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**MODERN ASPECTS OF INNOVATION CULTURE IN
THE FIELD OF THE FOOD INDUSTRY AS A PART OF
THE AGRI-FOOD CHAIN***

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Abstract: *Innovation is the driving force behind the development of enterprises and is vital to their survival. Starting a new business is often accompanied by the discovery of new market niches, the offering of innovative products, or the launch of new approaches to satisfy consumer preferences. Within a constantly changing environment, enterprises need to build an innovation culture that ensures the preservation of the focus on innovation. This report reviews the current concepts of innovation culture and the factors that determine it. Special attention is paid to the specifics of food industry enterprises. The food industry is representative of the low-tech sectors in terms of research and development costs. However, as a result of global crises (climate change, military conflicts, and interrupted supply chains), the importance of the sector and its potential to offer quality and healthy food is growing. The study analyses the interrelationship between innovation culture and the level of innovation activity in the field of food production as part of the agri-food chain. On this basis, a model of an innovation culture in the field of food production is proposed. The report represents case studies of the practice of enterprises in the sector. The aim is to test the relevance of the model and to identify the main factors that help enterprises develop innovation-oriented behavior, as well as the barriers that prevent it. In the end, guidelines for further improvements of the model and ideas for further areas of research are proposed.*

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SAVREMENI ASPEKTI KULTURE INOVACIJA U OBLASTI PREHRAMBENE INDUSTRIJE KAO DELA POLJOPRIVREDNO-PREHRAMBENOG LANCA

Sažetak: *Inovacija je pokretačka snaga razvoja preduzeća i vitalni činilac njihovog opstanka. Pokretanje novog posla je često praćeno otkrivanjem novih tržišnih niša, ponudom novih inovativnih proizvoda ili lansiranjem novih pristupa u procesu zadovoljenja potrošačkih preferencija. U okruženju koje se stalno menja, preduzeća moraju izgraditi kulturu usmerenosti ka inovacijama. Ovaj rad pruža pregled aktuelnih konceptualnih rešenja kulture inovacija, kao i faktora koji je određuju. Posebna pažnja je usmerena na specifičnosti preduzeća u okviru prehrambene industrije. Prehrambena industrija je predstavnik sektora u kom je, još uvek, u primeni jednostavna tehnologija, posebno u smislu troškova istraživanja i razvoja. Međutim, kao rezultat globalne krize (klimatske promene, vojni sukobi i narušeni lanci snabdevanja) raste značaj ovog sektora, kao i njegov potencijal da ponudi kvalitetnu i zdravu hranu. U ovom radu se analizira međusobna povezanost između kulture inovacija i nivoa inovacionih aktivnosti u oblasti prehrambene industrije, kao segmenta poljoprivredno-prehrambenog lanca. Na osnovu toga, u radu se predlaže model kulture inovacija u oblasti prehrambene proizvodnje. U radu su takođe predstavljene studije slučaja koje se odnose na poslovne prakse preduzeća u okviru pomenutog sektora. Cilj istraživanja se odnosi na testiranje relevantnosti modela i identifikovanje ključnih faktora koji pomažu preduzećima da razviju ponašanje orijentisano ka inovacijama, a takođe i ključnih barijera takvom ponašanju. Na posletku, predložene su smernice za dalja unapređenja modela i izneti pravci budućih istraživanja.*

Ključne reči: *kultura inovacija, prehrambena industrija, lanci snabdevanja*

1. INTRODUCTION

Innovations are a driver for development and play a major role in the survival and profitability of companies. Many researches reveal this relationship both on a company's level and at a country or regional level (Kim & Mauborgne (2005); Robinson & Schroeder (2014); Global Innovation Index (2022)). Due to its importance, the question arises of how an organization can continuously guarantee a high level of innovation activities. Many factors are revealed both internally and externally for the company. According to Ahmed and Rehman

(2020) leaders are the main pillars for stimulating innovative behavior. Innovative efficiency depends on the leadership style as there isn't one leadership style suitable for every company. Other authors emphasize regional culture, which creates an innovative spirit (Pfothenauer, Wentland & Ruge (2022)).

The present paper focuses on the role of the organizational and innovation culture in the food-processing industry in Bulgaria for the level of innovativeness of the companies.

