

## Fractal Organization as Innovative Model for Entrepreneurial University Development

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**Abstract:** The article is devoted to the issues of building an entrepreneurial fractal university. The authors examine characteristics of entrepreneurial universities under reforming and modernization of a vocational training system. Particular emphasis is directed to the academic and intellectual entrepreneurship caused by embedding entrepreneurial culture traits in the university's staff organizational culture. Given this, it is the fractal organizational structure, characterized by self-similarity, which is investigated as the key mechanism for the new culture development. Assuming that the building of fractals is facilitated by organizational social values and networks, the authors turn to the basic features of social capital such as "reciprocity" and "trust" as the indicators of entrepreneurial culture development. Having analyzed the challenges which entrepreneurial universities are facing in Russia, the authors highlight the potential of a fractal university as an innovative model for creating and developing the co-entrepreneurial culture of the university staff and employees.

**Key words:** Academic entrepreneurship • Intellectual entrepreneurship • Entrepreneurial university • Systematic innovation • Fractal organization

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### INTRODUCTION

While triggering modernization of vocational education in most countries, challenges of globalization have caused dramatic changes in the status of educational institutions in the global market of educational services. P. Scott pointed out that 'all universities are subject to the same processes of globalization - partly as objects, victims even, of these processes, but partly as subjects or key agents of globalization'. They are positioned within national systems "locked into national contexts" and the majority are still state institutions. Yet globalization 'is inescapably bound up with the emergence of a knowledge society that trades in symbolic goods, worldwide brands, images-as-commodities and scientific know-how" [1]. Developing this idea L. E. Steele states: 'The concept of globalization has had varying effects on universities in the periphery, but even more so, on the more traditional of them [2].

Demand for a greater ability to compete has resulted in the universities' policy of 'academic capitalism' which implies either introduction of student tuition fee or its

increase, shift from scholarships and grants to educational loans, commercialization of universities' research, attracting private donations, signing contracting on research and personnel training with businesses, etc. and, therefore, emergence of entrepreneurial universities as specific educational market structures and active agents of this policy.

Annual reports of the Association of University Technology Managers (AUTM) help to reveal the role of entrepreneurial universities in the development of the world and national economies. Since the Bayh-Dole Act, assigning ownership of federally-funded inventions to academic institutions, was passed by the U.S. Congress in 1980 U.S. universities have generated 6,000 new businesses and have created 4,300 new products and 153 drugs. Even through the Great Recession period university technology commercialization has continued apace. Over the past decade the pace at which U.S. universities licensed inventions and spun off companies increased considerably, with the average number of inventions per university exceeding 56%. Only in 2009 due to the Bayh-Dole Act major provisions U.S. universities generated \$2.3 billion in licensing income with

29.4 licenses per institution, while an average academic institution generated 3.3 start-ups, more than double the 1994 level [3].

Recent global and national surveys on academic entrepreneurship have provided generalized data on the entrepreneurial universities' practices in the USA, Canada, Mexico, Australia, Sri Lanka, in European and some other countries. Russia witnessed advent of academic entrepreneurship caused by the government attempt to reform the country's vocational training only at the beginning of the 21<sup>st</sup> century. Despite a steady global increase in the number of entrepreneurial universities, neither international science nor international academic policy can clearly define their essence and conditions for development.

The article explores potential applications of a fractal structure as an innovative model to building an entrepreneurial university. This is supposed to be realized through a deliberate bottom-up strategy of entrepreneurial culture fractals dissemination based on new co-entrepreneurial competences acquired by employees. The first section reviews evolution of an entrepreneurial university concept in the context of necessity of creating intellectual entrepreneurship culture as a basis for building entrepreneurial higher educational institutions. In section two we analyze some propositions of the fractal company theory to portray the functional content of the university entrepreneurial culture fractals. Section three dwells on the issues of building fractal entrepreneurial universities on the basis of the collectivist strategy of embedding co-entrepreneurial culture, with reciprocity, employees' involvement in innovative processes and based on trust relationships being the most important indicators of the culture evolution. In the final section, considering Vladivostok State University of Economics and Service as an example, we present basic findings of the present research and spell out the main directions of our further studies.

**Basic Features Of Entrepreneurial Universities:** The idea of an entrepreneurial university was originated in the works of Henry Etzkowitz and Burton Clark.

