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ASSESSING THE EFFECTIVENESS OF COLLABORATIONS BETWEEN COMPANIES IN INNOVATION PROCESSES – A REFERENCE MODEL

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Abstract: *In today's business environment, the competition takes place not only between individual businesses but also between business networks. In particular, given that business organizations rarely innovate alone, the innovation process is based on collaborations between creators of products, customers and various other institutions. To achieve and maintain effective collaborations, it is necessary to control the effectiveness of the collaborations between a company and other external entities by measuring it through an appropriate set of indicators. Unfortunately, the research on the evaluation of collaboration in business networks is still limited. The present work aims at contributing to the reduction of this gap by providing a reference model for assessing the effectiveness of collaboration in business networks. This model can be used as a reference model to develop an appropriate set of indicators to control the effectiveness of the collaborations in business networks.*

Key Words: ***Collaborative Innovations, Open Innovations, Dynamic Virtual Enterprises, Business Networks, Innovation Process***

1. INTRODUCTION

The importance of collaboration with customers to develop innovative products and services has long been recognized. As a result, such collaboration becomes essential component of the efforts of many developing organizations.

The consequences of collaborative innovation with customers is significant because it is a change of the business paradigm. Today, business organizations accumulate knowledge by the customers and modern technology push innovation forward faster. Forms of open innovation arise as well [1,2,3,4,5].

Business organizations operate under increasingly close collaboration with suppliers and customers to gain new ideas and knowledge from these external sources [6,7]. Reducing the economies of scale of research and development activities generate such collaborations [8,9]. The growth and expansion of collaboration between business organizations transform the nature of competition and collaboration [3].

2. COLLABORATIVE INNOVATIONS

2.1 Evaluation of collaborative innovations

One of the main evaluation criteria is whether collaborative innovations help to overcome the restrictive aspects of the business environment. Collaborative innovations must be able to influence the socio-technical environment of an organization.

As a reaction to restrictions on a business organization, collaborative innovations must contribute to: opening the innovation cycle to internal and external organizational innovation assets; facilitate risk-taking; promote positive attitudes towards the performance of innovation and risk-taking in the contemporary business environment.

Collaborative innovations open innovation cycle for a diverse group of actors within the organizational hierarchy and outside an organization [10,11,12]. By opening up the innovation cycle allows the flow of innovative assets within business organizations and beyond. Therefore, the innovation process has the potential to improve elements of the innovation cycle alternative.

Generating ideas is simplified because organizations use a wide range of knowledge and expertise within and outside their borders [13]. Implementation and dissemination of ideas is facilitated by their support actors involved in the generation and selection of ideas. They are more willing to accept innovation and take on responsibilities. Collaborative innovations provide organizations with opportunities to focus on the implementation and dissemination ideas to actors possessing the most important capabilities. In this manner they strengthen the implementation of elements and spreading of the innovation cycle.

Collaborative innovations performance is characterized by five indicators:

- The number of new technologies generated through collaboration;
- Documented intellectual property;
- Immediate effect on product ranges (changes to existing product platforms or new products for sale);
- Market acceptance of new technologies, including quantitative estimates of analysts immediate financial performance of products;
- Perception of the participants for the overall performance of innovation.

2.2 Leadership and management of collaborative innovations

Barriers to collaborative innovations can be eliminated or minimized by exercising appropriate leadership and management [14,15]. In very complex processes of collaborative innovations lot of things can go wrong between intentions and implementation.

First collection of relevant and committed actors in sustainable interactions can fail due to: lack of past experience and traditions in interaction; negative perceptions of past interactions; difficulties in motivating relevant actors to take the time and effort to interactive participation [14].

Secondly when the actors agree to interact, often it is because they recognize the need to share and combine ideas and resources to solve urgent or important issues. But interaction does not always stimulate collaboration overriding conflict of interest. Moreover, collaboration may fail overriding distrust and opportunistic behavior, availability of procedural uncertainty and the existence of incompatible and destructive cognitive models [14,16,17].

Thirdly, when the actors engage in the process of collaboration they may not contribute to innovation. Recurring events of collaboration in enclosed and sustainable business networks with the same actors who over time have developed similar views of the world will stifle creativity, will discourage the creation, prototyping and implementing new and bold ideas and will decrease the spread of innovation [18].