First, we will focus on the construct of culture. According to Hofstede, Hofstede and Minkov (2010) culture is defined by 4 layers – symbols, characters, rituals, and values. The symbols, characters, and rituals are tied to external practices, whose hidden cultural sense is interpreted by the members of the respective group only. The deepest and most stable layer consists of the values, and they remain constant, regardless of the variability of the used practices. With the development of science and technologies, new innovation practices appear: crowdsourcing, open innovation, design thinking, stage-gate systems, scientific discovery, big data analytics, measuring innovation, and innovation management software. They change the practices e.g., processes, methodology, management, and type of innovation, but the driving force, the values, remain much more stable.

Dobni (2008) investigates the innovation culture in organizations. According to him, innovation is contextual and the level of innovativeness depends on the culture of the organization (Dobni, 2008). He defines the culture in organizations “as the deeply seated (and often subconscious) values and beliefs shared by employees at all levels, and it is manifested in the characteristics (call them traits) of the organization.” The organizational culture defines the characteristics of the employees, and “it is communicated and reinforced through symbolism, feelings, relationships, language, behaviors, physical settings, artifacts, and the like (Schein, 1984).” Dobni (2008) emphasizes that “To change the organization’s focus, say to one of innovation, often requires a change in the organization’s general cultural orientation.”

Hofstede, Hofstede and Minkov (2010) also defines the different levels of culture: national, regional, ethnic, religious, linguistic, gender, generational, and level of social distinction, related to opportunities for obtaining education and professional employment. For those working under an employment contract: level of the organization, department, and/or corporation.

At the organizational level, we can research the manifestations of innovation culture in different sectors of the economy, as well as at the level of enterprise size. Many studies indicate that depending on the size of the enterprises and the

related available resources, the focus of innovation is different (Vladimirov, 2011).

Another aspect of innovation culture is related to its relationship with regional culture. Factors such as national values, local traditions, and legislation influence the innovation culture and determine the motivations for innovation, the areas in which innovation efforts are focused, state and municipal incentives, and are a deterrent to the development of certain types of innovation. For example, in the field of agriculture, the production of GMO products is acceptable and even encouraged in the USA, while in the EU, the use of this technology meets strong resistance.

Hofstede classified national cultures according to 2 factors: power distance and uncertainty avoidance. On this basis, 4 types of organizations influenced by national culture are distinguished: machine, pyramid, family, and market. This explains why, in many cases, the direct copying of innovation policies and methodologies without taking into account the regional specifics and culture leads to negative results. (Delvenne & Thoreau (2017); Pfothenhauer, Wentland & Ruge (2022); Pedraza-Rodriguez & Ruiz-Velez (2023)).

2. LITERATURE REVIEW

Dobni (2008) substantiates the idea that innovation culture can be considered in a multidimensional context that includes 4 dimensions:

1. The intention to be innovative, measured by Innovation propensity, and Organizational consistency.
2. The infrastructure to support innovation, measured by Organizational learning, and Creativity and empowerment.
3. The operational level behaviors necessary to influence a market and value orientation, measured by Market orientation and Value orientation.
4. The environment to implement innovation.

Dobni (2008) describes a culture supporting innovation as engaging “behaviors that would value creativity, risk-taking, freedom, teamwork, be value seeking and solutions-oriented, communicative, instill trust and respect, and be quick on the uptake in making decisions”.

Halim, Ahmad & Ramayah (2019), based on Dobni's model, conducted a study among SMEs in Malaysia, characterized as a developing country. According to them, to "cultivate and sustain an innovation culture an SME must adopt a participative management culture where communication and networking are

optimized and flexible structure, employee ownership, risk-taking, orientation, training, and knowledge are welcomed.”

In their model, they examine the influence of organizational culture, organizational learning, and market orientation on the innovation culture. The research reveals that the organizational culture influences the innovation culture along its four dimensions: adaptability, involvement, consistency, and mission.

Organizational learning has a positive influence on innovation culture in its two dimensions: information acquiring, and behavioral and cognitive learning i.e., the ability to transform the acquired information into actions. The research doesn't support the hypothesis that the third dimension of the organizational learning construct, information interpretation, has a positive impact on the innovation culture. The market orientation consists of two dimensions: orientation to competitors and orientation to customers. The study reveals that orientation to competitors has a positive impact on innovation culture, whereas the role of orientation to customers can't be confirmed.