In 1983, in the article *Entrepreneurial Scientists and Entrepreneurial Universities in American Academic Science*, H. Etzkowitz conceptualized "entrepreneurial universities" as academic institutions which would actively acquire commercial characteristics by entering partnerships with private businesses, by patenting and licensing their discoveries, i.e. by selling knowledge gained in research and, thus, by seeking for the new sources of funding their activities [4].

The concept of an entrepreneurial university introduced in 1998 by the American sociologist Burton R. Clark in his study *Creating Entrepreneurial Universities. Organizational Pathways of Transformation*. According to Burton R. Clark, an American sociologist and ideologist of an entrepreneurial university, "the concept carries the overtone of "enterprise" - a willful effort in institution-building that requires much special activity and energy. Taking risks when initiating new practices whose outcome is in doubt is a major factor. An entrepreneurial university, on its own, actively seeks to innovate in how it goes about its business. It seeks to work out a substantial shift in organizational character so as to arrive at a more promising posture for the future. The author focuses his attention on the process of a university transformation from its traditional to entrepreneurial model, the five key 'pathways' for which being the strengthened steering core, the expanded developmental periphery, the diversified funding base, the stimulated academic heartland and the integrated entrepreneurial culture [5].

In 2000, H. Etzkowitz and his colleagues came to the conclusion that an entrepreneurial university was turning into a global phenomenon and presented their *entrepreneurial paradigm* or so called *The Triple Helix model of academy-industry-government relations* [6].

Academics' citations used by Fl. Smarandache and Șt. Vlădușescu [7] in their studies on evolution of an entrepreneurial university concept prove pressing character of the issue alongside with its insufficient scientific argumentation. For example, D. Woollard, O. Jones and M. Zhang came to the conclusion that *entrepreneurial* or so called *the third mission* approach to the university concept might produce lack of its understanding or even misunderstanding. According to Bratianu C. and Stanciu St. the concept of "an entrepreneurial university is still fuzzy and culturally dependent."

Most researchers of the contemporary entrepreneurial universities agree with the concept ideologists that activities of this type *enterprises* are based on academic entrepreneurship, i.e. commercialization of the universities' research outcomes through creating start-ups, patenting, licensing, etc. A shift toward academic entrepreneurship is characterized by an increase in the number of traditional academic goals of a university - educating and research and by adjustment of its new goals - fostering the regional social and economic development - to the academic ones. An entrepreneurial university is a modern phenomenon,

realized by the academic community as a new method of production, based on continuous inflow of organizational and technological innovations.

The researchers emphasize that academic entrepreneurs should not reduce their endeavors to only profit making and developing new mechanisms of financing. Academic entrepreneurship is *creative destruction* resulted from entrepreneurial activities within the academy and based on managerial decisions which providing a proper balance between centralization and decentralization, standardization and flexibility, mechanic and organic structures. In this context careful consideration of external environment is a must [8].

Having studied international experience, Russian researchers Konstantinov G.N. and Filonovich S.R. identified three basic areas for entrepreneurial universities where academic entrepreneurship functions as a barrier-breaker:

- Knowledge generation by developing research methods and investigating new fields of knowledge or new issues in familiar ones;
- Teaching/ training by using innovative educational techniques and modified teaching/ training contents thereby implementing the latest scientific and technological achievements into educational process;
- Practical application of theoretical knowledge by building relationships with the university's external environment [9].

What has gained special importance in the sphere of academic entrepreneurship is intellectual entrepreneurship focused on organizational learning and knowledge as resources able to create value due to new combinations of organizational knowledge. Intellectual entrepreneurs concentrate their endeavors on educating employees, on creating, sharing and cooperative utilizing of knowledge, on visualizing their university's future rather than on delving into its past [10].

The term *intellectual entrepreneurship* was suggested by the American scholar Chervitz R.A. in 2002. In his work *Intellectual Entrepreneurship. A vision for graduate education* the author offers four *core values* upon which intellectual entrepreneurship is based: vision and discovery, ownership and accountability, integrative thinking and action and collaboration and teamwork [11]. Later in the article *Creating a Culture of Intellectual Entrepreneurship* Chervitz R.A. has stated that while intellect cannot be restricted to the academy, "creating

material wealth is only one expression of entrepreneurship. Entrepreneurship isn't a synonym for business; it is an attitude for engaging the world - a process of cultural innovation" [12].

