

Opportunities for innovation activity of enterprises from the dairy sector in the food industry

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Abstract. Dairy processing enterprises in Bulgaria are faced with the need to implement modern equipment and technological updates in order to guarantee the quality and control of the manufactured products. The investment policy should be aimed at expanding the assortment range, competitiveness and entry into new markets. The paper analyzes the results of a research of innovation activity in dairy enterprises. The new economic situation requires companies to generate and absorb increasingly competitive innovations, to maintain and develop high innovation activity. This is becoming an increasingly important condition for their effective functioning and survival. All enterprises have a positive attitude towards innovative behavior, which is a necessary but not sufficient condition for carrying out innovative activity and achieving the relevant results. In any organization, it is necessary to provide conditions for the introduction of innovations, therefore it must have such a structure and processes that assume and implement appropriate innovative behavior. Management principles are the basis for making decisions to stimulate or inhibit innovation activity in enterprises. In this regard, export intensity, R&D expenditures and patent activity are leading in innovation processes.

1 Introduction

Over the last 10 years in Bulgaria, the number of milk processing enterprises has remained the same, or about 250 enterprises. Bulgaria provides 0.6% of raw milk to the EU. To solve the crisis in the milk processing sector in Bulgaria, which was also a European problem, outside help was sought. Subsidizing the sector is along the lines of European payments and national transitional aid. The measures led to a revival in the dairy sector, but the challenges to the quality of the manufactured products are strongly linked to the quality of the raw material and the dynamics of the innovation processes in the industry.

In a narrow sense, the innovation potential of a company is manifested in its ability to carry out fast, efficient and constant renewal in the field of its activity (products, markets, technologies). When evaluating the innovation potential, a formal approach can be taken by measuring the company's achievements in innovation activity: volume of sales and profit from new products, occupied market share, R&D expenditure, number of patents, etc. It should be emphasized, however, that the innovation potential of the company is mainly the result of human effort, abilities, skills and experience, which are evaluated very complexly [1].

The innovation strategy derives from and supports the overall company strategy. Strategies in the other functional areas support and reinforce the advantages due to the technology. In industries with slow technological change and a low technological level, the technological dimension of strategy supports and strengthens the

competitive advantages provided in other technological areas [2].

It has been empirically proven that small firms are much less dependent on internal research and development than large firms and much more dependent on external knowledge acquired through alliances, partnerships and other formations in which they participate [3].

Innovation in (SMEs) is largely determined by the personal characteristics as well as the management approach of the owner/owners of the companies. The SME owner/owners must be sensitive to the continuous changes in the business environment, be oriented towards the introduction of new technologies, work methods and the application of modern management practices [4].

The lack of sufficiently complete observations and data on the innovativeness of firms is an obstacle to identifying the impact of the factors that determine them and, accordingly, to the formation of a sufficiently good policy at the enterprise level [5].

Small firms tend to explore more original technologies and emphasize product innovation. Product innovation, seen as more commonly applicable by SMEs, is associated with providing appropriate responses to customer or marketing needs, to which SMEs are strongly oriented. In the case of small companies, it is noted that the implementation of innovations is not systematic. Sometimes they carry out continuous innovation projects, sometimes they work on several projects at the same time, other times - none at all.

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Small and medium-sized enterprises are by nature much more flexible than large ones allowing them to "open innovation". In the case of large enterprises, the opportunity is to introduce so-called internal entrepreneurship, while in the case of SMEs, it is the potential for organizational learning, reformulation of strategies and procedures. Small firms tend to explore more original technologies and emphasize product innovation, while large ones, especially in their mature phase, regardless of the industry in which they operate, develop processional innovations and make incremental changes to existing technologies [6]. Process innovation is not usually seen as a priority for SMEs, but is associated with large companies [7].