Garza and Lopez (2020) analyzed 41 studies on the topic of measuring the Innovation Culture construct. They unify the innovation culture construct into 28 characteristics. Then they grouped the characteristics in two ways. First counting the level of importance and level of presence the 28 characteristics are grouped into 4 quadrants: core, niche, generic, and minor dimensions. Second, using cluster analysis, they group the characteristics into seven clusters which “represent the major research clusters on how previous research has studied the measurement of the innovation culture construct”: employee characteristics, external orientation and strategy, communication, collaboration, change, technology, adoption.

3. PROPOSAL FOR A MODEL FOR MEASURING INNOVATION CULTURE

The measurement of the innovation culture construct is multidimensional. As general frameworks for measuring the level of innovation culture, we can indicate:

- The extent to which the organization values innovation. In these areas, the level of innovation culture is determined by autonomy, risk-taking, stimulating and easy-to-implement processes for generating ideas, the presence of a system for evaluating and selecting innovation projects, and the ability to manage multiple interconnected innovation projects.

- Type of innovations the organization is focused on. Organizations develop skills in different types of innovation. These abilities depend on the market, the industry, the size of the company, and the resources it has, as well as on its development strategy and its mission in the market. The ability to develop various types of innovation in a balanced way, including innovation in the business model, shows a stronger innovation culture.
- The degree of openness of the innovation processes. The variety is from closed innovation, where the innovations are done in one department or the organization only, to total openness, in comply with the Open innovation model (Chesbrough, Vanhaverbeke & West, 2008), where the organization uses all accessible resources of the internal and external environment both for developing innovation and implementing it in the market. The factors in this area of investigation are the number of departments engaged in idea generation and innovation projects, the number and kind of external partners along the whole innovation process, openness of the communication, NIF syndrome, and degree of trust in the organization and in the environment it operates.
- Focus on eco innovations. We put ecological innovation in a separate area of measurement because of its increasing importance. Climate change and the growing need for energy use optimization and protection of the environment force companies to put such innovation on the list of main priorities (Garcia-Granero, Piedra-Munoz & Galdeano-Gomez, 2020) Especially for the agriculture and food processing industry, the changing attitude towards the treatment of animals has an additional impact, which leads to the search for solutions for more humane treatment of animals and looking for alternatives to animal products.
- Flexibility and adaptability of the organization. The above-mentioned areas for measurement of the innovation culture should also be considered in its dynamics. The higher the company's culture values innovation, the more sensitive is to changes in the environment. We consider reactions to the changes in the environment from two sides. First, in the existing environment: customer behavior changes, competitors' innovations, and changes in local legislation. Second, reactions to changes in the technologies, allow the organization to be an innovation leader: to create new markets, new solutions to existing markets, and new business models.

Absolute and relative measurements of the level of innovation culture are distinguished. The difference is whether we consider or not the local specifics. If

we measure the absolute level, we can compare the level of innovation culture with every other company in the world.

The relative measurement is contextual and takes in mind influencing factors such as local or state culture, local legislation, state incentives and limitations, the openness of the economy, the size of the company, the business area, environmental resources, etc. The type of measurement, we use, depends on the goals of the research.

In conclusion, we developed our proposal for an innovation culture construct. The model consists of two levels of investigation of the innovation culture: general and contextual.

The general one describes the attitude toward innovations. It answers the questions of how and what decisions about innovation the company takes. On this level, we define the innovation culture as a cascade, where the upper level defines the lower one. If a change is done in the upper level the lower one will also be changed. On top of the model are the values and beliefs defined by: how the organization perceives its place and role in the environment, its mission and values, the focus and the attitude towards innovation, the relationships inside and outside the organization – trust and attitude towards partners, competitors, and third parties, attitude towards change, and autonomy.

The second level is Leadership, defined by: What leaders are promoted, what spirit they create, how they value and develop people, and whether they share the mission and values of the company. The next level is Goals, defined by: How big are the goals, how achievable are the goals, does the goals are toward development or to maintain the system, what is the future role of the company and time to achieve the goals.

The fourth level is Strategy, defined by: Which innovation projects are chosen, internal and external partnerships, the path to achieving the goals, and Organizational structure. The next level is the Resources: what internal (people, money, and capital) and external resources (partnerships) the company has, and how resources needed are acquired. And the last one is the Technology used.