The most critical factor facilitating academic and intellectual entrepreneurship development is obviously universities' human capital. If entrepreneurial universities' leadership and staff realize their urgent need for innovations and, therefore, initiate development of ideas and collaborate in their implementation trying to match commitment to academic values with a corporate culture of innovation, they will succeed in creating and utilizing their innovations [13]. Nevertheless, further development of entrepreneurial universities is impossible without realizing and utilizing so called *synergy* effect. In this connection, it is interesting to analyze the results of the students' research conducted within the Intellectual Entrepreneurship program (Prof. R. A. Chervitz and Ch. A. Sullivan [11]) at the University of Texas, Austin. According to the findings, intellectual entrepreneurs are in a constant search for developing new ideas and visions for their professional work within the framework of their competences. During *a discovery process* individuals learn much more about themselves and about their potential and, therefore, develop their intuition and skills in economic forecasting. As owners of their unique professional knowledge, experience, skills, abilities and talents "intellectual entrepreneurs take responsibility for acquiring the knowledge and tools required to bring their vision to fruition."

The *synergy* stimulates intellectual entrepreneurs to generate knowledge, thus, removing obstacles to the individuals' intellectual potential and eliminating restrictions on creating knowledge and achieving better social and economic results. Collaboration and teamwork are integral parts of the *synergy* effect. Working collaboratively, individuals build up intellectual communities, consisting of various networks (intellectual centers, universities, forums, venture funds, etc.) and tackling the problem of limited resources. At the same time to perform their part of teamwork intellectual entrepreneurs are required to realize who they are, what matters most to them and what possibilities are available to them.

In business incubators and *synergy groups* this effect creates opportunities for the students and faculty to reveal their personal and professional potential, to use their expertise in collaboration with individuals outside the academia, to cooperate with stakeholders from public and private sectors in solving community common problems.

We assume that development of such mechanism for creating entrepreneurial self-organizing universities should be based on the fractal theory.

**Fractal Organization as Requirement for Entrepreneurial University Development:**

The term *fractal* (from the Latin word *fractus*, meaning fractured, broken) was introduced by the French mathematician, physical scientist and biologist Benoit Mandelbrot to label geometric objects in which the part and the whole are similar in some way, i.e. have similar properties (self-similarity) at all levels of magnification. Dr Mandelbrot’s pioneering research was followed by attempts to explain disorder or chaos as a result of bifurcations, thus, to apply fractal theory to chaotic systems, both social and economic, as well.

The concept of a *fractal company* introduced by H.J. Warnecke is especially important for understanding the issue of entrepreneurial universities. In H.J. Warnecke’s sense a fractal is “an independently acting corporate entity whose goal and performance can be precisely described” and whose activity is based on such principles as self-organization, self-optimization, functional transparency of processes and dimensions, employee motivation, company goals comprehension, taking quality for granted, realizing internal and external competition [14]. Sihm W. extended the number of principles by adding up self-similarity, self-optimization, dynamics/ vitality/ adaptability and holism. Fractals function due to their ability to attract necessary resources and availability of a certain degree of autonomy for

self-initializing their operations and decision making. The rules of the game between fractals of different levels are determined by their relationships. Fractals always optimize their goals, performance and characteristics in order to react adequately to the market requirements [15].

The differences between fractal and traditional systems, i.e. fractal and hierarchical structures, are summarized in Table 1.

The fractal company is an open system which either consists of independently functioning self similar units, the fractals, or is an integral part of a fractal by itself. H.J. Warnecke, the founder of the *fractal factory* theory, focused his special efforts on the study of relationships among fractals as structures executing their tasks due to their mutual servicing. According to this approach, fractals cooperation results in creating various groups with their own structures but functioning as a coherent whole, i.e. a *fractal factory*. Its potential is rooted in its values and the culture of manufacturing. Each fractal and finally each workplace should be analyzed as a whole enterprise: specific work should be done though comprehensive joint efforts while every task should be executed autonomously. Therefore, it is ideology rather than a product which becomes the key issue for the fractal company management [14]. For fractals to develop companies need a specific organizational culture, the one stimulating their employees to act as entrepreneurs.

To summarize, the fractal approach highlights those processes which govern and facilitate employees’ development, including building-up their entrepreneurial competences as a must for contemporary universities.

