Logical Layers of Entrepreneurship

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Entrepreneurship is a logical consequence of the external economic situation and the internal necessity of human well being and freedom. Therefore it should be considered as a set of interacting logical layers, based on social, psychological, economical and technological aspects. Inside each layer which may be interpret as subsystems of entrepreneurship, there are defined internal relations and possible interactions similarly to information systems structure. Layers interacting each other are offering a set of ranges of optimum engagement of resources and elasticity on the external boundaries and regulations. Based on the above, entrepreneurship may be considered as a layered system interacting with the surroundings in optimum way. It is easy to see that the presented concept may be related either to single person or organization. Also it is strongly oriented onto Resource Based View (RBV) of the organization description. One of the main problems of entrepreneurship is quantitative aspect. How to measure changes of entrepreneurship? What should be assumed as a objective function? Which semantic models are adequate for computer aid of the entrepreneur? How to evaluate axiologically entrepreneurship? These questions are not resolved yet. The layered concept of entrepreneurship allows on quasi-quantitative approach. Interlayer interactions allow on computer aided approximations and introduce feed-back information to the system. Analogies to architecture of information processing seems to be the most appropriate approach to description of entrepreneur elements and strategies.

Introduction

What does it mean „Entrepreneurship“. There are some definitions describing this term quite properly, e.g. it is the set of phenomena associated with the mindset, planning and activities that create and exchange value through the identification and employment of changes in resources, opportunities and/or innovation [Davis 2007]. But it should be noticed macroscopically that:
1. Entrepreneurship of single people it is ability to take a risk and change social status from the employee onto employer (or self employee) and the economic status toward higher position.
2. Entrepreneurship of an organization (just being employer) may be considered as ability to take a risk and change its objective function toward the higher utility and therefore make it more effective economically and stable in time.
3. Corporate entrepreneurship may be interpreted as the ability to form more global (corporate) objective function and change the utility of full structure and resources of the corporation.
4. Entrepreneurship of all nation or country may be understood as ability to engage as much as possible its members into processes of change the global economical objective function.

In all the above cases the most important role play: the objective function, change process and the utility category in Debreu sense [Debreu 1959], understanding as more general value than the price measured in capital units. Such approach is useful for quasi-quantitative expression of changes of entrepreneurship. But first of all, it is necessary to define quantitatively the utility from the entrepreneurship sense. It is quite difficult problem related not only to numerical evaluations, but also to subjective aspects of utility measure and the used scale [Stevens 1975].
In general the utility may be expressed as a set of categories similarly to multicriteria analysis [Anderson 2008]. But there are some differences derived from subjective assumptions of components of linear combination equal to total utility of organization, corporation, society, etc. What's more, the same definition of the utility may vary from country to country or from expert to expert. One of possible solutions is to find the reference entrepreneurs and define for them standardized categories assumed as reference models. Then it is possible to use rational scale for comparisons [Hillinger 2007]. But still such measurements will be uncertain and may be evaluated as quasi-quantitative. It should be noticed that there are no fully acceptable quantitative approaches to entrepreneurship. There are in the literature some attempts to estimate potential variables of entrepreneurship [Birkinshaw 2003, Davis 2008, Mitra 2008].


One of the most important aspects of domestic private sector growth is the project signed by the United Nations as UNDP (United Nations Development Program). It is very good tool for building new functional models of entrepreneurship development related to concrete situations (country welfare, social situation, etc.). It is easy to see that the above model is based on layered structure. However, from the epistemological point of view, the defined layers are not enough logically separated what causes reductionistic approach to quantification of entrepreneurship not adequate. In other words there is not possible to build a linear combinations of suitable variables which may represent a vector of entrepreneurship. For that reason it seems to be interesting to introduce different set of logical layers, which may be assumed as a subsystem of the entrepreneurship phenomenon, understanding as a system.