In summary, there is a risk that different obstacles disrupt the relationship between interaction, collaboration and innovation. Good intentions for communication and collaboration in order to study and exploit new ideas are not enough for the realization of collaborative innovations. In order to achieve sustainability of the process of collaborative innovations must implement appropriate methods of leadership and management.

Firstly, to create a well-functioning interactive environment by active and committed actors leaders and managers must operate as organizers. The organizers aim to motivate, empower and unite actors to create and form interactive environment to determine the agenda of interactions to clarify the interactive processes and foster mutual adjustment of expectations [14].

Secondly, leaders and managers need to promote and facilitate collaboration between stakeholders operating as intermediaries. The mediators aim to form or clarify mutual commitments to manage the process of collaboration through decomposition into different stages to form a trust and resolve disputes through coordination of interests based on common models and to remove obstacles to collaboration [16,19].

Finally, the progress of collaborative innovations can help if leaders and managers act as catalysts that apply entrepreneurial approaches to leadership and management. Catalysts help to reformat the problems giving new knowledge and new roles for actors benefit from existing and emerging constraints and opportunities, manage risk and promote transformative accumulation of knowledge and traditional thinking [19]).

3. CO-CREATION OF PRODUCTS WITH CUSTOMERS

The management of uncertainty is one of the main practices of innovation management. Business organizations are faced with different sources of uncertainty stemming from their technical and managerial capabilities and target markets. Thomke [20] classifies uncertainties associated with innovation projects: technical, manufacturing, and marketing. To minimize these uncertainties business organizations should transfer and have access to different types of information [21,22,23]. Generally, this information can be classified into two main groups [24]:

- Information about customer and market needs. Its information needs, desires, satisfaction, motives and others; customer proposals for new products or services. Better access to information related to the needs of customers increases the effectiveness of innovation. This reduces the risk of failures. Necessary information helps build a detailed picture and assessment of customer requirements, business operations and organizational systems. Such information is generally transferred by methods of marketing research of customers to businesses;
- Information concerning the possibilities of technological solutions. This is information on how to best apply technology to transform customer needs into new products and services. Access to technological information is related to the effectiveness of the innovation process. Better information technology helps product developers to engage in activities in the innovation process which are more directly related to problem solving. The more complex and radical innovations are, the greater the need for technological information from various problem areas.

All innovations are characterized by two types of information, although in different cases, their ratio is different [25].

Today, common understanding of the innovation process is based on the premise that business organizations rarely innovate alone, while the innovation process is based on interactive relationships between creators of products, customers and various other institutions [26].

Recently, the concept of "open innovation" is used to characterize systems where innovation is not made only in businesses but also a cooperative basis with other external actors [27,28,29]. Open innovation is the opposite of closed innovation where business organizations use ideas generated only inside them by major research laboratories and strictly controlled networks of vertically integrated partners [1]. Open innovation characterized by collaboration for innovation within large horizontal and vertical networks of universities, start-up businesses, suppliers and competitors. Business organizations should use ideas of their own research units and ideas from the outside and

must use internal and external access routes to markets in order to advance its technology.

The goal is to get access to external information, thus minimizing uncertainties in innovative designs. Informal relations define the innovativeness of open innovation. Open innovation extends beyond the usual contractual relationship to achieve joint value. These include new forms of value creation, based on informal, non-contractual, flexible and short-term relationships.

Access to customer information is a fundamental requirement for any innovation. There are two traditional approaches to acquire such information. Data input from customers can be acquired either clearly through consultation with customers about the needs and preferences through market research and interviews with focus groups, or by research in the customers sphere (analyzing sales data, Internet content, interviews with collaborators sales).

Customers can have different roles in the innovation process. Some customers may provide key information on future trends and possible technological solutions, while others are more suitable for the evaluation of innovative concepts or to participate in refining the prototypes. All these roles revolve around three ways to use the information generated by customers when developing new products:

- Research in the sphere of customers;
- Consultation with customers;
- Innovate with customers.

Research in customers sphere - In this approach, the products are designed on behalf of customers. This is the typical notion of so-called."Market orientation". Business organizations use the existing customer information from various sources such as feedback from associates in sales; analyzing sales data from previous periods; analyzing Internet content; Reports of studies of third parties and others to determine customer needs [3]. Another significant source of this approach are analyzes of the performance of existing products (of the organization itself and its competitors).

