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On innovation activities development

Abstract

Basing on decomposition of the terms of "innovation", "innovation activities", "economic development", "economic growth", "development", "growth": the differences between the terms of "innovation activities development" and "innovation development" are discussed; there is stressed on the probable occurrence of the complementary couples such as "business process / product" in the process of a firm's transition to innovation activities.

The "Matrix of "development / growth" of the firm in market economy" is proposed for consideration. Basing on the principles of the institutional economy, here we considered the innovation activities development, its external and internal factors. It is noted that the institutional environment (as a part of the innovation activities environment) and the consumer are the key external factors for its development at the microeconomic and macroeconomic levels. The innovation activities peculiarities are described: at the microeconomic level as the implementation of the "innovation life cycle" stages, and at the macroeconomic level as the implementation of the "national innovation system" development process. Given that activities in both cases is subject to certain conditional rules: the notions "innovation life cycle" and "national innovation system" is proposed to be considered as established concepts, attribute them and the new concept "national innovation system as an environment for supporting the innovation life cycle" to socio-cultural institutional environment of the innovation activities development.

An imaginary three-dimensional "space of action" for a firm with the following directions was introduced: "courage", "trust", "profit", using which the appropriate model of behavior for an innovation-active firm and appropriate roles is proposed; the expected ranges of activities for a firm is defined for each direction. The importance of network structures in innovation activities as an environment with a high degree of trust among its participants is discussed. In the frameworks of "space of action" we consider the innovation ecosystem as a network formation, and propose the "innovation ecosystem" concept as another socio-cultural institution, which is a part of the institutional environment of the innovation activities development. The narrative was chosen as a recipe of building trust among the participants in innovation activities. The main components of the innovation activities environment are stratified into three imaginary screens (such as "reality", "images", "rules"), which are located in parallel to the planes formed in the frameworks of the firm's activities in the imaginary "space of action" (such as "physical", "mental", and "economic", respectively). The prospects for application of the proposed theoretical model an innovation-active firm's behavior in the imaginary "space of action" are outlined.

1 Statement of the problem

For any firm, the innovation activity and its development begin when the authorized person or group of persons to develop and adopt the relevant management decision, and subsequently implement this decision within a certain period within legal capacity. The course of development and management of decision-making on innovation

Keywords

innovation, innovation activities development, institutional economy, innovation life cycle, national innovation system, innovation ecosystem, trust, narrative, theoretical model, stratification of environmental components

JEL: K30, M11, M12, M13, O31, O38

activities (both those that have been successful and those that did not result in as intended), as well as the innovations that occurred during the observation period, constitute the firm's "success story" that is the result of its *innovation development*.

The result of innovation development is the firm's property as a whole, including but not limited to its individual employees who were [1, p. 369-370] rather "cost centers" than "profit centers".

Instead, it was the authorized employee and / or a group of authorized employees relevant to that firm at one time, who made the management decision to choose the innovation activities.

In such circumstances, the person or group of persons authorized to make management decisions, the firm that takes that management decision before the implementation, and the environment in which their legal capacity is realized, obtains the key role in ensuring the innovation activities development. Therefore, the environment, the authorized person's or groups of persons and firm's appropriate behavior, their interaction and cross-impacts deserve consideration in more details.

2 Latest scientific progress and publications review

The institutional economics is the economic theory that addresses the evolution of economic systems basing on the individual behavior. For example, within the framework of institutional theory there were studied the following issues: the present state of the institutional environment and directions for the institutional system modernization in Ukraine [2]; the impact of the institutional environment on innovation processes and the economy's functioning [3] in general view, and at a firm's view in implementing technological innovations [4] in particular; institutional structure of agro-industrial production and classification of the institutions by nature of influence on the economic agents' behavior [5]; the principles of developing a modern regional innovation system as an innovation-friendly institutional environment [6]; the role of the key innovation institutions in shaping the innovation system [7]; different aspects of the terms "organization", "institute", "institution", "institutional form", "institutional conditions" [3, 7, 8].

Thus, the research held in the present days basing on the institutionalism approach is mainly concerned with the institutional environment as such, the features of its development, or various aspects of activities, among which the innovation activities at the level of firms, sectoral policy, or regional policy. Instead, there is not sufficient attention that is paid to the "individual" whose behavior underlies the institutional economy. Above-mentioned significantly limits the integrity of the research performed, and the integrity of consideration of the innovation activities development as a global phenomenon.

3 The purpose and problem of research

The purpose of this article is to review (on the basis of the institutional theory) the external and internal factors that contribute to the innovation

activities development, study their relationship at the microeconomic and macroeconomic levels of economy, to describe the model of behavior of an innovation-active firm, and to stratify the components of the innovation activities development environment.