Measure of entrepreneurship

The problem of measurement of non mathematical categories of social science is well known [Gospodarek 2009, Zeller 1980]. Someone can put the question: what for do it? The answer is neither very easy nor univocally [Davis 2008]. First of all we need to notice that
entrepreneurship may be measured in two modes ex post and ex ante. Ex post means that entrepreneurship at a given moment and territory or inside a given organization was determined and quantified. Ex ante means that based on some existing information, the assuming level of entrepreneurship may be reached after an interval of time. This is an element of forecasting applied e.g. in feasibility studies of investment projects supported by EFRR (one of the formal questions is: how much new job places will be created and/or how much new enterprises will be registered?). This way one practical aspect of quasi-quantification of entrepreneurship is shown. But is it the correct measurement of entrepreneurship? It is only one aspect of the phenomenon. The World Bank Group Entrepreneurship Survey measures entrepreneurial activity around the world. Their database includes cross-country, time-series data on the number of total and newly registered businesses for 84 countries [Klapper 2007]. Relating a quantity of new registered firms to the nation size, the following chart may be presented Figure 4. But it still represents final effects ex-post and gives only some forecasting knowledge with unknown level of uncertainty. The problem of ex ante measure is still not resolved.

Figure 2. Bubble chart of nations sized according to new business density.
Source: 2008 World Bank Group Entrepreneurship Survey
http://deeplinking.net/entrepreneurship-data/ .

The next question is related to the scale and the measure interpretation of entrepreneurship. Usually we would like to compare entrepreneurship of the observed entity to reference model. It is understandable ratio of two measured values, expressed in percent. This kind of comparison is independent on geographical location and the volume of the compared entrepreneurship entities. But one can see, that increasing on 100% of small unit is not the same as 5% increasing of big corporation. Therefore for full characteristic, an extra global coefficient will be necessary e.g. for differential comparison. Then entrepreneurship may by characterized by minimum two values one relational and one differential with unit, e.g. number of peoples changing their status form employed to self employee. But we need more exact definition of the compared values, because the entrepreneurship is complex problem and therefore may be analyzed as a linear combination of some independent and categorized
variables. According to this statement it is necessary to reduce the problem onto logical layers, which may be treated as independent each other [Gospodarek 2009]. Each layer forms a base vector, represented by its length. All base vectors form a linear, vector space with defined measure (length of the vector) [Gelfand 1989].

Such attempt to evaluate differences between entrepreneurial objectives is quite similar to multicriteria analysis, well known method of quantization in decision support [Anderson 2008]. In that case, categories and importance weights are defined for each possible option. The best option is chosen based on the maximum value of the product of total score and weight. But in the case of entrepreneurship evaluation it is more complicated. We need to take into account the total score of all, possible variables, forming the vector in the linear space of entrepreneurship determinants. This is the main purpose of defining entrepreneurship logical layers.

Six layers of entrepreneurship development

As it was pointed out, a new set of logical layers of entrepreneurship description should be assumed. They may be grouped into the following ontological model of entrepreneurial decisions.

Figure 3 Interaction of logical layers in entrepreneurial decision making. An ontological model.

1. Layer of knowledge

At the level of knowledge layer, one can observe that entrepreneurship on any territory or entrepreneur structure is strongly dependent on a level of the knowledge based society and use of transparent technologies [Brown 2004, Kuratko 2006]. This knowledge based society is related to the ratio of high educated citizens, number of patents registered, quantity of information exchanged, etc. Suitable coefficients of quantification may be introduced, calculated and experimentally verified. As the most important determinants of entrepreneurship at the knowledge layer, the following categories may be concerned:
1. Education potential – the higher competences the more probability of innovative acts. Saturation of high education of the group of entrepreneurs and it unique competences are recognized as human capital for entrepreneurial acting.

2. Research and development potential – the more scientific activity, the more chances of new solutions and technology transfer to a practice.

3. Technological transparency – the more educated and younger nation or entrepreneur group, the more technical devices are familiar and remain in common use. This way all innovations are quicker converted into transparent technology.

4. Innovation and high-tech applications in practice – the number of patents and practically used results of research projects is one of the important ex post indicators of entrepreneurship and may be understand as a power of the entrepreneurs to innovative acting.

5. Knowledge collection and exchange are unique resource for entrepreneurial acting related to computer aided processes and forcing R&D processes. Also knowledge collection induces knowledge base development of an organization, society or nation.

6. Social and organizational knowledge allows on effective use of available resources and make better climate for entrepreneurial activity. Organizational knowledge allows on more effective management and induces new entrepreneurial structures inside organization or society.