The Contextual or Environmental level describes the contexts within which the innovation activities are performed. The main focus is how much the organization uses the innovation opportunities within the constraints of local specifics and limits. We answer the question of what are the specifics of the environment in which the company operates. The factors we take into consideration are the countries or region's culture, infrastructure, incentives, and limitations. The other factor is the size of the enterprise, which defines the availability of resources. The

last one is the business area as there are differences in innovation culture within different sectors.

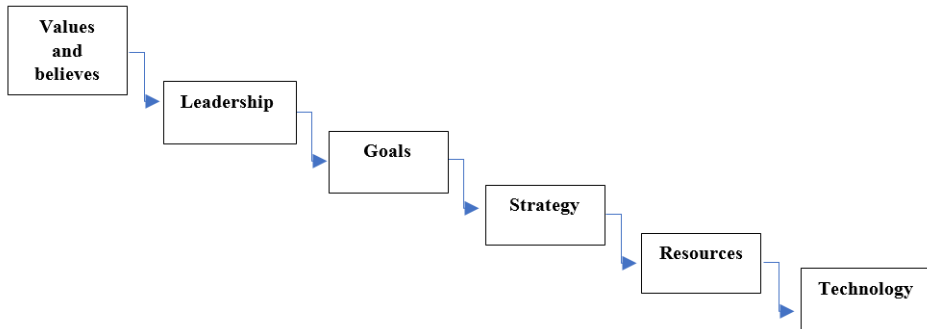


Figure 1. General level of Innovation culture model

Note. Authors' presentation.

We hypothesize that by measuring both levels of innovation culture, we could define both the absolute and the relative level of innovation culture of the company.

4. SPECIFICS OF INNOVATION CULTURE IN THE FOOD PROCESSING INDUSTRY AS PART OF THE AGRI-FOOD CHAIN

The Agri-food supply chain supply chain covers the production of agricultural products, food processing, wholesale distribution, and distribution to the final consumer. To cover all activities and find more potential for innovations, we should take into consideration the supply of other raw materials such as preservatives, fillers, colorants, additives, packaging, energy and water consumption, machines, and raw materials for machine maintenance, transport, as well as processing, or disposal of production surpluses throughout the chain. From this perspective, we differentiate the changes in the agri-food supply chains in two directions: goals of the chain and methods of organization and operation.

The goals of the agri-food supply chains:

Bridging the gap between food production and consumption Nosratabadi, Mosavi & Lakner, (2020). The production/consumption gap could be considered in time and between the regions. Servicing smaller niches makes this goal more challenging Zilberman, Lu & Reardon, (2019).

The achievement of technological knowledge and capabilities to which the individual organization does not have access or resources;

Cost reduction and process optimization along the entire chain;

More equitable distribution of value in supply chains. This depends on the objectives of the individual participants, their market power, and the chain structure itself.

On EU level, according to Farm-to-fork strategy (2020) “to reduce the environmental and climate footprint of the EU food system and strengthen its resilience, ensure food security in the face of climate change and biodiversity loss and lead a global transition towards competitive sustainability from farm to fork and tapping into new opportunities” (Zilberman, Lu & Reardon, 2019).

According to Innovation-induced food supply chain Zilberman, Lu & Reardon (2019), product innovation leads to a change in the organization of supply chains from traditional market transactions to vertical integration and contract farming. The ratio when choosing a model depends on the ability of the entrepreneur to control the quality, the availability of resources, and the marginal profit of in-house production versus that of supply from external manufacturers. Horizontal integration is another trend affecting the agri-food chain. It brings together entrepreneurs of the same level to increase competitiveness and market power by sharing logistics, production, joint actions, technology, and information.

In the agro-food chain, horizontal integration among agricultural producers is the most widespread. However, it directly affects the other participants in the chain. Depending on the initiator of the horizontal merger, it may have different objectives and market power. In a merger initiated by market agents at one level, the goals may be greater bargaining power with actors at subsequent levels, access to resources, process optimization, and loss reduction. Often, such associations are stimulated by participants at the next levels in the chain - food product manufacturers, and distributors. Rather, their goals are to guarantee sufficient raw materials at more favorable prices and to control the quality of products and the activities of agricultural producers.