4 Results of the research

4.1 ON INNOVATION ACTIVITIES, INNOVATION, GROWTH, AND DEVELOPMENT

Innovation activities today requires the proper public perception, the necessary conceptualization, the proper interpretation of basic terms, clear definitions and the ability to measure results. The fact, evolution and confirmation of this can be found in the 4th edition of the Oslo Manual [9], an open voluntary standard by OECD / Eurostat:

- it is recommended to keep in mind that [9, p. 20-23]:
 - the term "innovation" can signify both an activity and the outcome of the activity;
 - general definitions and concepts of innovation applicable to all four economic sectors (Business, Government, Non-profits serving households, and Households);
 - innovation must be implemented, i.e. put into use or made available for others to use, while the baseline definition of innovation in this manual does not require it to be a success;
 - innovation activities include all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm;
- it is suggested to divide the innovation into two types: "innovation as products" and "innovation as business processes" [ibid., p. 34];
- definitions applicable to the firms pursuing innovation activities are provided [ibid., p. 81]:
 - an innovative firm reports one or more innovations within the observation period;
 - an innovation-active firm is engaged at some time during the observation period in one or more activities to develop or implement new or improved products or business processes for an intended use;
 - both innovative and non-innovative firms can be innovation-active during an observation period.

Today, in the minds of participants in economic activity, the thesis of rapid economic development, which occurs on the model of innovation development, is generally accepted. So, the question arises: is the increase in the number of innovation-active firms an indicator of economic development or economic growth?

It should be noted that since the time of J. Schumpeter's theory of economic development in

the professional environment of definition, the relationship between the definitions of "economic development" / "economic growth", "development" / "growth" [10, 11], views on the theory of economic growth [12] continue to be the topic of research and debate. To summarize them, here are some considerations:

- according to Schumpeter, economic development "is a distinct phenomenon, entirely foreign to what may be observed in the circular flow or in the tendency towards equilibrium. It is spontaneous and discontinuous change in the channels of the flow, disturbance of equilibrium, which forever alters and displaces the equilibrium state previously existing." [13, p. 73];
- according to the Nobel laureate Robert Lucas, "we think of (economic) growth and (economic) development as distinct fields, with growth theory defined as those aspects of economic growth we have some understanding of, and development defined as those we don't." [14, p. 13];
- economic growth is a quantitative development, and a reversible process followed by a recession; economic development is a qualitative economic growth with deep structural changes, and with their occurrence, it is not correct to speak about a reverse. "Economic development and economic growth are combined by the innovation changes that can occur as a result of new conditions that have a historical and often unique content and cause (encourage) the emergence of new, typically more productive activities." [15, p. 22];
- development is a complex notion by its nature, which also means directional, irreversible movement of an entity of development, and change of its qualitative state, and connection – the transition between states, as well as the precondition for growth [11, p. 41];
- elementary form of any development, which is reproduced in all further definitions of this notion, is the transition "identity – difference – contradiction" [16, p. 31].

By decomposing the above definitions by structure – environment, subject of activity, recipe, object, firm, and considering the principles on which marketing of innovations is provided [17], firstly, we formulate a number of general provisions for the innovation activities development as a phenomenon and for the subject and object of the firm's activity that pursues it:

- "innovation activities development" and "innovation development" are close but not identical terms, as the innovation development is a prerequisite and consequence of the innovation activities development;
- innovation development occurs exclusively through innovations realized through the

innovation activities development in the exercise within legal capacity;

- innovation activities development can be considered in the present, past and future. Innovation development – in the future and in the past. Innovation activities development can be planned, innovation development – declared as a goal and stated as a result;
- innovation activities begin with the development of the first appropriate management decision and always and every time concerns a specific product or process;
- innovation activities development starts from the moment of implementation of the first management decision. The firm that makes the decision to proceed becomes innovation-active. The object of activity of the innovation-active firm is transformed from the "product life cycle" to the "innovation life cycle";
- in addition to the product, the subject of activity of the innovation-active firm may also be technologies, intellectual property rights, business processes, other processes that are the property of the firm, and management decisions about them should be made in relation of their possible prospects on market;
- at a person or a group of persons authorized to make management decisions has appears at least two new activities as complementary couple – a product that moves to the market in the stages of "innovation life cycle" and new business process. The latter provides the reproduction of the necessary stage of the "innovation life cycle" for the product¹, which is operationally linked to it and precedes it in time;
- for an innovation-active firm, the sequence of operations in the value chain changes from traditional perception to consumer-oriented perception (consumer, his/her priorities → delivery channels → supply of services or products → resources, raw materials → assets, basic competences) [18, p. 39];
- the purpose of the firm's development is to enter the profit zone and stay there for as long as possible to increase its value [17, p. 88], therefore, the innovation activities development becomes a means that this state can provide;

secondly, we answer the above question: the increase in the number of innovation-active firms should be attributed to the indicators of economic growth, because, for a firm in market economy, the transition to implementation of innovation activity becomes an undeniable task of development; sustainable development-based caring of competitiveness of own products throughout the life cycle becomes a challenge, and the ability to build an effective management system that will make the necessary management decisions, and to implement its in production and