Knowledge and information based entrepreneurial initiatives are characteristic for well developed countries. But is it true that this aspect is not important for African nations? Of course – not. Each entrepreneur needs to use unique knowledge, unique from the near surroundings point of view. It may be a well known model of business in other countries, but in this moment and in a given place it is innovative acting. Therefore the knowledge layer of entrepreneurship is strongly related to the surroundings of the entrepreneur. It is classic feed back between two layers and all information exchanged between the entrepreneur and the surroundings are stabilizing business processes.

Layer of knowledge is logically independent and its influence on entrepreneurship should be evaluated in relation to the surroundings. It is necessary to define a priori the weight of knowledge layer importance for concrete problem.

2. Layer of psychology and social behaviors

This layer of psychological behaviors of peoples, decision makers and organizations seems to be the most important inductor of the entrepreneurial acting [The Psychology...2006, Shaver 1991]. Even neoclassical view of the problem must take into account that psychological aspect of changes as very important. For system approach psychoeconomical aspect is crucial due to simple mechanism of preferable changes. Dreams and believes are the base of entrepreneurship [Kuratko 2006]. How to express quantitatively some social increments to entrepreneurship? The same way as usual. It is necessary to define acceptable categories, which may be expressed as some coefficients. It may be pointed the following aspects of psychological and social layers.

1. Consumption reference models and achievements – makes all entrepreneurship go around. This is the base of peoples dream about self business and wellbeing. High level consumption is related to economic freedom. Suitable models are available in TV and Internet. Verification of the exiting situation is available from travelling and observations of neighbors.

2. Social relations and group interactions are very important determinant of the entrepreneurship. Personal contacts with business representatives and the owners of their own enterprises give imagination for entrepreneurs. Group pressure on self employment is one of the important aspect of entrepreneurial decisions. Poverty is always the main cause of the own business creation.

3. Free mobility, travelling and people exchange, allows on copying the existing models of entrepreneurship from more advanced countries or structures to less developed ones. Copying of good working businesses is the shortest way for successful transfer of know how onto local reality. It is also the right way to change mind of the potential entrepreneur. Such
social interactions are very important for the decision taking about changing the existing social status or objective function.

4. Freedom of the unity in relation to law and social restrictions is one of the preferences of democratic nations. Full freedom is not possible being employed. But self employee it is the point. The same statement may be related to corporation. The corporate entrepreneurship is a freedom of choice under less level of regulations and boundaries.

5. Social stability, safety and human rights respect means that unemployment and poverty must be reduced. Entrepreneurship gives the chance, not warranty. But it is sufficient attractor for taking changes. Even if economical boundaries say no, a lot of decisions about self employee are taken.

6. Necessity of leadership is the natural tendency of human being. One, important way to achieve suitable social position is related to creation of self enterprise and state an employer instead of being an employee. Therefore entrepreneurial acting is confirmation of the mentioned tendency.

These psychological and social aspects of entrepreneurship are independent on territorial localizations and level of development. Dreams are free from boundaries. That's mean that the behavioral economy is the best theory for explaining entrepreneurship development, and that psychological and social aspects are really independent logical layer in reasoning introducing to global problems a lot of unexpected perimeters. This also means that ceteris paribus in describing entrepreneurship is rather wide range. The problem may be focused on the question: how to take into account this totally non mathematical aspect into global measure of entrepreneurship? And the answer is rather difficult.

3. Layer of resources

Entrepreneurship means changes in business activity. It means that either set resources must be rearranged or new resources must be available. It may be stated that: no suitable resources – no entrepreneurship. This way, the layer of resources together with psychological behavior one are the most important in the entrepreneurial acting. There should exist some relations between the resource based view (RBV) of organization and strategy description and entrepreneurship what may be interesting for ex-ante evaluations [Barney 1991, Conner 1976]. Based on the RBV the quantitative approach to management evaluation is possible [Gospodarek 20007]. It is natural that seeking for analogies of entrepreneurship evaluations, the choice of RBV model seems to be rational.

1. Availability of resources causes an entrepreneurship pressure higher in more saturated regions (or organizations). It should be noticed that free capital and qualified workers are elements of the resources.

2. Diversity of resources allows on more miscellaneous entrepreneurial activity and react more elastic on signals from the surroundings.

3. Elasticity of the resources allows on multidirectional entrepreneurship interactions and quick changes of objective functions within the same set of the resources.