Consultation with customers - In this approach, besides studying data on customer preferences, what is performed is direct consultation with them in order to obtain input for the innovation process. In the early stages of innovation projects customer preferences or unmet needs are identified through surveys, interviews with quantitative indicators or focus groups. A perfect and proven method is known as "Driven by innovation results" that combines group research methods and assessment into a coherent model [31]. In later phases of the innovation process customers provide different solutions or concepts so that they can respond to the submitted designs [3].

Innovate with customers. In the previous two approaches customers remain isolated from business organizations. In this third alternative method customers are actively involved in the design and development of future products using funds provided by organizations that create products. This is about actively integrate customers in the innovation process [32], building conception of the so-called "customer centric organization" [33,34,35]. The creators of products empower customers to design their own decisions and apply methodologies for efficient transfer of innovative solutions from customers to businesses. These are forms of open innovation with customers (customer co-creation). The term " customer co-creation " indicates the approach to create products where customers are actively engaged and involved in the design of new proposals [33,34,35]. Co-creation with customers is defined as active, creative and social process based on collaboration between producers and customers [68].

The main benefit of jointly developing products with customers is expanding database of needs, applications and technological solutions that reside in the area of customer products or services.

Business organizations organized process of innovation by customers as forming capabilities and infrastructure that allow customers to perform activities in the innovation process. This is a new concept of open innovation with customers [29,36,69].

There are three characteristics that affect the dimensions of the conceptual methods of co-production with customers [37]:

- Stage of the innovation process. Stage of the innovation process which characterizes moment when the input from activities of common creation enters the process of developing new products i.e., whether the data of customers falls in the earliest stages of the process (generating ideas and developing concepts) or enters the end of the process (design and testing of products);
- Degree of collaboration. The degree of collaboration characterizes the structure of the underlying open innovation relationship i.e., whether it is bilateral collaboration between a business organization and one customer at a particular time or there is a network of customers who collaborate with each other regardless of the business organization;
- Degree of freedom. The degree of freedom characterizes the nature of the tasks that are assigned to customers i.e., whether assigned specific, predefined tasks with minimal freedom or open creative tasks on which decisions are difficult to predict because of the many degrees of freedom.

4. COLLABORATIVE CAPABILITIES

4.1. Collaborative capabilities as a precondition for successful collaborative innovations

In this work the survey and analysis of collaborative capabilities and related ideas is done through a chronological overview of the different theoretical approaches. Theoretical approaches to collaborative abilities are closely related to the theory of business organizations: Resource approach [38]; cognitive approach; concept of dynamic capabilities [39]; competencies based approach [40]. The author's opinion is that at organizational level collaborative abilities should be considered as starting meta abilities that contribute to the multiplication of internal and external knowledge bases in today's uncertain and complex environment.

At individual level Buckley et al. [41] focus on management skills for partnership in cross cultural joint ventures. Storbacka al. [42] describe the quality of the

relationship as based on commitment, communication, commitment and satisfaction, while Crosby et al. [43] - as based on trust and satisfaction.

At intra organizational level and Kahn and Mentzer [43] identified two different approaches for managing interactions between organizational units: transaction-based; collaborative based. The integration between organizational units in the form of collaboration implies common goals, shared values, mutual commitment, collaborative behavior.

Researchers of approaches to forming collaborative abilities at intra organizational level in terms of integration between organizational units [44,45] and in terms of the so-called. "Cross functional integration" [45] accentuate the difference between collaborative integration and transaction and hierarchical integration. They define collaboration such as informal collaboration; exchange ideas, information and resources; teamwork. Collaboration is also defined as an attitude of links between organizational units expressing emotional, volitional processes and sharing [44]. The integration between organizational units is also characterized by engagement and information exchange [44]. According to Tyler [46] collaboration is defined and also as capabilities for collaboration, comprising: data processing; communication; transfer and operational knowledge management; management of internal organizational coordination; reliability and ability to build trust; skills to negotiate etc.

Research on collaboration at intra organizational level underline the importance of informal communication to official ward and consultation in the implementation of functions such as marketing, logistics and production, developing new products and ensuring manufacturability of designs [44,45].

At teams level collaboration is treated as team integration [47], as cross functional collaboration [48] or as a collaborative cross-functional integration [45].

At inter organizational level interactions are considered as a means of generating more value and competitive advantage if they express rather different dependencies than only market-based or transactional dependencies [49].