Such development of supply chains gives rise to the need for bridging institutions, stakeholder platforms, agricultural extension organizations (public, private, civil), contractual agreements (Mileva and Georgieva, 2022), both at individual levels and between them. Their role can be considered in 2 aspects:

First, defining, controlling and supporting the participants in a given association or chain. They have the role of administrators, mentors and regulators. Thanks to

them, the rules on which the chain works are defined and regulated, information is provided on market opportunities and participants are assisted to benefit, they participate in the processes of formation of state and regional policies and the common interests of the association are protected. These are clusters, associations, branch organizations.

Second, supporting the operational work of individual participants. These are shared logistics centers, digital platforms consolidating and mediating the activity of the agro-food chain. Their goal is to consolidate the activities of individual participants, to optimize the logistics and control of food products, as well as the sharing of information between participants. An important role of these intermediaries is risk control and the role of a buffer in a situation of mismatch between the demand and supply of raw materials and finished products.

The described trends in the development of the food industry also expand the scope of the agro-food chain. The participants in it should include the organizations outside the direct chain. Scientific institutes and research centers, and developers of digital and technological solutions are playing an increasingly important role. The role of data analysis and online control is becoming increasingly important in decision-making and requires relevant decisions. The role of middlemen becomes even more important due to the increasingly complex agri-food supply chain.

Based on the analysis, the next stage of our research is to develop a model for measuring innovation culture at the company level and to conduct a pilot study to test the model.

For this purpose, we developed a questionnaire for conducting semi-structured interviews among companies from the food-processing industry. The questionnaire reflected the results of the analysis, the experience of other similar studies, as well as the information required by the national statistics for measuring innovation activity. There are 50 questions in total, grouped into 4 groups:

- a. Group 1: Company profile, 6 questions.
- b. Group 2: Innovation culture, 18 questions.
- c. Group 3: Innovation activity, 17 questions.
- d. Group 4: Factors and barriers to innovation development, including environmental innovation, 9 questions.

Four companies were selected among which research was conducted (Table 1).

Table 1

Description of test-researched companies

Company	Country of origin	Size	Production	Core markets
1	Bulgaria	Small	Dairy products	Bulgarian
2	Bulgaria	Small	Healthy juices	European
3	Bulgaria	Small	Protein Bars and Flapjacks	Global
4	Lithuania	Medium	Chocolates and sugar confectionery	Global

Note. Authors' presentation.

Due to the small sample size of the study, they cannot and are not intended to be considered statistically significant. We consider the results as a preliminary indicator of the level of innovation culture among companies in the Bulgarian food industry. The model would give us a starting point to improve the model and directions for future research.

While conducting the interviews, we identified the following areas of improvement for the questionnaire:

In the scope of the questionnaire, there is a need to add questions about the values and beliefs of the company. Important questions in this area are: What are the company's most important values? Where is innovation in the company's value scale? How is this evidenced by the company's innovation policy? Other important questions on the topic of values are what are the reasons and goals of innovation in the company, and by what specific criteria innovation projects are selected? We intend to use Hofstede's classification of 4 types of cultures: family, machine, market, and pyramid. This information together with the questions already included will give us information about the type of innovation culture on the one hand and the level of innovation activity within the identified innovation culture.

The impact of climate change and environmental impacts will increasingly affect innovation activity and the innovation field. The questionnaire should also include questions about whether companies have specific innovation activities related to the environmental requirements of governments and the market. Thus, the questionnaire will cover the entire presented model.

Despite the small number of investigated companies, the information obtained gives us certain indicators for further research in the supply chain of the food-processing industry.

All companies have a vision for their role in the future, as well as an innovation strategy. In 3 out of 4 investigated enterprises, the innovation process is not formalized and is not considered as a separate part of enterprise management. At the same time, the 3 largest companies also have over 20 ideas per year and implement between 35% and 90% of them. The micro-enterprise has few ideas, but they are all implemented. Here we can raise the hypothesis that the number of introduced innovations is related more to the values and leadership in the enterprise, and not so much to the level of formalization of the innovation activity.