¹ A new business process may include, for example, the implementation of new marketing and logistics business decisions, management of investment and personnel, the acquisition of the necessary knowledge and skills, the assurance of the development of new production operations, technological solutions, technologies and more.

innovation activity becomes the successful and effective existence condition [19, p. 31]; thirdly, to visualize and formalize the description of the course of growth and development processes in time and space, we propose to consider the "Matrix of "development / growth" of the firm in the market economy", and in its basis (Figure 1), we put:

- three stages of "growth" of the firm – "identity", "difference", "contradictions" – "horizontal";
- three levels of the firm's "development" as a stage of activity – "non-innovation activity", "innovation activity", "post innovation activity" – "vertical".

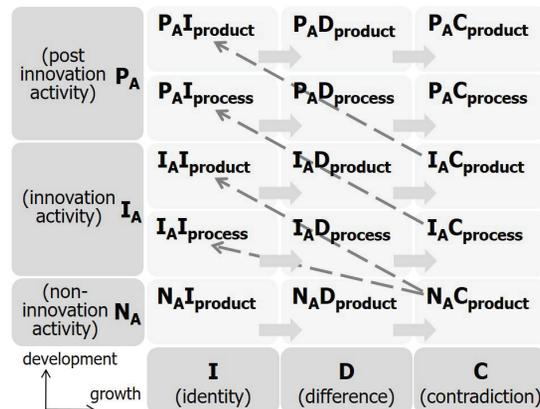


Figure 1 The Matrix of "development / growth" of the firm in the market economy

Source: the author's development

In constructing the "Matrix of "development / growth" of the firm in the market economy", we considered that growth is a consistent movement of the firm in time through the stage's "identity" → "difference" → "contradiction". In this case, at the $N_A I_{product}$ stage, the firm is confidently in the "profit zone"; at the $N_A D_{product}$ stage – it loses some of its profits, for example, due to competitors' actions or inefficiency of the production process; at the $N_A C_{product}$ stage it has considerable risk and may leave the "profit zone". The solution to the "contradiction" at the $N_A C_{product}$ stage is to discontinue or further develop the firm as a transition to another level of development up to pursuing innovation activity, which may cause the firm to return to the "profit zone" and find itself in a new "identity", but at another stage of its development for the product ($I_A I_{product}$) and for the process ($I_A I_{process}$) as a complementary couple, the appearance of which has been outlined above. Then again, the process of growth as a successive movement of the firm in the time within the stages of "identity" → "difference" → "contradiction" takes place for the product and for the process to the stages of "contradiction". It should be noted that a firm can operate several products and processes at the same time, thus simultaneously being at different stages of growth and levels of development. Today, it is not yet known how to resolve "contradictions" at the $I_A C_{product}$, $I_A C_{process}$ stages, as they should arise in the firm's innovation activity, and what will be the name of the "post innovation activity".

4.2 ON INNOVATION ACTIVITIES DEVELOPMENT ENVIRONMENT

Let us consider the environment of innovation activities development in the institutional economy. In doing so, we consider the possible methodological and terminological incorrect use of the term of "institute" instead of the term of "institution" when translating the term of "institution" into Russian and Ukrainian [8, p. 44]. We will consider the term of "firm", "innovation-active firm", "economic agent", "household", "non-governmental organization", "participant of economic activity" as synonymous terms to "organization" used in the institutional economy, and the terms of "manager", "a person authorized to make management decisions", "authorized employee of the firm", to the term of "individual".

We use the following definitions of the terms of institutional economy: "an individual is a partially rational personality whose social actions underlie the evolution of economic systems and elements of their external environment", "an organization is an individual or associate firm whose purpose is to reduce the uncertainty of the actions of others firms and transaction costs", "an institution is a mechanism to reduce information uncertainty by forming routine firms' behavior patterns", and we will consider the "organization" as a medium of action of "individuals", voluntarily created by them and adapted to the influence of "institutions" [ibid., pp. 46-47], and "institutions" – in accordance with the principle of methodological individualism – as an element of the mechanism of decision-making by authorized employee of the firm, and we take into account that [3, pp. 15-16]:

- an institution should be regarded with the relevant norm as a regulator of relations, although institutions can only be formed by reflective (external to the human) but not moral (internal) norms;
- reflexive norms are implemented exclusively through other economic agents (partners) and are divided into two types: legal norms, which correspond to *legal institutions*, and "conditional" (entered into by consent) rules, which correspond to *socio-cultural institutions*;
- coordination of influence of institutions on the actions of firms occurs through one of four "institutional forms" – market, alliance, network, hierarchy (firm, state) – as a set of economic relations;
- the set of institutional forms is defined by the term "institutional structure of the economy", and the set of institutions by the term "institutional environment";
- for the proper conduct of innovation activities, the presence of most institutions, typical for a developed institutional environment and all institutional forms, of which those that determine (reduce) the amount of transaction costs, are of particular importance, is vital.