4. Sufficiency of the resources means that the entrepreneurial concept may be practically used and remains stable in reference period of time.

5. Productivity of resources is very important aspect of entrepreneurship profit. The higher resources productivity, the sooner scale effect may be obtained.

6. Intelligence of the resources is the base of high-tech entrepreneurial acts. It means that product or technology of higher generation may be created by the intelligent resources of lower generation.

The presented aspects of relations between the resources and entrepreneurship may be understand as the logical layer. Influence of the available resources and its properties on entrepreneurial activity may be quantified using measurable properties and categories of the resources as: quantity, value, productivity, etc. It should be noticed that resource layer is independent on territorial and organizational aspects.

4. Layer of communication
Is it possible to act as an entrepreneur without communication? Today it seems to be almost impossible [International Handbook... 2005]. Information, its processing and exchange is crucial for nowadays entrepreneurship processes [Gajjala 2006]. Communication means marketing and the external knowledge. It is also set of interactions in mental sphere what may redirected social behaviours or objective functions. A lot of know-how concepts and business blueprints derived from copying from one area to another one or from one organization to another. Multiplying and copying entrepreneurial behaviors are standard processes of economic development. Internet offers the external knowledge resources with a wide range services of SOA type especially derived from Web 2.0 community. But communication means also interpersonal contacts and free travelling. In general all communication processes generate knowledge diffusion and seems to be strong mechanism of entrepreneurship. Therefore communication should be pointed as the following logical layer of entrepreneurship. Measurement of the relations between communication aspects and entrepreneurial activity seems to be quite clear, because there are good statistical data. The following six aspects seem to be the most important:

1. Freedom of information exchange and interpersonal communication means free use of the external knowledge, flexible protection of intellectual property, technology transfer activities, etc.

2. Virtualization of social and economic services understanding as internet e-services, e-education, e-government, and strong b2b or b2c relations. This is important for quick access to know-how, statistical data, registration forms, law and tax rules, marketing information and suitable models for business creation.

3. Saturation of information exchange media is related to covering the entrepreneur objective with all necessary information exchange devices and technologies, what allows on full duplex dialog with the surroundings. It means not only for receiving information, but also sending marketing offers and performing on ecommerce activity.

4. Travelling and tourism gives an unique chance for interpersonal contacts and copying good solutions of a business foundations to local entrepreneur surroundings. It allows also on international personal exchange and aliases of joint venture type. This is one of very important aspects of entrepreneurship development.

5. Information technologies transparency and use is related to the entrepreneur surroundings. If people better understand technology then more complicated devices may become acceptable and entrepreneurship tends to high tech solutions. In general technological transparency is strongly related to information use, knowledge and education level of society.

6. Fast internet access is the last indicator of potential entrepreneurship power. Nowadays it determines the level of information exchange, and access to the most important business and technological data online. It also induces the use of virtual services, ecommerce solution and e-education.

The presented communication layer seems to be easy for quantitative approach. Also it is possible to form suitable measure for comparison using data collected by Eurostat and UNstats. Because the role of virtual society is growing up it is necessary to pay attention to the communication layer as a one of important factors of entrepreneurship development.

5. Layer of surrounding and interactions

It should be also recognized as a boundaries layer, because interactions of the entrepreneur with the surroundings are subjected different restrictions and risks. To take a risk of innovative acting or replacing personal status from quasistable employee onto metastable employer needs to think about possible troubles derived from the surroundings [Birkinshaw 2003]. Therefore in analyzing entrepreneurship development an independent layer of surroundings and interactions should be introduced. Entrepreneurship may be treated as a game of the entrepreneur against the surroundings, where on any strategy taken by the entrepreneur, the surroundings answers the most spitful response. The entrepreneur must be familiar with all boundaries, restrictions, trends and preferences related to the surroundings. Among them the following aspects should be taken into account.
Law and tax rules and their stability and transparency are fundamental bases and further discussion seems to be not necessary. The more complicated and not univocally rules, the less attractive surroundings for entrepreneurs. Too much and too less regulations, the less conditions for entrepreneurship development.

1. Bank and money services are crucial for all business activities. Payment services, credit availability, ebanking feature are for today standard achievements. Also freedom in international money transfer is important for any entrepreneur.