An important indicator of the innovation environment of the studied companies is the role of employees from different levels in the organizations. All companies reported lower engagement of enterprise employees compared to owners and senior managers. At the same time, three of the companies answered that the idea-generation system covers only the management level, and decisions on certain innovations are made by a multidisciplinary team. However, this team does not include employees of all departments and levels of the enterprise. The company, whose system of gathering ideas covers all units, also reports a higher commitment to the innovation process of the workers and executives. We can hypothesize that the wider the cover of the idea-generation system and the involvement in innovation projects and processes, the greater will be the employees' commitment to these processes.

Examining the supply chain, all companies are active in interacting with customers and, accordingly, in related sales and marketing activities. Interaction with suppliers and other partners is at a very low level - rated by all four companies between one and there with the highest degree of seven. Only one of the four companies is a member of a professional organization, but none participates in joint projects within such an organization. Interaction with scientific institutes is above average. The companies mainly carry out joint product and technology development projects.

The research shows that the companies are not active in the development of patented products and technologies. They have had no such projects in the last twelve months. In the last three years, the three largest companies have registered a trademark and two of them have had a patent application and only one for a trade secret. From the research done, we can state the assumption that the companies in the food industry in Bulgaria do not share the concept of open innovation.

Regarding the types of innovation, the focus of all the studied firms is on product innovation. The development of other types of innovation is different for each company and we are not able to draw reasonable conclusions based on the present research.

All companies develop the most technologically driven. The exception is only one company whose 50% of developments are market-driven and 40% are technologically driven. All Bulgarian companies develop incremental innovation in more than 90% of the cases.

The researched companies do not use European or state funding. All enterprises are financed with bank loans and own funds only.

Regarding barriers to innovation, all companies agree that the cost of financing is a deterrent to innovation. The companies are unanimous that the lack of customers, as well as the availability of technology, are not among the barriers preventing innovation.

A distinction is drawn between small and medium-sized enterprises and micro-enterprises. The microenterprise indicated eight limiting factors out of a total of 15 indicated in the questionnaire, while larger companies indicated between five and six. Apart from environmental factors, they have limitations such as managerial capacity and influence of larger companies in the industry.

Regarding the impact of environmental changes and policies, the most common innovation activities are related to activities involving RES and recycling projects. The remaining environmental measures such as prevention of water pollution and emergence, reduced noise, and preservation of biodiversity are not important for the expatriate companies. Only Vitanea reports the impact of changes in government policy, consumer behavior, increasing costs, and extreme conditions as affecting their operations.

5. CONCLUSION: DISCUSSIONS AND LIMITATIONS

The proposed model of defining innovation culture is a framework and opens many questions for future research. A broader study could investigate whether the proposed model for defining and measuring innovation culture is applicable in practice. What is the impact of each level on the overall model and what is the result of a lack of alignment between the levels? Also interesting is the question of forming indicators that would provide information about a lack of alignment.

Other research questions arose from the study, which could enrich the topic and increase the effectiveness of innovation policy at the enterprise level. Regarding

the supply chain, the issue of the level of cooperation with suppliers, third parties, and organizations within the industry should be explored more deeply. The companies' responses show a low level of interaction in these directions. It is necessary to study to what extent these indicative results correspond to the real situation of companies from the food-processing industry in Bulgaria.

We pay attention to the commitment of the company's personnel in innovation processes. It can be hypothesized that the wider the involvement of staff in the innovation process, the more engaged they are.

Another area of study is the influence of enterprise size. The level of innovation activity, as well as the number and type of barriers to it, are directly related to the size of the enterprise. The larger the enterprise and the larger the market in which it operates, other things being equal, the more ideas it will generate and the more innovations it will implement. At the same time, there will be fewer barriers to the creation and implementation of innovations.

The investigated companies are very few. The conclusions drawn in this way only help us to make assumptions and set topics for deeper research.

When analyzing the results, it is necessary to consider the industry's specifics. Two businesses offer products with high levels of differentiation in fast-growing industries such as functional foods and healthy, close-to-medical foods, while the smallest company is a representative of an oversaturated and highly competitive industry such as dairy. This places companies in a different cultural environment, with different priorities and business operations, which also distorts the evaluations of the answers provided.

Last but not least, we expect that in a larger study and the subsequent analysis, in the absence of a statistically significant relationship with the proposed model, other questions from the presented questionnaire for determining the innovation culture in SMEs from the food-processing industry in Bulgaria will be dropped out.

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