There are barriers of different nature to innovation. The first group of barriers to innovation is related to their financing. The characteristics of this type of barriers include the need for serious investments in the field of innovation, the presence of high associated risk in innovation projects, difficulties in determining the rate of return on the investments made and the size of the expected cash flows [8].

The second group is related to the company's innovation policy. It is determined by the lack of clear priorities for the development of innovation activity, the insufficiently developed system for stimulating and recognizing the work of innovators, etc. The third group is expressed in the lack of conditions for the development of an effective company innovation practice. Parameters of this group of barriers are insufficiently good conditions for training, development and work of people involved in innovation, an underdeveloped network of contacts at the company, branch, national economy and exchange levels, insufficient and untimely support of innovation activity by strategic managers and the owners of the company, etc. [8].

2 Materials and methods

For the purposes of the research, 4 companies from the dairy sector were surveyed in the period August-October this year in in South Central Region, Bulgaria. One of them is a farm, according to REGULATION No. 26 on the specific requirements for direct supplies of small quantities of raw materials and food of animal origin. The rest are two medium enterprises and one large enterprise. All four enterprises wished to keep the name confidential and the results will be applied to the enterprise size criterion when analyzing their activities. In the course of the research, the following hypotheses are tested:

- The level of innovation activity is higher in export-oriented food industry enterprises;
- The level of innovation activity is higher at enterprises with a more developed own scientific research base and greater investments in R&D, etc.

2.1 A survey method

A survey method for researching company innovations (survey questionnaire) - this method provides an opportunity to obtain information from specialists and

managers in the company about the advantages and disadvantages of competing products on the market, reveals the decisive factors for choosing one product over another and orients the company to the characteristics that the new product must possess.

2.2 A "profile diagram"

A "profile diagram" - a method of describing the characteristics (indicators) determining the innovation potential of the company and its main competitor or benchmark. Constructing a "profile diagram" of the characteristics of an organization's innovation potential can be used as a way to improve a firm's innovation capability. Among the main characteristics determining the innovation potential are relative share of the sales, volume of new products, number of new products, process innovations, number of innovative projects, number of patents, annual budget for research and development activity.

The purpose of creating an innovation profile of the researched companies is to identify the main factors that determine the innovativeness of companies as a driver of their economic development.

2.3 χ^2 –method for testing research hypotheses

A test of the static hypothesis must end with the adoption of a static decision about which hypothesis is true: the null hypothesis for the absence of a relationship or the alternative hypothesis for the presence of a relationship. Accordingly, the final conclusion of the study also depends on this: the initial scientific hypothesis is confirmed or not. It is obvious that the basis for accepting the decision is the p level, i.e. the probability that the null hypothesis is still true. But in accepting a given decision, the probability of accepting a wrong decision is always allowed, since the research was conducted on the basis of a sample, and the conclusion is made in relation to the general population [6].

3 Results

Traditional approaches determine the innovative activity [9]. of companies based on a set of indicators that, according to a certain logic, can be connected to the intensity of the innovation process. Such indicators may be, for example: annual research and development budget as an absolute amount and as a percentage of sales volume; number of patents registered or acquired by the company; number of innovation projects implemented by the company for a certain period; number of ideas for innovations that are proposed by staff; number of products that have been put into production in the last year or in the last three years; relative share of the sales volume of products that have been put into production in the last year or in the last three years.

100% of the surveyed organizations are privately owned. The interviewed persons hold managerial positions – top-level manager, contractor manager, middle-level managers.

Figure 1 presents an overview of Research and Development expenditure (R&D expenditure), measured as a percentage of turnover.

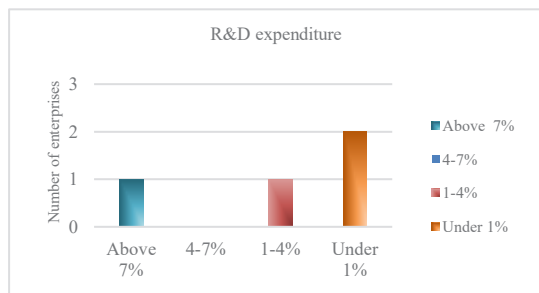


Figure 1. R&D expenditure as a share of turnover of the enterprises

Two of the surveyed enterprises spend the least amount, less than 1% of the enterprise's turnover, on research and development, one of the medium-sized organizations spends more than 7%, and the large one spends between 1 and 4%.