Thus, the institutional environment is appropriate [2, p. 142]:

- as a notion, to identify the most important fundamental social, legal, political, economic, moral and ethical, cultural rules and norms that determine the behavior and relationships in society, in particular between firms and the state, and should be aimed at improving the efficiency of the economy and life quality of the population;
- as a phenomenon, it is generalized to consider on systems of relations level "subject of research – category", where "category" with a corresponding set of both formal and informal institutions can be "politics", "law", "morality", "ideology", "culture", etc., and "subject of research" – both the economy as a whole, for example [2], and the innovation activities development (in particular in this article).

Thus, the institutional environment, as an important component of the environment, in which innovation activities and industrial (economic, social, etc.) development takes place, becomes a key factor of influence:

- at the microeconomic level – on the strategic behavior and performance of the firms [4, p. 1941]. The object of this activity is to take care of the "innovation life cycle" for specific products or business processes;
- at the macroeconomic level – the orderliness and acceleration of the firms' movement to the poles of gravity – strategic goals, priorities for the development of science and technology and innovation, announced and supported by the state [20, p. 8]. The object of this activity is the guardianship of the development of the "national innovation system".

Conceptually, the process of creating innovation within both the "innovation life cycle" and the "national innovation system" is considered as a sequence of several stages (*idea* → *research* → *development* → *implementation* → *realization*). Within the "innovation life cycle", the process of its creation can occur according to "conditional" rules, which are described by a comprehensive list of eight basic structural and logical schemes² [21, p. 4-9], seven of which are implemented in the process of creating an innovation, and eighth – in the process of its transfer. In the "national innovation system", innovation is considered as the result of the interaction of a set of legislative, structural and functional components (institutions) involved in the process of creation and application of scientific knowledge and technology and defining the legal, economic, organizational and social conditions to ensure the innovation process.

Therefore, the state management of the innovation activities development becomes a

separate important and complex task of the legislative and executive branches of authority, the implementation of which is connected with the adoption of relevant program documents of development and provision of measures for their implementation by specialists of the relevant qualification and competence. The training and retraining of such specialists are provided by the higher education system, as a component of the education subsystem of the national innovation system, in which, as a rule, several more subsystems are allocated. For example, Ukrainian national innovation system has five subsystems [22]: state regulation, education, knowledge generation, innovation infrastructure and production.

If within the "innovation life cycle" the latter is seen as a series of logical cause and effect relationships outside the environment of its creation, when the necessary resources and the firms providing them are not taken into account, then in the "national innovation system" instead, the causal relationships that accompany the development of innovation are not taken into account, and only a conglomerate of the forces and means existing in the national economy that support the implementation of the stages of the "innovation life cycle" is considered [23, p. 57].

Given that the interaction of firms in creating innovations within both the "innovation life cycle" and "national innovation system" is actually provided by "conditional" rules as defined by reflective norms, the terms of "innovation life cycle" and "national innovation system" in the mind of a firms' managers today can be considered established concepts that shape its behavior, and as a consequence, the behavior of an innovation-active firm. Therefore, the concepts of "innovation life cycle" and "national innovation system" should be considered as socio-cultural institutions of the institutional environment of the innovation activities development, the implementation of which allows optimizing transaction costs.

With this approach, fostering in the minds of the economic activity participants of the new concept "national innovation system – an environment for supporting the innovation life cycle" becomes an important task of public administration for the innovation activities development, the formation of which will ensure optimal correspondence between the micro- and macroeconomic levels of such management for a specific product or business process as a future innovation, significantly reducing transaction costs. That is, the concept of "national innovation system – an environment for supporting the innovation life cycle" should be considered as a compulsory socio-cultural institution of the institutional environment of the innovation activities development.

² The basic structural and logical schemes describing the process of creating innovation within the "innovation life cycle" are 1) simple sequential linear structure; 2) the radial parallel serial structure; 3) the fan parallel-serial cross-structure; 4) the serial-parallel ϕ -structure of type 1; 5) the serial-parallel ϕ -structure of type 2; 6) the serial-parallel ϕ -structure of type 3; 7) the serial-parallel ϕ -cross-structure; 8) the serial-parallel ϕ -structure of type 4 [21, p. 4-9].

4.3 ON INNOVATION-ACTIVE FIRM'S AND PERSON'S AUTHORIZED TO MAKES MANAGEMENT DECISIONS BEHAVIOR

Based on the terms of institutional economy – "individual", "institutional forms", "institution" the processes of formation and activity of the firm in today's market economy will be considered and modeled.