In business alliances and dynamic partnerships is necessary development of the so-called "Alliance competencies " [50] by the capabilities of organizations to find, develop and manage relationships. The Alliance abilities are mechanisms that help business organizations to participate in sustainable and repeatable activities in perception, exchange and dissemination of knowledge on management of alliances.

Sivadas and Dwyer [51] define cooperative skills as the ability of partners to trust, communicate and coordinate. Niemela [52] develops multidimensional concept of cooperative competencies, which includes components of network social skills, managerial skills and cognitive abilities.

Ritter et al. [53] developed concept called "Networking skills" to explain the role of network management in achieving success in innovation. Their two-dimensional model of network competence focuses on training and collaborative aspects.

At level business networks position of actors and network structure are essential [67]. Actors gather information and complementary competencies through networks. By definition, this approach focuses on interactive perspective and into trust, norms and relationships as key components of social capital [55].

4.2. Integrative cross dimensional concepts of collaborative capabilities

To manage alliances in an optimal way businesses must to focus on different levels of collaboration. Cross dimensional analyzes are not common practice, however. Tayler [46] examined the abilities of collaboration by multi-dimensional terms that complement and even replace technological capabilities. According to Tayler [46] collaboration in general is a process in which individuals, groups and organizations gather, interact and establish psychological interactions to achieve mutual advantages or benefits.

As the accumulation of knowledge, innovation and trust, ability for collaboration can best be studied by applying multiple levels of analysis and should therefore be considered a multi-level and cross-stage concept [46]. It is a key issue at all levels and the same concept can be used for study and analysis of the various levels.

4.3. Nature of capabilities for collaboration

The focus of this work is on the ability to collaboration based on relational orientation as contrast to transactional orientation [49]. Relational orientation is associated with higher levels of trust and communication, which together with the commitment shall be considered as flexible components. Trust, commitment and responsiveness are closely linked and mutually interact. Trust is considered an essential condition for partnerships [56,57], although the communication is needed for the emergence of trust and communication may eventually grow into confidence. Like trust and communication and commitment are also recursively connected.

The risk is multi-dimensional phenomenon and contains rational (subject to calculation) and emotional (based on influences) elements.

Commitment is the second component of collaborative relationships. It is also considered as a multidimensional concept or as consisting of multiple commitments [58]. Engagement in collaborative interaction is bilateral - assessments and expectations for future economic opportunities lead to based on logic instrumental commitment. Based on logic commitment is also known as calculative commitment [59].

Communication is the third major component of collaborative relationships. Collaborative communication signals about the intent of collaborative partners, promotes collaboration, smoothes building relationships and facilitating the creation of a favorable based on deference atmosphere between partners [60].

4.4. Ability to collaborate in knowledge creation and collaborative innovation

Capacity for collaboration are essential in the dynamic and turbulent environments where unusual situations require coordination actions [46,61].

Therefore, knowing of the mechanism by which collaboration helps business organizations to create and transfer knowledge in the development of innovation and achievement higher performance. Mills et al. [62] illustrate the role of collaboration in innovation process in specific model. The model describes in a simple and logical way key and interrelated role of collaboration in establishing a knowledge, where time, trust and shared mental activity are prerequisites. Collaboration is a prerequisite for the creation and transfer of knowledge.

The role of ability to cooperate or in other words, the ability to build and manage relationships with other countries in individual, team and organizational unit is pivotal in strategies for continuous innovation. The ability to collaborate facilitates updating old skills, internal organization or intra organizational development and acquisition of new skills. So called. "Transformational capacity" of an organization [54] is its ability continuously to refine its product portfolio based on technological opportunities that arise in its internal environment [46].

4.5. Ability to collaborate and organizational effectiveness

Unsuccessful business alliances and associations fail in a very simple reason - they are not designed or used for the realization of collaboration [62]. The continuous generation of value and innovation in the dynamic environment is only possible connections that are superior relational qualities such as trust, communication and commitment. These factors should be considered as key characteristics of successful collaborations between organizational and thus higher organizational performance [57,63].

According Heimeriks [64] the performance of business alliances influenced by their abilities and the quality of their relationships, covering many economic and social factors. Configuration of resources, compatibility of partners and coordination are economic factors while trust, commitment and responsiveness are relational factors.