Table 1: Differences between fractal and traditional hierarchical company

Dimensions	Traditional Company	Fractal Company
Organizational Structure	The company is the sum of its activities and strategic fields of business.	The company is an integrated system with all its processes and structures.
Company Development	The company develops in a linear, stable and predictable as well as manageable and controllable way.	The company develops non-linear but with leaps in development and transformations according to laws of probability. This development can be controlled, however it can not be predicted.
Hierarchy	The organizational structure is a matrix hierarchy.	The organizational structure is superordinate and interlinked, it is the basis for the company fractals.
Component Relationship	Administrative higher unit and passive lower units! Controllers at the same level in the hierarchy have similar functions	Coordinative higher fractal and active lower fractals Every fractals have same functional modules
Data Availability	Information is handled according to its priority and momentary necessity and this is bases on the division of labor (bring-principle).	Information is available for everybody and is evaluated individually to profit-points of view (fetch-principle).
Goal-orientation	Work according to specified objectives. Certain departures from the plan are periodically corrected by new plans and compensated by holding resources in stock.	Work through the goal-formation process. Goals/fulfillments of objectives are not planned in detail. Self organizing, self acting units secure the intermediate results.
Adaptability	Suitable for a stable environment	Suitable for a turbulent environment
Flexibility	Not flexible	Flexible
Relationships with Stakeholders	Business dealings with suppliers, commercialization and competitors are of the kind of the zero-sum-game (what I win, you will lose).	All business dealings aim in fact or potentially at making a joint profit (together we will win).
Relationships with External Environment	There are clearly defined limits within the fields of the company and between company and environment.	Limits are fuzzy as well as permeable to information and they are characterized by process-functional links.

Sources: [16,17]

Fractal universities have been and are still in the focus of research in many European countries. What is emphasized by most authors is the fractal character of the universities' organizational structure and their ability to function as self-organized, autonomous research teams and learning groups of stakeholders, which allow for their fast adaptability to the changes in internal and external environment and the proper allocation of their resources to achieve the goals set [18]. However, this approach seems to be limited due to inability to investigate the nature of changes in employees' behavior, resulted from development of incentives, motivation, their competence models and profiles.

Analysis of the existing scientific approaches to the functional nature of fractals allows us to specify components of a university's entrepreneurial culture, which correspond to different level of its fractals:

- Goals, vision, mission;
- Priority guidelines and tasks of organizational development;
- Relationships procedures, patterns and operations;
- Managerial and organizational processes.

The fractal approach to organizations allows description of a system of fractals which characterizes the corresponding level of organizational entrepreneurial culture and functions at the corresponding level of entrepreneurial environment. Within the framework of our research the smallest fractal unit of a university is considered to be an employee - an inner stakeholder and entrepreneurial competences bearer. Therefore, the first level fractals are characterized by a low level of entrepreneurial culture development. The boundaries of the second level fractals are determined by relationships procedures, patterns and operations of employees, project and other teams/groups, including university departments aimed to achieve common goals. Considering the fact that organizational socialization in the cause of these fractals' building does not hinder reciprocal character of the organizational culture changes, fractals of the second level correspond to the middle level of entrepreneurial culture development.

Functioning of the third level fractals is conditioned by the relationships between internal and external stakeholders collaborating in realization the university's vision, mission and strategies at the level of the university, its branches and even managerial innovations, such as franchising, outsourcing, etc. These fractals are characterized by the highest level of the entrepreneurial culture development.

The biggest or the fourth level fractals refer to communities and their relationships with external stakeholders. Such fractals go beyond the boundaries of the organization's entrepreneurial culture and operate within the boundaries of specific territories, for instance, within an entrepreneurial region. Therefore, communities as large as countries might be referred to as fractals of the highest level, which are characterized by entrepreneurial business culture. Under globalization it would be logical to suppose that the highest level fractals may emerge within the boundaries of international communities.

Our studies show that it is a fractal organizational structure which is able to provide sustainable development of entrepreneurial universities [19]. Recent experience of Russian universities has proved that without fundamental internal changes all the top-down efforts of leadership to build an entrepreneurial university being guided only by a new mission are unlikely to be successful. Already in 2003-2004 a few out of 38 Russian universities, participants of the project *Strategic Planning of Russian Universities Development*, were involved in development a strategy for entrepreneurial universities. The project was initiated by the *Journal University Management: Practice and Theory* and co-sponsored by *The Ford Foundation*. In September 2011, at the 4th St.Petersburg *International Innovation Forum the Skolkovo Fund* and a number of the leading Russian universities signed a declaration on creation of the Association of Entrepreneurial Universities of Russia. Enhancing innovation-friendly environment as a resource for encouraging entrepreneurship in higher education institutions was emphasized by the Russian Prime Minister Dmitry Medvedev at the meeting with experts in university-based entrepreneurship development in Novosibirsk Academgorodok, held on August 7, 2012.