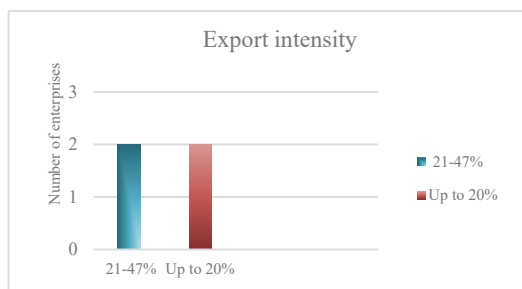


Figure 2. Export intensity

The highest share of export intensity of the researched enterprises is in the range of 21-49%, followed by that of up to 20%. The highest share of export intensity is achieved by medium-sized enterprises, followed by large and small enterprises (Figure 2).

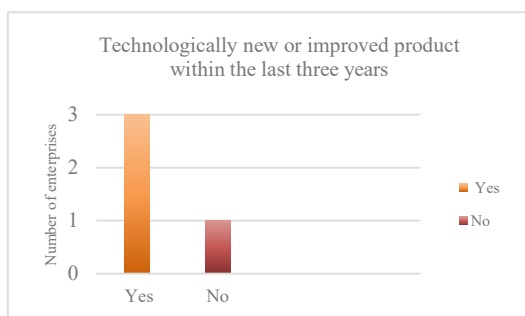


Figure 3. Technologically new or improved product within the last three years

Three of the researched enterprises have introduced technologically new or improved products in the last three years. For the small organization, this practice is not foreign, but the term of the innovations made back in time is longer. The preliminary selection of an innovation policy in the investigated enterprises was previously studied in order to analyze more precisely the hypothetical regularities (Figure 3).

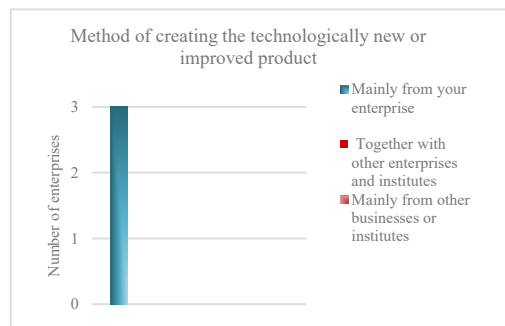


Figure 4. Method of creating the technologically new or improved product

The study of the way of creating the technologically new or improved product shows 100 percent of the enterprises that develop and produce new products create them entirely by their own enterprise, without the participation of other institutions and business organizations. The result contradicts the theoretical statements about the concept of open innovation in small and medium-sized enterprises.

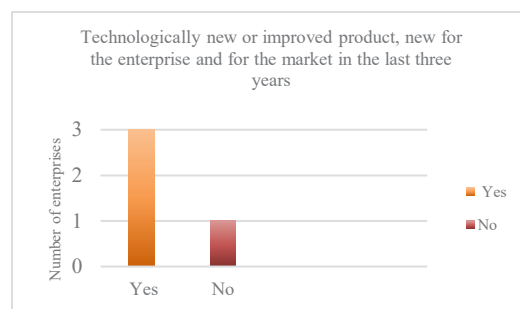


Figure 5. Technologically new or improved product, new for the enterprise and for the market in the last three years

Three of the researched enterprises have introduced technologically new or improved products, new for the enterprise and for the market in the last three years. For the small organization, this practice is foreign (Figure 5).