Haymerikis model [64] can be generalized to cover the different levels of network interactions and concepts such as the ability to collaboration, quality of collaboration and effectiveness of the collaboration. they could be used interchangeably with the components of the model.

Relational factors (trust, communication and commitment) may have key importance for intra organizational collaboration, when informal collaboration is manifested as communication and coordination. So can be achieved increased organizational effectiveness through better coordination between organizational units [45].

The role of collaboration highlighted in situations of high market uncertainty or technological or organizational complicacy. All this makes it necessary to intensify the generation of information and knowledge [46]. The effect of collaboration on organizational performance is stronger in complex products and services [44] or in indeterminate and changing economic conditions [61]. Under such conditions, the ability to collaborate is key factor in a networked economy where competitiveness is based on knowledge and constant innovation.

Ability to cooperate should be seen as a source of competitive advantage because they are generating value, they are difficult to imitate, not massively developed and socially complex [38].

Ritter et al. [65] considered that the network competencies (i.e. skills of an organization to develop and manage relationships with key suppliers, customers and other counterparties and to be effective in interactions) are key competencies which have a direct impact on the competitive power and performance of an organization. Tyler [46] believes that the ability to collaborate can compensate for moderate and even mediocre technology skills (know how) when an organization pursues technological innovation. If these skills are considered complementary technological capabilities, this combination is in the form of meta abilities could allow continuous development of dynamic capabilities that play a key role in organizational performance and are a source of sustainable competitive advantage [57,62,66].

5. MODEL FOR MANAGEMENT OF EFFICIENCY IN COLLABORATION

On the base of what has been recalled in the previous sections and on the personal experience of the author in several projects of across-companies coperation, a reference model for assessing the effectiveness of collaborations between companies in innovation processes has been developed. It is based on the an authors developed methodology for evaluating the performance in collaboration. The structure of the model is represented in Fig. 1.

In developing the model author accept that the participants in the business networks that implement collaboration have their controls of collaboration such as: management of service levels; implementation of collaborative manufacturing; evaluation of performance and continuous improvement. The partners use management effectiveness systems in collaboration in the agreed conditions for collaboration. Very often such support collaboration systems maintain control of the process of collaboration in business networks. According to a methodology developed by authors management effectiveness in collaboration involves three main phases: development of collaborative indicators; Monitoring and reporting of process in real-time collaboration; analyzing the effectiveness of the collaboration process.