2. Economic boundaries are crucial in all entrepreneurial activities. More poverty - less possibilities of entrepreneurship development. Less profit prospects mean low probability of entrepreneurial acts (high taxes, local fees, high costs of services, etc. are breaks of entrepreneurship).

3. Organizational and formal boundaries cause entrepreneurial activities less profitable and less effective. Special permissions, concessions, longer decision processes are enemies of quick entrepreneurial processes.

4. Technological and information barriers are similar problems as lack of suitable resources. Especially weak access to Internet is frustrated. Less information facilities about law, taxes and surrounding business services cause given area less interesting.

5. Beaurocracy and corruption are real brakes of the entrepreneurial processes. The most corrupted country or area, the less development of entrepreneurship are observed.

6. Transport barriers are examples of less interesting business locations and entrepreneurial processes. No highways, no railways etc. reduce physical achievement of an entrepreneur and causes raising of product delivery costs.

6 Layer of environmental safety

Environmental safety is the base of current business development. All accepted technologies are nature friendly. All supporting programs are strongly related to environment protection. As an example, the EFRR conditions may be cited, where in an application form potential beneficent must prove accordance of the project with Nature 2000 rules. Therefore all aspects of the environment surroundings of the entrepreneur activities may be pointed as extracted logical layer.

1. Ecological aspects of wellness are well known for the develop countries. A lot of new business activities are related to ecological technologies and methods of nature protection. These aspects generate innovations and entrepreneurial acts. Also the mental changes of citizens are observed toward the ecological problems.

2. Technologies safe for environment are one of the important objectives of entrepreneurship. Usually they are innovative and offer better productivity and reduce wastes. These technologies are supported by governmental funds what is very positive for entrepreneurship development.

3. Understanding ecology and education allows on acceptance high budget spends on ecological friendly technologies and resources. It also means that entrepreneur acts remaining in accordance with ecology will be better accepted by society.

4. Culture of natural resource saving is being built on the base of ecological educations and long term observations of results of ecological investment projects. The results of sustainable development policy in UE are one of the best examples. Pure water and air in all EU countries is the priority of investment supported by EFRR. For entrepreneurship it is one of important aspects.

5. Policy of natural resource exploiting allows on sense investment acting and non robbery exploiting according to protection of nature rules. For entrepreneurship it is good opportunity, because all exploiting natural resources activities are redirected to innovative technologies and techniques.

6. Pro ecological programs and projects are understanding as available funds supporting investment into protection of natural resources. These giant capital are partner of entrepreneurship and allows on establish stable long term enterprises serving unique services related to environment protection (purification of water and air, protection of drinking water resources, deactivation of poisons, utilization of wastes, etc.).

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The above arguments show that environmental safety may be one of the most important causes of entrepreneurship development. Huge amounts of money available for investment projects related to natural environment protection are sufficient magnet for business making, regarding that services related to maintenance ecological installations are long term type. It allows for a long term planning engagement into business and set an objective function based on micro balance during a long time. Therefore environmental safety with its all aspects forms a separate logical layer of entrepreneurship.

Model of entrepreneurial decision

Based on layered structure of entrepreneurship development the following model, presented on the figure 3 may be introduced. It is based on the entrepreneurial decision structure in micro mode and may be expanded on macro mode as a sum of micro states. This way total entrepreneurship may be considered as a superposition of all micro decisions related to territory, time or organization.

Figure 4  Double shell model of entrepreneurial decisions

Let have a look at the above structure of decision making. Main stream of decision are behavioral actions of the entrepreneur. This decisions are affected by the surroundings in positive and/or negative form. Positive interactions are stimulations (e.g. governemental support, external funds, etc.) and free information exchange (e.g. knowledge diffusion from the surroundings, support based on web 2.0 concept, etc.). Negative aspects are all regulations
(law restrictions, taxes, free law interpretations, etc.), boundaries (different protection rules, social demands, etc.) and pathological interactions (e.g. corruption, paid concessions, hidden taxes, etc.). The above interactions are related to micro-macro balance and may be analyzed by SWOT and PEST method. They may be divided on three logical layers described in the preceding section: layer of communication, layer of surroundings and interaction and layer of environmental safety.