Three of the researched enterprises have introduced technologically new process in the last three years. The analysis of the way of creating the technological new process shows that all enterprises use internal sources and do not cooperate with other enterprises or institutes. The highest share of internal sources of creation of a new technological process is associated with the costs of organizations for the purchase of new technological equipment (Figures 6 and 7).

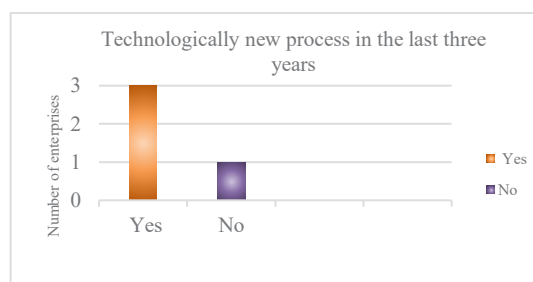


Figure 6. Technologically new process in the last three years

Three of the researched enterprises have introduced technologically new process in the last three years. The analysis of the way of creating the technological new process shows that all enterprises use internal sources and do not cooperate with other enterprises or institutes. The highest share of internal sources of creation of a new technological process is associated with the costs of organizations for the purchase of new technological equipment (Figures 6 and 7).

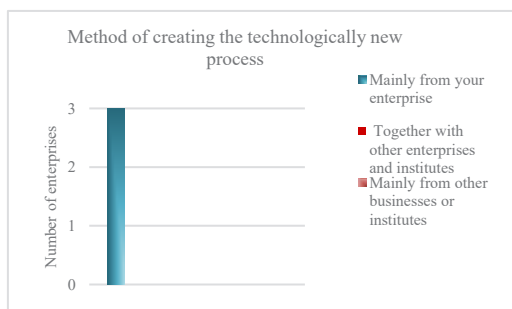


Figure 7. Method of creating the technologically new process

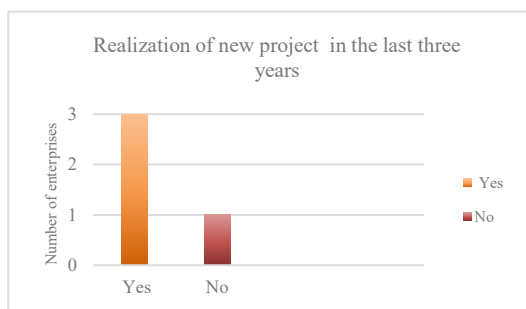


Figure 8. Realization of new project in the last three years

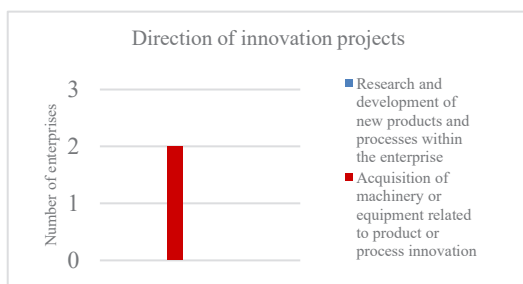


Figure 9. Direction of innovation projects

The analysis of the researched indicator in the enterprises shows that all the respondents with a positive answer point to areas of innovation projects that are solely related to the acquisition of machines or equipment for product or process innovation as well as market introduction of new or improved products. Majoring in industrial design and other preparation for technologically new or improved products for market introduction are not among the answers. Only one of the surveyed medium-sized enterprises applied for 3 patents in the last 3 years (Figures 8, 9 and 10).