**Issues of Creating an Entrepreneurial Fractal University:** Building an entrepreneurial university requires a deliberate and consistent development of entrepreneurial culture fractals to turn traditionally-minded institutional staff into co-entrepreneurs, bearers of new entrepreneurial competences.

The fractal approach used in our research allows us to explain the evolution of the staff and students' entrepreneurial culture which is specified as a critical consideration for entrepreneurial universities creation.

Therefore, with reference to the fractal theory, which defines *fractal* as any dynamic continuous bifurcation characterizing system transition from order to chaos, a great amount of changes related to dissemination of entrepreneurial competences in various, relatively

autonomous, units of an organization (academic and administrative departments, subsidiaries, informal groups of learners and employees, etc.) results in emergence and accumulation of gradual evolutionary distinctions in organizational culture.

Till entrepreneurial culture remains an isolated sub-culture, these changes are reversible and are not reinforced by the set of values proclaimed by the organization's leadership. Further accumulation of changes caused by internal and external factors allows overcoming the critical point of bifurcation. As a result, a group of employees, bearers of entrepreneurial values, identifies itself as a new, relatively autonomous, unit whose experience is transmitted and reconstructed by other similar groups.

Fractal movement resulted from such organizational socialization resembles a succession of self-maintained changes which are self-organized around a self-built internal pattern. According to the principles of socialization offered by Nikolaeva E.M. [20], this self-building process may be realized according to already existing institutionalized social patterns or practices, according to absolutely new pattern or practices or it may be a creative endeavor aimed to seize new opportunities. As a result of controllable socialization fractals - sub-cultures of entrepreneurship - provide foundation for defining the core values of entrepreneurial culture.

To illustrate the process we should correlate the fractal approach principles with the three-stage concept of entrepreneurship organizations evolution by R. Wunderer and P. Dick [21]:

- Entrepreneurship is not only generating new ideas, but also identifying, developing and applying new combinations of a company's resources. An *entrepreneur* is a person who is pushing down any limitations rather than adjusting to them. Creating sub-culture of entrepreneurship is correlated with building the first level fractals.
- Intrapreneurship refers to the deliberate use of employees' entrepreneurial talents and creativity. *Intrapreneurs* - entrepreneurs in entrepreneurship - are large corporation employees who are distinguished by a specific entrepreneurial spirit. Therefore, development of entrepreneurship sub-culture is correlated with building the second level fractals.

- Co-entrepreneurship is targeted at the long-term growth of the company's value or its maintenance at the proper level by providing value added benefits for the key stakeholders such as employees, customers, suppliers, investors and society in general. Further evolution of entrepreneurship sub-culture results in creating entrepreneurial culture of organization and is correlated with building the third level fractals.

Reviewing of entrepreneurship in German companies evidences that *co-entrepreneurs* are competent, active and trustworthy partners who are characterized by distinguished expertise in developing concepts and in operating as well as by their social competence, i.e. emotional and social intelligence and morality. The culture of co-entrepreneurship is conditioned by actual and efficient support to the company's strategy from the most part of its employees at all hierarchal levels and in all functional departments. This support should be manifested in the employees' strive to do their common tasks, to be socially competent and to be guided by initiatives and accountability. Building a fractal organization is, therefore, conditioned by the collectivist strategy of embedding co-entrepreneurial culture. Only this approach provides favorable prospects for fractal universities as organizations where, according to M. Senge, "the individual is a mirror of the whole and the whole is a mirror of the individuals" [22]. The collectivist strategy of entrepreneurial organization is grounded on the perception of the company's sustainability and progress as a concern shared by all employees. The strategy implies building of a community of entrepreneurs, which networks all hierarchal levels, creates and maintains innovation-friendly organizational climate. Building fractals of entrepreneurial culture (an individual - a group - an organization) is considered as a new mechanism for creating an entrepreneurial university. In many respects, this can be explained by the necessity to employ not only methods of organizational learning but also those of disseminating and interiorizing organizational knowledge. The fact that this approach can be applied to building a learning organization is of crucial importance for creating an entrepreneurial university.