But it is possible to distinguish the internal shell of the entrepreneurial decision. It represents operational aspects of the micro-macro interaction. Subjective aspects are rationality bounded decisions of the entrepreneur toward any changes of the objective function. The entrepreneur-visionary can take the risk of changes without precise, quantitative data, but he can take into account some rational aspects derived from the surroundings. These aspects are possible to quantify and may be understand as: economic perimeters, market volume, general welfare, optimization data, etc. In other words, the entrepreneur may estimate probability of success and define new objective function and strategy resulting from the set of decision having Markov chain property (real option strategies possible to optimization on the base of Bellman’s theorem) [Bellman 1957]. Because these aspects are expresses formally as measured numbers, the entrepreneur may use a computer support of his decision making. Of course such support will not eliminate uncertainty, but it seems to be obvious, that computer may reduce the risk of improper decision.

The entrepreneurial decision may induce two changes, denoted as “real variables” and “imagine variable”. The real variables are related to resources necessary for successful roll out of any entrepreneurial concept. Because the set of resources may be understand as a countable set with characteristics (e.g. the utility represented by the utility function) during entrepreneurial acting the resources will be changed (either their quantity and quality or the utility function). The surroundings may offer outsourcing service related to fitting the utility function to optimum set of resources. Therefore optimization procedures lead to countable structure and topology of the resources what may be evaluated and expressed quantitatively.

On the other hand there exist some “imagine variables” of entrepreneurial decision processes. These variables are related to concepts, know how and metaknowledge of entrepreneurial project. They are difficult to estimate quantitatively, but their role in the entrepreneurial processes are crucial. It is innovation process. The surroundings add to objective concept the context sense, what makes the innovative project real. But at the beginning of entrepreneurial decision making process full knowledge about project is hidden. It may be partially unhidden by preparing good feasibility study, but still some uncertainty will be present. The above reasoning brings a conclusion that inner shell of the entrepreneurial decision should be analyzed as three layers: layer of knowledge, layer of resources and layer of psychological and social behavior.

The presented model of entrepreneurial decision making may be expanded onto entire entrepreneurship activity. It shows a surroundings of the entrepreneurial decision, divided onto two spheres: inner and outer. As a logical consequence the six logical layers of entrepreneurship derived. Then potential development of entrepreneurship may be analyzed as a vector of six variables, representing each layer in a numeric form.

Some quantitative aspects

What does it mean “good or bad level of entrepreneurship”? The answer is neither univocal nor simple. As it was shown, there are six important determinants of quantization of entrepreneurship phenomenon. Is it true that self employment of one person in poor region elsewhere in India is the same score as self employment of one citizen of Sweden? In absolute numbers it is one person in both cases. But it should be noticed that productivity in both cases expressed as generated added value in pps units may be completely different. Does it this property be postponed? What about the probability of self enterprise establish in both presented situations? In the first case unsufficiency of resources may be the most important barrier, in the second case, the style of easy living in reach, social country seems to be the barrier. Therefore any quantitative approaches to entrepreneurship should be discussed in layered structure of reasoning rather than in system mode. But how to measure entrepreneurship regarding all
possible increments and making this procedure not too complex? What accuracy should be achieved in order to evaluate important of the difference between two results? Also we need to notice that simplifying the model some stronger ceteris paribus constraints may interfere the obtained results. All the expressed problems are not resolved yet and it seems to be impossible to find easy solution. Taking into account layered structure of entrepreneurship development it is easier, but one of the most difficult aspects to evaluate is imagine variable (concept and know-how power) in relation to the context influence.

Because entrepreneurship is complex phenomenon it is not strange that its quantization must distinguish minimum two cases:
1. Corporate entrepreneurship (including social entrepreneurship).
2. Territorial entrepreneurship (regional, global, etc.)
In both pointed cases, common characteristic may be related to a level of value added changes per engaged person (or capital invested). I means that increasing of economic effect is related to the number of persons engaged into this process (or its costs). This way it seems to be possible to compare the score of entrepreneurship between organization and regional average entrepreneurship. But there are some more indicators (e.g. number of patents, number of business projects, etc.). In general some aspects of CBA analysis seems to be adequate tool for expression of results of the entrepreneurial activity.