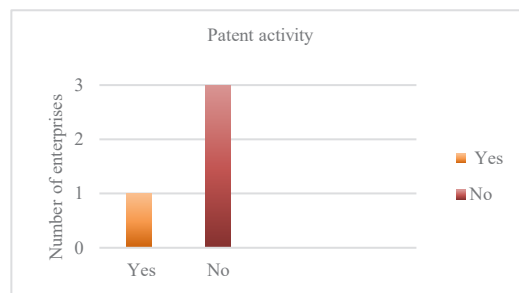


Figure 10. Patent activity

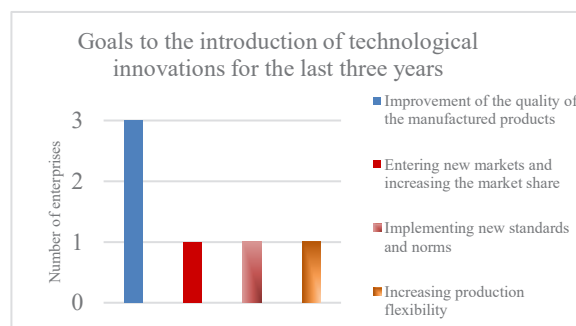


Figure 11. Goals to the introduction of technological innovations for the last three years

The analysis of the goals for the introduction of technological innovations for the last three years shows that all the respondents pursue the improvement of the quality of the manufactured products, and only one of the medium-sized enterprises is aimed at entering new markets and increasing the market share, implementing new standards and norms, increasing production flexibility, reducing labor costs per unit of final output (Figure 11).

The analysis of the researched enterprises related to the sources of innovative ideas shows that the main generator of ideas in three enterprises is their own research and development. One of the medium-sized enterprises uses as a source management bodies and units, personnel with narrow specialization, as well as local fairs, exhibitions, meetings, marketing research. Borrowing ideas from foreign competitors and government institutions and local public innovation, local fairs, exhibitions, meetings, marketing research. Borrowing ideas from foreign competitors and government institutions and local public innovation programs are not among the practices of organizations as such generators of ideas (Figure 12).

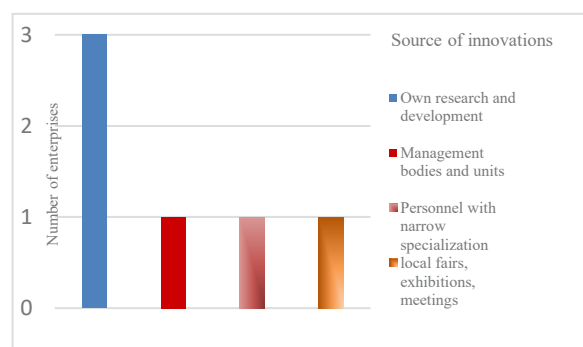
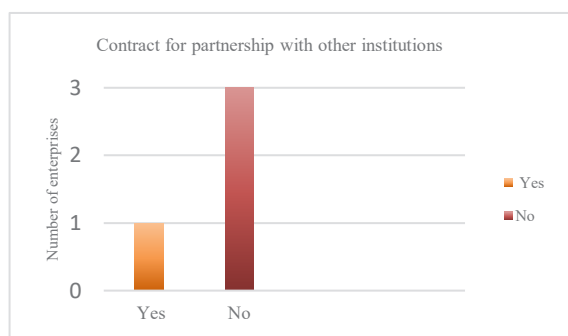


Figure 12. Source of innovation

Joint interaction with universities and scientific institutes is not in the field of conflict of interest and is a widely applied practice among scientific organizations in terms of carrying out compatible research and development activity, as well as solving a problem that has arisen. One of the researched organizations has a contract with a university. Interaction with competing companies is based on bilateral agreements, and on this basis, a conflict of interest in terms of markets and technological innovation is also assumed, which explains the absence of organizations, that indicate this partnership (Figure



13).