To model the process of the firm formation, we will set the term "individual" as a rectangle with a 3:1 aspect ratio, "institutional forms" – a square with a 2:2 aspect ratio, "institution" – a rectangle with a 1:3 aspect ratio.

We put all three figures on one another so that they have one common vertex, arranging the rectangles perpendicular to each other, and numbering the squares formed (Figure 2).

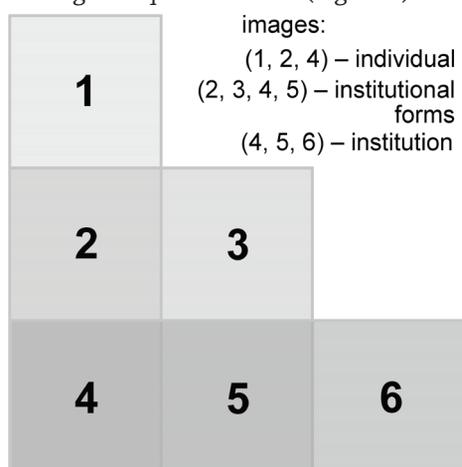


Figure 2 Modeling of firm formation in today's market economy

Sources: author's development

In Figure 2, "individual" is presented by squares 1, 2, 4, "institutional forms" are squares 2, 3, 4, 5, "institution" is squares 4, 5, 6. Obviously, the firm can be formed only at the intersection of all three of figures corresponding to square 4.

A simulation of a firm's activity in a market economy will be presented using the above approach to the process of its formation. In the imaginary three-dimensional "space of action" of the firm along the axes of the Cartesian coordinate system, we set aside the key attributes and motivating factors that should be given to or guide the firm's managers (individual) in making management decisions about the current activities of the firm. As the factors (features) for innovation activities, we choose: "courage", "trust", and "profit", with the axes of abscissa, ordinate, and applicate, respectively.

We imagine the three constituents of the firm (see Figure 2) with three parallelepipeds with the aspect ratio: "individual" – 3:1:1/3; "institutional forms" – 2:2:1/3; "institution" is 1:3:1/3 and we will lay them on top of each other so that they have one common "rib" along the axis of the applicate.

We draw on the axes the abscissa, the ordinate and the applicate the unit vectors \mathbf{c} , \mathbf{t} , \mathbf{p} as the

result of the division of a vector describing the relevant factors (features), which should be endowed or guide the firm's managers (individual) in making management decision, by the scalar of this vector at a particular point in time t : "courage" – $\mathbf{c} = \mathbf{C}/C(t)$, "trust" – $\mathbf{t} = \mathbf{T}/T(t)$, "profit" – $\mathbf{p} = \mathbf{P}/P(t)$.

Under such conditions, any firm E in an imaginary "space of action" at a certain moment t will look like a cube formed by three parallelepipeds with the aspect ratio of 1:1:1/3, with an edge length equal to one, and is described by three parameters $E(C(t), T(t), P(t))$ (see Figure 3).

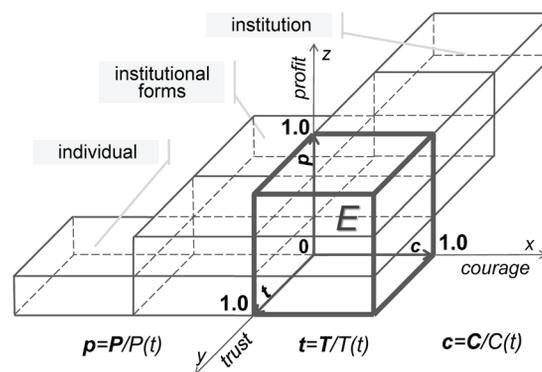


Figure 3 Modeling the image of firm E in an imagined "space of action" ("courage", "trust", and "profit") at a certain moment
 Source: author's development

This approach to modeling the firm's activity in a market economy allows us to examine the behavior of both the innovation-active firm and firm's managers in at least three aspects regarding: "courage" when making management decisions; the degree of "trust" in existing institutions and other economic agents; the amount of "profit" as a probable consequence of the management decisions implementation, as well as to describe the permissible limitations for doing business that can be defined: for the "courage" direction – as physical (the boundaries of the firm, market, geographical borders of the region, country, the continent up to the Earth limits, the latter, for example, in the case of space tourism as a commercial service); for the "trust" direction – as mental (from restrictions or permissions managed by the firm, the level of necessary legal support of the current activity; corporate social responsibility to the moral boundaries of its conduct with different – B2B, B2C, B2G – customer categories); for the "profit" direction – as economic (from the volumes: available resources and assets with which to start (develop) activities; profits received; taxes paid; funds paid for personal and social programs to hidden income and unpaid taxes).

