more than a third of the appropriations for these purposes. Companies with less than 500 employees in the Federal Republic of Germany accounted for 3.3%, from 500 to 2000 people - 9.3%, and for firms with the number of employees over 2000 people - 87.4% of R & D expenses. At the end of the last century, 600 US corporations accounted for 99% of R & D funding. The share of 8 of them is 1/3 [7].

It should be noted that large companies also lead to an aggravation of competitive relations. Since a small quantity of large players in global markets does not reduce the level of competition, but increases its intensity. Basically, all global world markets (automotive, aircraft, shipbuilding, instrument engineering, mining) today have an oligopolistic market structure, which implies a limited number of participants, and this circumstance leads to increase in the intensity of competition, unlike other competitive market structures. As some authors point out: “The intensity of competition can be measured by the value of 1/n, where n is the number of market participants. The more market participants, the less competition intensity is, and vice versa, the smaller the number of market participants, the higher and sharper the competition is. With oligopolistic market structure, where the number of economic units is 4, after dropping out of one participant in competitive struggle, for each of the remaining ones market share will increase by 25%” [8].

However, it should be mentioned here that the intensity of competition in oligopolies can be much greater if we consider that not one participant, but just three participants can drop out of the market as a result of competition because most oligopolists lose their positions in the market in favor of one leader. In conditions of perfect market competition, only a few players are eliminated as a result of competitive rivalry, and their market share is insignificant to take it into account for the assessment of the level of competition intensity.

In addition, it should be assumed that the intensity, in this case, is not only the expression of the quantitative ratio of market volume and price sufficient for the analysis of static equilibrium, but also the expression of the qualitatively innovative competitive mutual adaptation of large industrial
enterprises in the perspective of dynamic development. The intensity of competition of the limited number of large producers is determined by the interdependence, a high degree of uncertainty, which is associated with technological scale changes and is essentially dynamic. And since leadership in oligopoly is associated with the tendency towards constant innovation in technology and organization, the intensity of competition ultimately reflects the intensity of immanent, advanced innovative development, as a condition for competitive mutual adaptation in oligopoly.

In accordance with this, a large industrial corporation, introducing innovations, receives a double benefit. On the one hand, due to the introduction of new technologies (technological innovations), production costs and, accordingly, the prime cost of the product is reduced [9]. On the other hand, due to the introduction of a new product, competitors are being forced out of the market. In conditions of oligopolistic competition, the effect of these external and internal factors of enterprise development are interdependent, when savings on domestic reserves and production scale make it possible to receive savings due to strategic advantages, by obtaining additional market share (figure 1).

![Figure 1. Interconnection between savings on internal reserves and the strategy of industrial enterprises](image)

However, it should be noted that these opportunities for obtaining benefits from external competitive advantages are limited by the trends related to the scientific and technical progress, increasing of complexity of industrial products and the growth of investment costs in the framework of innovative activities of the corporation. In particular, in accordance with the leading nature of the innovative development of industrial corporations, the intensity of competition between them in oligopolistic conditions is determined, on the one hand, by reduction in the life cycle of technology (product), on the other hand, by increase in the incubation cycle for developing a new technology.

**Table 1. Duration of the phases of incubation development of some basic technologies of the new technological order [10]**

| Production           | Phase duration (years) |
|----------------------|------------------------|
| Mainframes           | 15-20                  |
| NC machinery         | 10-15                  |
| Industrial robotics  | 10-15                  |
| Microprocessors      | 5-10                   |
| Personal Computers   | 2-3                    |
As shown in Table 1, the incubation cycle for developing a new technology or a new product in the leading industries is, on average, 10-15 years. Simultaneously, these products have a relatively short life cycle, which, under accelerated conditions of scientific and technical progress, has a tendency to further shortening, and today also averages no more than 15 years. Accordingly, the trend of technological development in modern conditions is that the incubation cycle for developing a new technology becomes commensurate in duration with its life cycle in the market (figure 2).