Figure 13. Contract for partnership with other institution

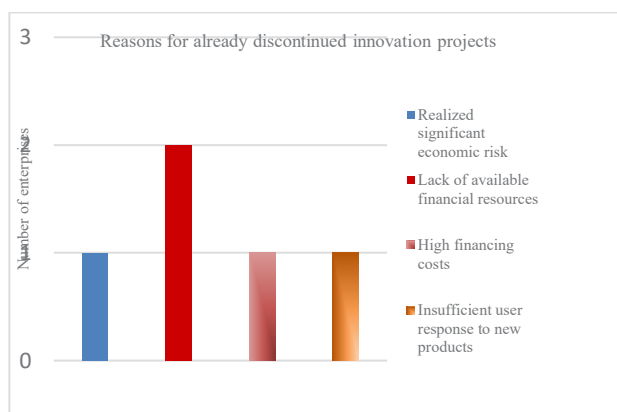


Figure 14. Reasons for already discontinued innovation project

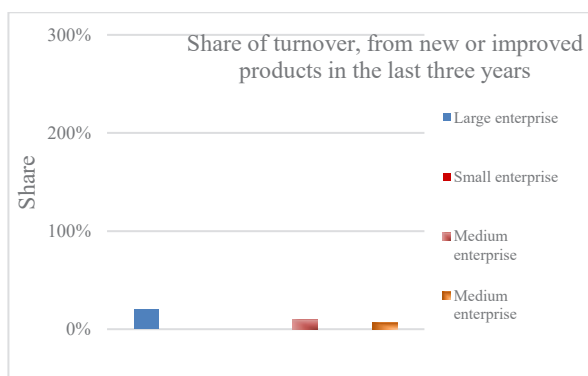


Figure 15. Share of turnover, from new or improved products in the last three years

The largest share of the researched organizations indicate as the main reasons for the interruption of innovation projects the lack of available financial resources, followed by the lack of qualified technical

personnel, the high costs of financing and the realized economic risk (Figure 14).

The largest share of the turnover of new or improved products in the last three years was realized by the large enterprise with a share of 20%, followed by the two medium-sized enterprises, respectively 10% and 7% (Figure 15).

Application of χ^2 -method for testing research hypotheses

The χ^2 -method was applied to test the research hypotheses. The levels of statistical significance were examined for the following groups of indicators:

- Export intensity – technologically new or improved products for the last three years.

Testing of null hypothesis H_0 – the introduction of new or improved products is not high in export-oriented enterprises. The alternative hypothesis H_1 is related to the thesis that the introduction of new or improved products is greater in export-oriented enterprises. The p-value is 0.013764, i.e. $p < 0.05$, which means that the null hypothesis is rejected. The rejection of the null hypothesis H_0 means that the alternative hypothesis H_1 is confirmed. Cramer's coefficient $V = 0.597614$ testifies to a strong relationship between the production of new and improved products by enterprises.

- Export intensity - technologically new or improved products, both for the enterprise and for the market for the last three years;

Testing of null hypothesis H_0 – technologically new or improved products, both for the enterprise and for the market for the last three years is not high in export-oriented enterprises. The alternative hypothesis H_1 is related to the thesis that the introduction of new products both by the enterprise and for its market is greater in export-oriented enterprises. The p-value is 0.012784, i.e. $p < 0.05$, which means that the null hypothesis is rejected. The rejection of the null hypothesis H_0 means that the alternative hypothesis H_1 is confirmed. Cramer's coefficient $V = 0.471614$ testifies to a strong relationship between the production of new and improved products by enterprises.

Therefore, higher innovation activity in this direction is observed in those enterprises whose activity is more export-oriented.

- R&D – patent activity.

Testing the null hypothesis H_0 – R&D expenditure is not related to patent activity. The alternative hypothesis H_1 relates to the proposition that R&D expenditures are directly related to patent activity. The p-value is 0.012784, i.e. $p < 0.05$, which means the null hypothesis is rejected. Rejection of the null hypothesis H_0 means that the alternative hypothesis H_1 is confirmed. Cramer's coefficient $V = 0.002955$ indicates a weak relationship between R&D expenditure and patent activity.

- R&D – share of sales of new or improved products for the last three years.