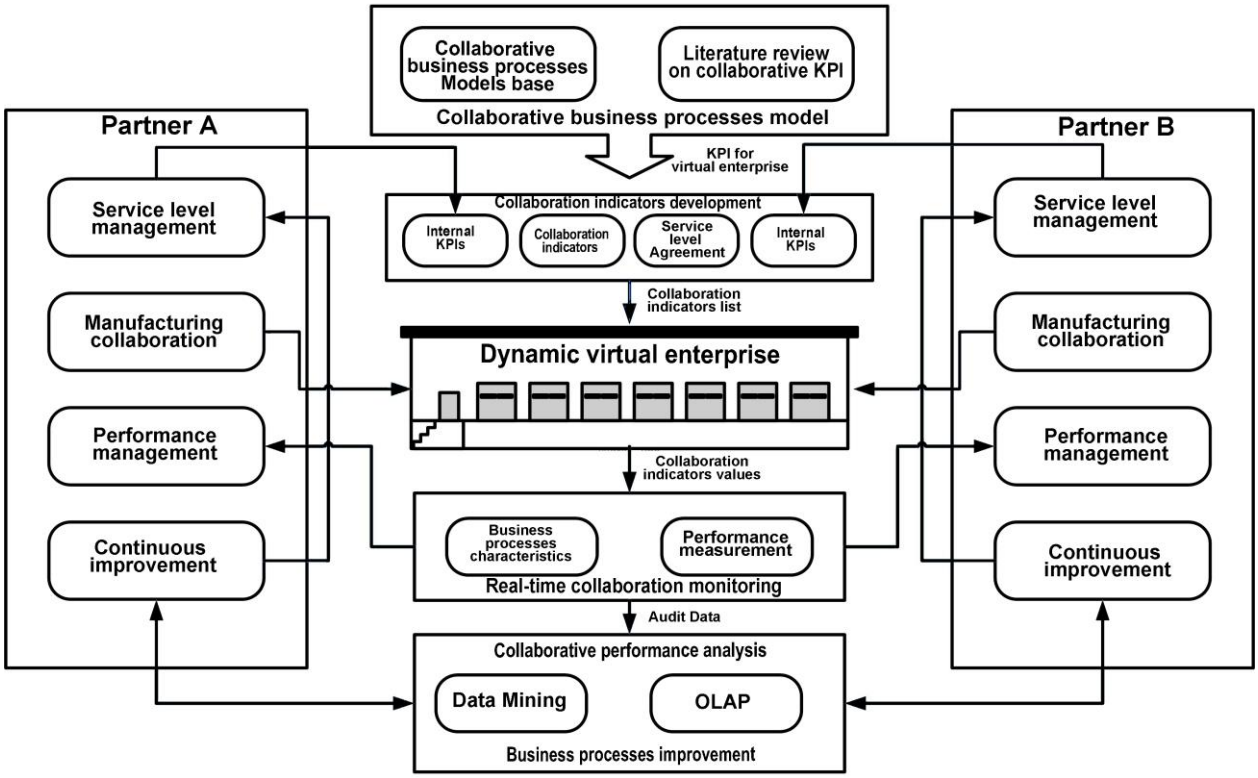

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Fig. 1. *Conceptual model of management efficiency in collaboration*

Developing collaborative indicators. Often in manufacturing collaboration product data (files from CAD systems) and specifications for product structure (BOM) is exchanged between the participating businesses to achieve effective communications. So far performance indicators and actions for continuous improvement are managed by different business organizations for many reasons such as: trade secret; negotiate prices; accounting transactions and others. To overcome the difficulties arising from this isolation in the developed model authors offer definition of collaborative indicators by which to manage the effectiveness of collaboration. If all participants collaboration effectively define and evaluate these common collaborative indicators in the implementation of industrial collaboration, they constantly will be able to strengthen the collaboration process and will eventually strengthen their competitiveness.

Real-time monitoring and reporting collaboration process. Through collaborative indicators, collaboration can be assessed in real time and be accountable to maintain the processes of collaboration within limits. Monitoring and reporting are needed for the operational management of all activities and to maximize the effectiveness of collaboration.

Analyzing the effectiveness of the collaboration process. Means to analyze effectiveness in collaboration are needed to carry out continuous improvement of the effectiveness of collaboration based on a thorough analysis of the value of collaborative indicators and uncover the paths to reach the perfection of the business.

6. EVALUATION PROCESS OF THE EFFECTIVENESS IN COLLABORATION

In order to assess effectiveness in collaboration authors offer use of indicators that participants in the collaboration are able to use in assessing the performance of their own business. In other words, collaborative indicators will be calculated using the primary performance indicators of individual partners.

According to the view of the authors process involves two stages: defining the collaborative indicators; assess the performance in collaboration.

The first step must be designed group of collaborative indicators for the target process of collaboration that are based on primary performance indicators of individual participants. The values of collaborative indicators are scaled between 0 and 1 and are brought together to calculate the performance of each case of collaboration. Must be also calculated weighting factors of collaborative indicators based on the opinions of experts in the field (users and managers).

The second step is assessed quantitatively primary indicators of performance and is calculated complex collaborative indicator based on pre-defined collaborative indicators and their weighting factors. After quantify primary indicators used to calculate collaborative indicators, it becomes possible calculation of ourselves collaborative indicators.

Finally, must be calculated the complex performance of collaboration in order to carry out benchmarking with previous periods or with previous forms of collaboration (previous dynamic virtual enterprises).

7. CONCLUSION

In this work the author presents a method for assessing the performance in collaboration that has the potential to help business organizations in the assessment and improvement initiatives for collaborative innovation. Through literature study are identified factors that have positive and negative effects on processes related to the realization of collaborative innovation.

This is the initial version of the model for assessment of the effectiveness in collaboration that requires further improvement and evaluation in practical terms.

It is envisaged that the validation of the developed model to be assigned to an expert group of managers from businesses of Bulgarian furniture cluster. All participants in the group will provided with full information on the structure and characteristics of the developed by the author method, accompanied by a questionnaire. The resulting feedback will be analyzed by the author and will be made refinements and adjustments. It is envisaged that with the advanced model to carry out a study of collaborative innovation in enterprises of Bulgarian furniture cluster based on specific innovative solutions. The main objective of the conceived study is to test the validity of the model and to identify areas in which it manifests imperfections.

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