The proposed theoretical model shows why two or more firms that are competitors in the "profit" direction of business can simultaneously be partners in the "trust" or "courage" directions (for example, the partnership of well-known Renault and Nissan companies to develop new car models on common

platforms and their sales in different markets).

The model provides an opportunity to describe and compare the behavior of all economic agents in all four sectors of the economy, including consumer behavior, for all institutional forms, and most of all – in network systems.

An example of a networking system, which phenomenon is still under investigation today, is the innovation ecosystems as a *collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution* characterized by three types of risks (initiative, interdependence, integration) [24], in which name, the term "ecosystem" is used in an economic context [25, p. 225] and which has [26, pp. 25-30]:

- universal features in terms of level of formation, develops on the principles of network self-organization and consists of four components: an idea, entrepreneurial experience, sources of funding and a community that combines components into one;
- characteristic features of decentralization and balance of interests, prioritization and identification, interactions between participants, adaptability, openness and information transparency;
- the potential for transformation into flexible (due to the development of Internet technologies) network of small groups of producers, consumers and intermediaries that will form from time to time (*ad hoc* organizations) within the framework of joint projects.

Given the universal nature of the innovation ecosystems in terms of its level of formation and the above modeling of the firm's image in an imaginary "space of action", we can conclude that the innovation ecosystem has the directions:

- "trust" – as a phenomenon arising as situational, and each time around specific subjects of activity by innovation-active firms that are participants of the corresponding network formed ad hoc, dominated by the principle of high mutual trust;
- "courage" – as a term can be interpreted as a tool to support the innovation activities development, in particular, at the regional and sectoral levels of the economy;
- "profit" – is a temporary "dynamic" formation that reduces the transaction costs of its participants through the interaction of their information, communication, social, competence, resource and creative components to ensure the stages of the "innovation life cycle" for a specific product or business process that a priori exist, but are situationally dispersed in innovation systems of different levels (firms, enterprises, companies, industries, regions, national) as "static" formations.

Therefore, the concept of "innovation ecosystem" should be considered as another important *socio-cultural institution* of the institutional environment

of the innovation activities development and as the basis for emergence of a "new intersubjective spirituality, the horizon of which is defined by the process of communication between participants, and the principles of formation – are equality of participants, orientation to the interests of "Other", mutual respect, responsibility and trust" [27, p. 72], the main among which is to identify precisely the principle of trust.

The notion of "trust" in the economic sphere is considered "as an attitude to firms and institutions, which expresses a measure of confidence in their behaviors with the idea of the behaviors" [28, p. 42], which is formed in the mind of the participant of economic activity, and the proper means of realizing the trustworthy image is the corresponding narrative as "a simple story or easily expressed explanation of events that many people want to bring up in conversation or on news or social media because it can be used to stimulate the concerns or emotions of others, and/or because it appears to advance self-interest" [29, p. 4].

Features of narrative are openness to interpretation by the participant when a certain (positive or negative) "image" of reality is created, which is then interpreted; the existence of a scenario in which narratives can be created, interpreted, or become "instructions" for constructing reality; future orientation, when the interpretation creates in the participant's mind certain attitudes towards the perception of reality. Creating narratives that build trust in economic participants and institutions involves presenting in the past the present time achievements and events of the past that have been appropriately addressed by participants in the narrative. Created and disseminated in the field of economic activity positive narratives are able to deliver real results in the form of growth of profits, success of firms and be fixed in the form of digital indicators. In fact, this is a kind of "conversion" of intangible capital into economic and financial assets and the creation of reality through narratives [27, p. 73-74].

Since narratives are formed by predominantly external economic participants to the innovation-active firm, in particular, consumers of innovation, such consumer should be considered as another key external factor in the innovation activities development. On the other hand, firm E_1 that "created" innovation "A" may be a consumer of innovation "B" created by firm E_2 . In this case, the firm E_1 that intends to "consume" innovation "B", being "alone" with the plurality of "B_i" similar presented in the market of innovation may need help by addressing as "customer" to the "intermediary" firm E_3 that will facilitate its choice, for example, in favor of innovation "B₂" from firm E_2 or "B₄" from firm E_4 . Thus, when making a management decision, firm E_1 is influenced by the narratives that are formed and spread by at least three firms E_2 , E_3 , and E_4 . Similar considerations apply to innovation "A" created by firm E_1 , which

intends to "consume" firm E_2 , etc.

Thus, in the external environment, there are many narratives at the same time, which are the means of influencing the firms' managers of any firm and are freely (or specially) in spreading the means of communication. As a consequence, the external environment can be considered as a communication network in which narratives are formed and spread and thus influence the decision-making process of management. However, the "success stories", by which innovative firms and consumers of their innovations create and disseminate narratives, will depend on the roles ("creator", "consumer", "customer", "agent") that they can simultaneously "play".