The vector space model of entrepreneurship measure

Dividing entrepreneurship onto six logical layers for which definition of any numerical representation is possible it allows to use the well known linear vector space formalism for measure construction purposes. For that reason each layer is represented by one number obtained from a semantic model of its characteristic, which forms six dimensional vector space. Such representation may be assumed as quantity of the formed enterprises during a year in the case of territorial entrepreneurship. It may be also understand as the total added value generated by any entrepreneurial structure during a given period. This way all numerical representations of the defined layers form a base of entrepreneurship vector space. The total entrepreneurship is then represented by any linear combination of the base vectors being a length of the formed vector. The vector approach allows onto good understandable definition of the difference between two entrepreneurial objectives. It is the difference between the lengths of representing vectors.

But for general comparisons it is necessary to operate with unitary scale for each category representing a given layer. Thus the rational scale 0-100% seems to be the most reliable and appropriate. This way any changes of entrepreneurship (or its components) will be expressed in percent, but construction is still based on the ratio of lengths of suitable vectors. For the global evaluation of the phenomenon it seems to be sufficient approximation. It is necessary to understand that this kind of evaluation is less sensitive on small changes. The most positive aspect is reduction of noises derived from too much exact measures (in absolute difference scale) regarding the existing of serious ceteris paribus of quantization models.

Constructing the measure of entrepreneurship it is necessary to take the following steps:
1. Find the acceptable semantic models for each logical layer and define suitable valuation.
2. Define the importance of each numeric aspects (statistical weights) for each component (coefficients of the linear combination). All coefficients are summed to 1.
3. Build suitable vector as a linear combination of products value from the semantic model and the assumed coefficient.
4. Calculate the length of the vector according to standard definition in a metric space.

The above procedure gives an absolute value of entrepreneurship and must be expressed in units. We have two cases:
A. All partial representations of entrepreneurship are expressed by rational scale 0-100% what means, that there are reference model of the appropriate category assumed as 1. Then the obtained global vector representing entrepreneurship is always defined on a range [0,1] of real numbers.
B. All partial representations of entrepreneurship are expressed in absolute scale. Then the obtained global vector must be renormalized to unity by dividing through absolute reference vector (which must be earlier assumed and calculated).

In both cases there are subjective aspects of the measure related to reference values and the assumed impact factors for categories. This is the open problem and should be discussed widely. Building suitable reference vector model and assuming reference values based on the existing rankings and factors of entrepreneurship it is possible to receive very interesting quasi quantitative model for comparisons and forecasting. Also based on rational, percentage scale it is possible to compare different entrepreneurs.

Which numerical representations of the defined layers may be useful and acceptable for measurement of entrepreneurship purposes? The answer is not easy and should be discussed. But the defined structure is more precise and its elements (layers) are less overlapping each other. It allows on better quantization of each increment of the total measure and build the total vector of entrepreneurship level of development less uncertain.

Conclusions

The presented approach to the entrepreneurship development offers new possibilities of semantic models creation based on entrepreneurial decision scheme presented on Figure 4. The set of six logical layers introduced in this paper is consistent and may be recognized as quasi non overlapping. Of course there are strong relations between layers, but they are not affecting Carthesian character of introduced logical division. It allows on forming the measure of entrepreneurship development, understanding as a vector of linear space, where the basis is formed by any vector representation of each layer.

United Nations Development Program offers the model of entrepreneurship obeys the behavioral aspects of entrepreneurial decisions. The additional layer of psychology and social behavior was added into present model, because it seems to be the one of the most important factors of entrepreneurship development.

It is also pointed out an discussed why the resource layer should be separated from the knowledge layer. The context of the phenomenon is strongly related to the external knowledge which is subjected to constant turbulent expansion. Therefore, participation of tacit knowledge in entrepreneurial processes (understanding as the imagine variable) is one of the most important aspect related to innovative acting. From the other hand, unhidden resources (understanding as real variables) are the base of physical rolling out any innovative project.

The presented model is elastic and may be used for analyzing of any situation of the semantic aspects of entrepreneurship. The mechanisms of measure definition based on the vector space formalisms is universal for all possible variants of quantifications (more rational or more subjective). Good construction of the base vectors is restricted by definition of acceptable numerical representations of the layers. But it is far much easier than analysis of entrepreneurship in a holistic approach as the whole system. It will be the subject of further works about the layered model of entrepreneurship.

References