Conner M. L. and Clawson J. argue that building a learning organization may be governed by the principles of a fractal organization where every level of sub-culture reduplicates characteristics of other levels and has

common features, core values and set of common rules and traditions. Even without an in-depth study of learning organizations we can highlight social competences of fractal actors and their social networks as their specific characteristics. It is the fractal community where employees feel involved into internal and external organizational processes encouraged by a common set of rules and global principles and their commitment to the community's norms and morals. Every fractal community accumulates its own local learning experience, which enriches organizational system of learning and shares its benefits [23].

The key findings of the fractal structure studies show that ability to maintain the most essential characteristics of a fractal does not depend on the number of participants because its basic configuration, principles of organization and conditions for relationships are of common nature. The greater the scale of the fractal, the greater the learning potential of the whole network and the greater its influence on the local level of the fractal. This depends on the ability of all-level fractal communities to create the atmosphere of trust, reciprocity and common values. The key factor for the increase in the fractal scale is the increase in social capital at all its levels. This corresponds to the philosophy of an entrepreneurial university, with knowledge transmission not considered as the only its function. The university should identify itself as a system, generating social networks with a higher level of social capital and able to solve sophisticated intellectual tasks.

Therefore, criteria and indicators of social capital development can be used as qualitative indices to evaluate development of a fractal organization, based on its entrepreneurial culture. This method of measuring social capital might not be considered the only one. There are at least two reasons for this: first, absence of a universally recognized definition of social capital and second, implicit or relative character of the social capital components.

Though methodological dispute on social capital goes beyond the scope of this article, we should emphasize that ability for self-organization and collaboration, which characterize societies and communities possessing social capital, is of fundamental importance.

Taking into account that social capital is inseparable from trust, norms, values shared in society and social networks, this approach allows us to analyze fractals' characteristics and their vitality based on and resulted from their internal and external relationships.

Thus, fractals' reciprocity, employees' involvement into innovative networks and based on trust relationships may be used as indicators of entrepreneurial culture fractals evolution.

Reciprocity as a type of social integration, i.e. mutual obligations or mutual servicing, is based on the individuals' commitment to the social norms adopted in the course of their socialization. If compared to economic exchange, reciprocity is less transparent and more uncertain.

Nevertheless, reciprocity stimulates accumulating of social capital which in its turn not only preconditions reciprocity per se and its reproduction but also creates possibilities to solve economic issues. Reciprocity helps to transform social capital into economic capital which creates new motivational climate facilitating dissemination of entrepreneurial competences and creation of entrepreneurial culture fractals. Existing methodical approaches to measuring reciprocity are based on calculating reciprocity coefficient of elementary fractal as arithmetic mean of reciprocity indicators of all reciprocal pairs within the fractal. Building fractals of entrepreneurial culture at different levels - from the lowest to the highest - is connected with disseminating of entrepreneurial values and behavioral norms through networking.

As a network member, individual possesses a potential for the usage of his social capital. This potential depends on the individual's ties and models of relationships within the communities he is involved in or has access to, on the status of these communities and on the pattern of their relationships. The concept of bonding and bridging social capital developed by M. Granovetter, R. Burt, N. Lin, S. Portes and J. Sensenbrenner considers this approach as well as the networks theory.

Among indicators of social capital used in our research it is necessary to highlight indicators offered in the research of *Policy Research Institute, Canada* (September 2005) [24]. The authors of this research consider measurable components of social capital, characterizing its availability or presence and functioning within intra- and inter-organizational networks. To handle the problems of our research we should adopt PRI, Canada measurement procedures to measuring fractals of entrepreneurial culture, with economic component of the *trust* concept deserving special consideration. In scientific publications the preference in *trust* conceptualization belongs to F. Fukuyama, who determines trust as expecting of a steady and honest behavior of community members based on the common values they share [25].

When prevailing in society, trust-based relationships generate social capital, which differs from other forms of capital by the culture-related mechanism of its creation and transformation, i.e. religion, traditions or historic habits. Trust can be measured by calculating its *radius* - the radius of trust, which depends on the number of group members, self-organized around some common norms. There are a few methods, including organizational procedures, specifying this indicator, such as delegating responsibilities to individuals and teams, fundamental restructuring of organizational processes, providing autonomy to the company's departments, cooperation between teams and groups, creating inter-firm alliances.