4.4 ON STRATIFICATION OF COMPONENTS OF THE INNOVATION ACTIVITIES DEVELOPMENT ENVIRONMENT

We model one of the possible options for solving the task of creating and launching innovative products with new consumer features.

To do this, in an imaginary "space of action", taking into account the three-component model of the management process "action-decision-action*", where "action" is the stage of development, "decision" is the fact of adoption, and "action*" is the stage of implementation of management decision [19, p. 33], we will consider the behavior of four firms E_1, E_2, E_3, E_4 , which play corresponding roles during the observation period: E_1 - "creator", E_2 - "customer", E_3 - "consumer", E_4 - "agent".

We suppose that during the observation period at time:

- t_0 - firm E_2 ordered firm E_4 (the owner of the consumer information database) to research the opinions of consumers (firm E_3) on new features that should be further provided with innovative products;
- t_1 - firm E_2 received research results and commissioned firm E_1 to produce innovation products with new consumer features;
- t_2 - managers of firm E_1 , being at the "stage of management decision-making" found itself in a state of information uncertainty, turned to its own information sources and to the agent - firm E_4 (owner of technology database) for additional information, and as a result, made a management decision to purchase the necessary technological line from a specific manufacturer;
- t_3 - firm E_1 launched a trial batch of innovation products with new consumer features and invited firm E_3 as a consumer to test it;
- t_4 - firm E_1 began to supply innovative products with new consumer features to the customer - firm E_2 ;
- t_5 - firm E_2 brought innovation products with new consumer features to market and commissioned its expert evaluation for firm E_4 (owner of the expert information base).

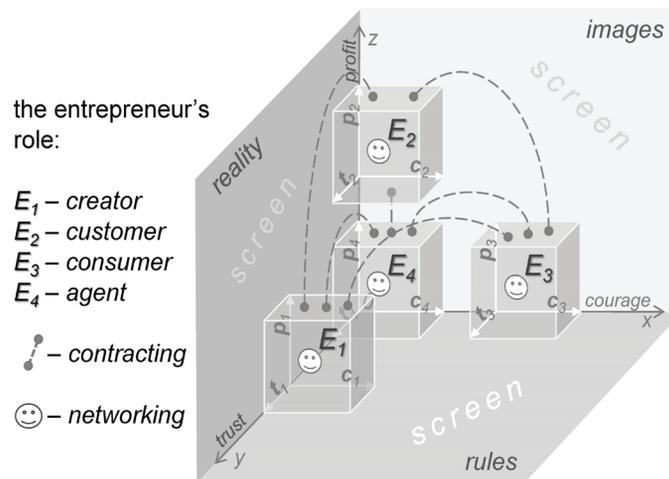
Therefore, at least an agreement should be in place between E_1, E_2, E_3, E_4 firms to accomplish this task:

- between E_2/E_4 - a study of "consumers" interest in a range of new features that can be further provided with innovation products;
- between E_2/E_1 - production of innovation products with additional features;
- between E_2/E_3 - expert evaluation of new consumer features of innovation products;
- between E_1/E_4 - information support and technology transfer services;
- between E_1/E_3 - testing innovation products with additional features;
- between E_4/E_3 - participation in surveys on new features of innovation products or new products appearing on the market.

Obviously, the proper implementation of these agreements by each of the firms (E_1, E_2, E_3 and E_4) depends on the timely adoption of the necessary management decisions by their managers and quality assurance of their management process for their implementation. Therefore, the management of firms E_1, E_2, E_3, E_4 as entrepreneurs in accordance with their chosen roles must effectively operate all the necessary components of the environment of innovation activities development in each of the areas of imaginary "space of action": "courage", "trust", "profit", the main of are convenient to stratify according to three - "reality", "images", "rules" on imaginary screens (Figure 4).

To do this, in the "space of action" of the firm we denote firms E_1, E_2, E_3, E_4 in the form of cubes with a volume equal to one, set their corresponding unit vectors c_i, t_i, p_i , where $i = 1, 2, 3, 4$, collinearly, we place three cubes around the fourth one along each axis of the imaginary "space of action" in an arbitrary order and imagine that:

- actions of firms, both within and outside the established agreements, occur according to certain rules, the formal routinization and compliance of which make their actions legally, economically and socially predicted and protected. Such behavior of firms can be described in the plane of "economic" limitation of their activities, which gives grounds to place the "rules" screen parallel to the plane XOY and to bring to it such components of the environment of innovation activities development, as: constitution; state; legal institutions of the institutional environment of the innovation activities development; institutional forms; rights; duties; norms; rules of life, behavior, coexistence, moral;
- a person or group of persons authorized to make management decisions for firms E_1, E_2, E_3, E_4 when do it, having limited time for this and being in a state of information uncertainty, trust their ideas about the reality formed on the basis of their own experience and narratives. This leads to the fact that the behavior of firms E_1, E_2, E_3, E_4 can be described in the plane of "mental" limitation of their activities, which



screen / components	
"rules":	constitution; state; legal institutions; institutional forms; rights; duties; norms; rules of life, behavior, coexistence, moral
"images":	socio-cultural institutions; concepts; narratives; reputation; goodwill; corporate social responsibility
"reality":	the person, and his/her business qualities; information; management decision; agreement; production process; product; business process; goods (services); market, advertising; innovation; competitiveness; consumer; value chain; profit zone; employee, and his/her knowledge and skills