Testing the null hypothesis H_0 – R&D spending is not related to sales share of new and improved products for the past three years. The alternative hypothesis H_1 relates to the statement that R&D expenditure is directly related

to the share of sales of new and improved products for the past three years. The p-value is 0.036791, i.e. $p < 0.05$, which means the null hypothesis is rejected. Rejection of the null hypothesis H_0 means that the alternative hypothesis H_1 is confirmed. Cramer's coefficient $V = 0.0036155$ indicates a weak relationship between R&D expenditure and the share of new and improved product sales over the past three years. .

4 Discussion

The research confirms that in small enterprises the implementation of innovations is not systematic. Sometimes they carry out continuous innovation projects, sometimes they work on several projects at the same time, other times - none at all.

One of the medium-sized enterprises collaborates with an external organization, and the second medium-sized enterprise uses entirely internal sources to create process or technological innovations. The results of the research do not confirm the tendency to implement the concept of "open" innovation by small and medium-sized enterprises.

The following are defined as the main factors that characterize the specifics of the companies' activities:

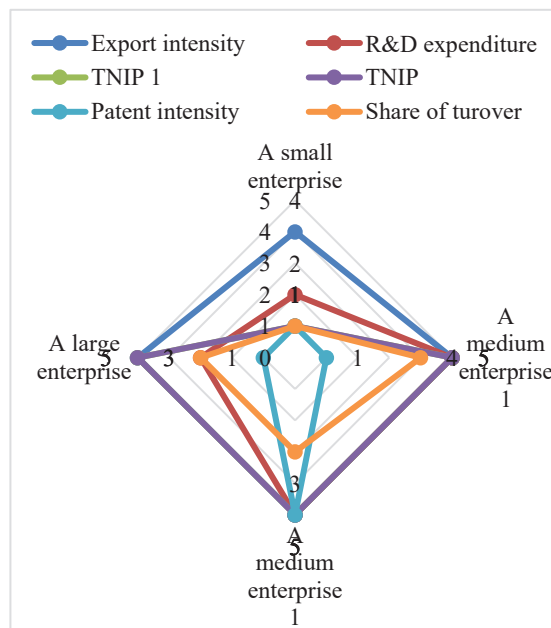
R&D expenditure, export intensity, number of technologically new or improved products produced, both for the enterprise and the market, technologically new processes in the last three years, patent intensity. The construction of a profile diagram is based on the indicators of innovation activity involved in the organization's innovation profile. The scores from the innovation profile are equated to the following scores in the profile diagram model: -2 to 1; -1 to 2; 0 at 3; +1 on 4; +2 on 5 (Table 1).

The analysis of the studied indicators shows a high activity of medium-sized enterprises, where the overall image of the nature of the innovation activity is formed and supplemented by a set of additional characteristics of the innovation process (Figure16).

Table 1. Data diagram of the innovation activity profile of the surveyed enterprises

Indicators	A small enterprise	A medium enterprise 1	A medium enterprise 2	A large enterprise
Export intensity	4	5	5	5
R&D expenditure	2	5	5	3
Number of technologically new or improved products produced, new for the enterprise and the market	1	5	5	5
New or improved products in the last three years	1	5	5	5
Patent intensity	1	1	5	1
Share of turnover, from new or improved products in the last three years	1	4	3	5

Figure16. „Profile Diagram“ of innovation activity of the surveyed enterprises



5 Conclusion

To ensure their successful development, organizations are constantly subject to new and potentially radical technological changes. A major challenge for managers is the need for an adequate interpretation of the relationships between the extraction of competitive advantages and the creation of innovations, between technological innovations and organizational flexibility, between momentum and the need for organizational changes. Organizational change, expressed in the formation of new strategies and technological innovations, represents a kind of denial of the existing status quo. Once created, a new technology can be used by someone else. This affects company-specific benefits, which can lead to a complete reversal of roles and positions – from an industry leader, an organization can find itself a catch-up.

I would like to thank my colleagues from UFT-Plovdiv, whose professional profile is related to the dairy sector, as well as the managers of the researched enterprises, who were so kind to respond to the topic of innovation activity.

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