**Concluding Remarks:** Finally, we can conclude that the fractal approach to building an entrepreneurial university allows to consider new sources of vocational training modernization, aimed to facilitate all form and factors of entrepreneurship and, therefore, provides entrepreneurial universities as agents of innovations with efficient tools of capitalizing their innovations.

The systemic innovation in marketing model, offered by a Japanese researcher Shimaguchi M. may be used as a basis for stimulating fractal approach in building entrepreneurial universities. Such innovation is viewed as a result of gradual accumulation of changes, a source of competitive advantages, a new equilibrium point, which raises offered to the client level of value creation and stimulates customers' loyalty [26]. At present the systemic innovation approach is characterized by seven interrelated areas: an innovative business model, innovative strategies, an innovative organization, innovative business processes, technological innovations, an innovative marketing and an innovative product. The integrity of these functional areas is obviously exceptional for development of the whole organization due to its great *synergy* and *multiplier effects*.

Every entrepreneurial university is undoubtedly able to build its own system of entrepreneurial culture fractals, which is based on the systemic innovation. Today, Vladivostok State University of Economics and Service has started a new large-scale *VSUES-City* project. This idea of inside-the-university business environment is targeted towards creating favorable conditions for building business units or, in fact, fractals of entrepreneurial culture.

*VSUES-City* is supposed to have its own bank, court, tax and labor law agencies, HR agency, house cleaning

services, manufacturing and sales companies, beauty salons, fashion tailor shops, photographic studios, restaurant and hotel, used as training centers, etc [27].

After testing, the pilot models will be integrated into all the university education programs. This will require a fractal-like systemic, institutional change in the content and organization of educational process and in implementation of integrated transformations in resources and project time-periods and stages. Though a few elements of this systemic change have been already developed, there is still much work to do till 2016, when the *VSUES-City* project is to be launched.

In consequence, the *VSUES-City* model should provide a useful educational tool and a significant resource for students to be absorbed into entrepreneurial culture and acquire entrepreneurship experience and for VSUES to be firmly established as an innovative entrepreneurial university.

From the above it is evident that such projects, being relevant to our present research and opening new prospects for further study of an entrepreneurial university, can also be chosen by universities as one of their strategic priorities. In any case, it must be recognized that a fractal university as an innovative model of organizational development stimulates the system of innovation in education, providing its internal and external stakeholders with new means of collaborating and mutual development, based on reciprocity, networking and trust.

## REFERENCES

1. Scott, P., 1998. Massification, internationalization and globalization. In Scott P. (Ed.), *The globalization of higher education* Buckingham, UK: SRHE and Open University Press, pp: 108-129.
2. Steele, L.E., 2008. Entrepreneurialism driven from minor enclaves at The University of the West Indies, St Augustine Campus. URL: [http://opus.bath.ac.uk/22257/1/UnivBath\\_DBA\\_2008\\_L\\_Steele.pdf](http://opus.bath.ac.uk/22257/1/UnivBath_DBA_2008_L_Steele.pdf)
3. Shane, S.C., 2011. Entrepreneurial Universities. *Forbes*. 2011. 9. 04. URL: <http://www.forbes.com/sites/scottshane/2011/09/04/entrepreneurial-universities/>
4. Etzkowitz, H., 1983. Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*. 21(2-3): 198-233.
5. Clark, B., 1998. *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. New York: IAU Press, pp: 163.