Figure 4 Simulation of E_1, E_2, E_3, E_4 firms' entrepreneurial behavior, roles, and interaction in an imaginary "space of action" and stratification of the main components of the environment of innovation activities development
Source: author's development

gives reason to place the screen "images" parallel to the plane X0Z and bring to it such components of the environment of innovation activities development, as: socio-cultural institutions of the institutional environment for the innovation activities development; concepts: "innovation life cycle", "national (regional, sectoral, etc.) innovation system", "national innovation system – environment for supporting the innovation life cycle", "innovation ecosystem"; narratives; reputation; goodwill; corporate social responsibility;

- actions of firms E_1, E_2, E_3, E_4 in the stage of management decisions implementation are related to attracting and transforming their own material and technical base and industrial capacities, proper investment and human resource supply, etc. Such behavior of the firms can be described in the plane of "physical" limitation of their activities, which gives grounds to place the "reality" screen parallel to the plane of YOZ and bring to it, in particular, such components of the environment of innovation activities development, as: the person or group of persons authorized to make management decisions, and his/her/they business qualities; information; management decision; agreement; production process; product; business process; goods (services); market, advertising; innovation;

competitiveness; consumer; value chain; profit zone; employee, his/her knowledge and skills.

5 Conclusions

Innovation activity is a complex, long-lasting and multidimensional phenomenon that arises out of necessity and unfolds under certain "conditional" rules in time, space and environment. At the same time, the environment in which innovation activity and its development begin and take place, and the consumer, who with his purse in some time "votes" for its result, become key external factors for the innovation activities development. Instead, the behavior of the person or group of persons authorized to make management decisions to innovation activity, the amount and completeness of the information at its disposal at the time of its adoption, the ability and behavior of the firm that takes that management decision as task within its legal capacity, together, become key internal factors for the innovation activities development.

The information uncertainty in which the person or group of persons authorized to make management decisions is a priori in making management decisions about an innovation activity is a consequence of his/her ideas about the image of the reality that surrounds him/her and the actions of the relevant economic agents formed under the influence of a set of positive and negative

narratives. Therefore, narrative is an effective means of building a credible image of the firm in all four sectors of the economy and facilitating the innovation activities development at the micro- and macroeconomic levels.

Given that at the microeconomic level, the incentive to create innovation is the expectation of an increase in market share, sales or profit, and the transition of the firm to the innovation activity becomes the expected task of its development, as a means of visualizing and formalizing the description of the time flow and space of processes of "growth → development", we proposed "Matrix of development / growth" of the firm in the market economy", which contains three stages of "growth" ("identity", "difference", "contradictions") and three levels of development as three stages activities ("non-innovation activity", "innovation activity", "post innovation activity") of the firm. Because several different products and processes may be the scope of a firm, the firm may be at different stages of growth and levels of development at the same time.

Public administration for the innovation activities development is a separate task of the legislative and executive branches of authority, and the solution for it is at least related to: the adoption of relevant programming documents of development and implementation of measures for their implementation; with the formation in the public consciousness of the necessary concepts for the innovation activities development as socio-cultural institutions of the institutional environment and narratives; with the preparation of the higher education system, as a component of the education subsystem of the

national innovation system, specialists of the relevant qualification and competence.

Consideration of processes of formation and activity of the innovation-active firm in imaginary three-dimensional ("courage", "trust", "profit") "space of action" allowed: to represent the innovation-active firm with a cube of a single volume, described by three corresponding parameters; consider the roles ("creator", "customer", "consumer", "agent") of the firm that it may perform in the course of the activity, in particular at the same time; determine for each of the areas of "space of action" the permissible limitations for the firm (respectively, "physical", "mental", "economic") in doing business; to discuss the phenomenon of the "innovation ecosystem" and propose its corresponding interpretations; to present the appearance of the environment for the innovation activities development from the position of the firm, stratifying its components into three ("reality", "images", "rules") screens.

The obtained research results allow us to better understand the peculiarities of innovation activities development at the micro- and macroeconomic levels, to organize descriptive definitions, to consider them in the future as terminological and to evaluate their applied use in making appropriate management decisions in innovation activity, including in public administration, transit during planning of innovation activities development to practical application of the proposed theoretical model of behavior of the innovation-active firm in the imaginary "space of action".

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