Figure 2. The trend of changes in the duration of development cycles and the use of new technology in global competition: a - incubation cycle for developing a new technology; b - the life cycle of this technology

Also, along with the equality in time periods, there is a tendency to equalize the amount of development costs and the amount of monopoly superprofits, provided by new technology during its life cycle (figure 3).

Figure 3. The cycle of innovation development of the industrial enterprise in the context of global competition (oligopoly): $t_0$ - individual cycle of monopolistic competition; $t_1$ - new technology development cycle; $t_2$ - monopolistic cycle of this technology; $W_1$ - the cost of developing a new technology; $W_2$ - the value of monopoly accumulation (monopoly superprofits)

In this case, within the framework of the single technological structure, the profits made by large industrial companies in conditions of oligopolistic competition should be invested in innovative developments, reducing the overall efficiency of the company in the short term. The exceptions can be situations of changing the technological structure, or the so-called “technological discontinuities” [11], which arise in some industries.
It should also be noted that the reduction of the life cycle of a new technology as a result of aggravation of global competition naturally leads to the fact that the obsolescence of equipment in industrial enterprises is far ahead of physical wear and tear of equipment [12]. Consequently, a large industrial corporation, in order not to be an outsider in the conditions of oligopolistic competition, is forced to switch to a new technology before the expiration of the normal depreciation period of old equipment. In this regard, it will inevitably have to incur double costs: the cost of developing and implementing a new technology, including neutralizing the risks of its market adaptation, and the cost of old equipment, which expenses are not refunded in full (in the form of depreciation) in a given period of time. In this situation, the source of undistributed superprofit, obtained as a result of monopoly limitation in the previous period, becomes a necessary investment link for the further development of this corporation.

Such a sum of expenses can be realized only based on substantial savings that a normal profit cannot provide since it was not originally designed for accelerated large-scale renovation of industrial production. The possibility of an accelerated transition to a new technology, a new production environment, for a large corporation is made up of the real value of monopoly accumulation over the previous period. In the case of technological shift, monopoly accumulation is necessary due to the incompatibility of the proportions of natural, normal accumulation and compensation. If a large industrial company in the conditions of oligopoly does not switch to a new technology before the period of reimbursement of the cost of the old technology, which is dictated by the conditions of technical development, it will be done by other participants. As a result, this company will not only lose additional profit but will also suffer losses due to compulsory reduction in the share of the sales market. Because the principle of dependence in oligopolistic competition is associated with the principle of substitution.

3. Conclusion

Thus, the level of innovation activity is a crucial factor in the growth of competitiveness, as for a separate industrial enterprise, so for the national economy as a whole. Russian economy still lags behind in terms of innovation activity from the leading countries of the world. The main reasons for the lack of innovation activity of Russian industrial enterprises today are: lack of investment resources, the suboptimal structure of industrial production with the high share of the materials sector, disinterest of new owners in increasing of innovation activity of enterprises, underdevelopment of innovation infrastructure, etc. [13, 14].

Along with these reasons, it is important, on the one hand, to improve competitive relations within the country, which act as an external stimulating factor for innovation activity. On the other hand, facilitating the inclusion of large Russian industrial enterprises in the system of global competition, primarily in the markets of high-tech products [15]. To a large extent, limiting the growth of innovation activity is associated with the change in the incubation cycle for developing a new technology, on the one hand, and the life cycle of this technology or product innovation, on the other. This causes equalization of additional costs for R & D and monopoly superprofits during the period of market realization of new product or technology.

Increase in the intensity of global competition as an external factor for stimulating innovation activity is associated with the oligopolistic structure of the global industrial markets. Under these conditions, as noted, the conjunct market conditions are the basis of “competitive mutual adjustment” of a small number of its participants. A favorable conjuncture is created by the largest industrial company, as a result of its successful innovation development, and the conjuncture conditions for oligopolists present at the same time competitive conditions for development. In this regard, in the conditions of modern oligopoly, the possibility of obtaining additional income by reducing internal costs, as a result of innovation development, is organically linked to the possibility of getting additional income, by obtaining strategic advantages, and increasing market share under oligopoly conditions.
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