6. Etzkowitz, H., A. Webster, Gebhardt, C. Cantisano and B.R. Terra, 2000. The future of university and the university of future: evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29: 313-330.
7. Smarandache, F.L. and Ş.T. Vlăduşescu, 2012. The Fifth Function of University: "Neutrosophic E-function" of Communication-Collaboration-Integration of University in the Information Age. URL: <http://fs.gallup.unm.edu/Neutrosophic-e-Function.pdf>
8. Bratianu, C. and S.T. Stanciu, 2010. An overview of present Research related To entrepreneurial University. *Management and Marketing*, 5(2): 117-134.
9. Konstantinov, G.N. and S.R. Filonovich, 2007. CHto takoe predprinimatel'skiy universitet. *Voprosy obrazovaniya*, 1: 49-62.
10. Edvinsson, L., 2002. *Corporate Longitude - Navigating the Knowledge Economy*, Bookhouse and Pearson, pp: 209.
11. Cherwitz, R.A. and C.H.A. Sullivan, 2002. Intellectual Entrepreneurship. A vision for graduate education. *Change*, November/December. URL: <https://webpace.utexas.edu/cherwitz/www/ie/articles.html>
12. Cherwitz, R.A., 2005. *Creating a Culture of Intellectual Entrepreneurship*. URL: <https://webpace.utexas.edu/cherwitz/www/ie/academe.html>
13. Pokholkov, Y.P., 2006. *Opora na sem` printsipov*. *Poisk*, 1(2): 5-6.
14. Warnecke, H.J., 1993. *The fractal company - production in the network*. Springer- Verlag, New York, N.Y. pp: 280.
15. Sihn, W., 2002. *Fractal Businesses in an E-Business World*. In the 8th International Conference on Concurrent Enterprising. Rome, Italy, pp: 17-19. June. URL: [http://www.manubuild.net/projects/08/CE002/Business%20to%20Business/05\\_Sihn.pdf](http://www.manubuild.net/projects/08/CE002/Business%20to%20Business/05_Sihn.pdf)
16. Ahmed, N.S. and N.M. Yasin, 2010. Inspiring a fractal approach in distributed healthcare information systems: A review. *International Journal of the Physical Sciences*, 5(11): 18 September: 1626-1640.
17. Kuehnle, H.I., 2002. Guidelines for future manufacturing-necessity of a change of organizational structures in industry and ways to the "fractal company". *WEB Journal*, 12, March. URL: [http://fstroj.utc.sk/journal/engl/papers/015\\_2002.pdf](http://fstroj.utc.sk/journal/engl/papers/015_2002.pdf)
18. Binsztok, A., K. Leja and E. Szczerbicki, 2007. *University of the Future: A Fractal Organisation of Knowledge*. In *Higher Education Management and Development in Central, Southern and Eastern Europe*. Waxmann Verlag, pp: 144-148.
19. Bodunkova, A.G. and I.P. Chernaya, 2011. *Fraktaly predprinimatel'skogo universiteta: innovatsionnaya model', ili novyy marketing*. *Vestnik Vladivostokskogo gosudarstvennogo universiteta ekonomiki i servisa "Territoriya novykh vozmozhnostey"*, 3: 148-155.
20. Nikolaeva, E.M., 2008. *Teoretiko-metodologicheskie i mirovozzrencheskie osnovaniya sinergeticheskoy kontseptsii sotsializatsii*. *Innovatsii v Obrazovanii*, 3: 57-66.
21. Vunderer, R. and P. Dik, 2003. *Klyuchevaya rol' sotsial'noy kompetentsii v kontseptsii sopredprinimatel'stva*. *Problemy teorii i praktiki upravleniya*. 6: 103-109.
22. Senge, M., 2007. *Knowledge entrepreneurship In Universities. Practice and Strategy in the Case of Internet Based Innovation Appropriation*. Doctoral Thesis. Universitat Oberta de Catalunya Barcelona Spain. URL: [http://www.tesisenred.net/bitstream/handle/10803/9117/tesi\\_msenges.pdf?sequence=1](http://www.tesisenred.net/bitstream/handle/10803/9117/tesi_msenges.pdf?sequence=1)
23. Conner, M.L. and J.G. Clawson, 2004. *Creating a Learning Culture: Strategy, Technology and Practice*. Cambridge University Press, pp: 352.
24. Charbonneau, J., 2005. *Measurement of Social Capital*. Reference Document for Public Policy Research, Development and Evaluation. URL: [http://www.horizons.gc.ca/doclib/Measurement\\_E.pdf](http://www.horizons.gc.ca/doclib/Measurement_E.pdf).
25. Fukuyama, F., 1999. *The Institute of Public Policy // George Mason University*. October 1 URL: <http://www.imf.org/external/pubs/ft/seminar/1999/reforms/fukuyama.htm#1>
26. Simaguti, M., 2006. *Epokha sistemnykh innovatsiy. V poiskakh novoy paradigmy marketinga*. M.: OOO "Mirakl", pp: 248.
27. Fal'ko, L.Y. and N.A. Konovalova, 2012. *Modernizatsiya obrazovatel'nogo protsessa na osnove praktiko-orientirovannoy modeli obucheniya*. *Universitetskoe upravlenie: praktika i Analiz*, 4: 73-78.