

Innovative Activity of Virtual Firm

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Abstract—The strengthening of competitive advantage combined with the transformation of business strategy is necessary for the company to succeed in the time of market changes. And in this sense the innovation activities of the firm are exactly significant. Virtual firms are a specific form of enterprise in which we can't suppose all regularities obtaining in other forms. The aim of the paper is to evaluate factors influencing the innovation activity of virtual firm with the determination of their importance and influences on the basis of selected metrics.

Keywords—Innovation, virtual firm, factor

MOTTO: „Everything is in the state of changes; nothing persists. We don't urge for a permanency.“

MASATOSHI NAITO, MATSUSHITA CORPORATION[4]

I. INTRODUCTION

TODAY at the time of considerable market changes there is exerted significant pressure on entrepreneurs. Heretofore going businesses have big problems of existence. They economize, restrict a production and sometimes liquidate the whole workrooms too. It is necessary to pay attention to the strengthening of competitive advantage with innovation of company activities to predate this critical scenarios.

Innovation is „a motor of the modern economics, which changes ideas and knowledge to products and services,, [11]. Not every company wants to use only the current methods and procedures or to go on the one way for the whole time of its doing business. The most companies put to use some kind of innovation during their working. The term “innovation” arose from the latin word „innovare“ which means “to recover”. The innovation can be perceived as a production and a usage of something new, nonexistent before now, that is necessary to help the company to catch present and future customers' notice on it.

Owing to the globalization there is an informal jointing of companies, formation of entrepreneurial nets, virtual teams or for example virtual organizations whose aim is to monitor the set collective goal such as use of a special chance on the market or of a strategic advantage compared to another competitors.

So the virtual firm is a specific form of entrepreneurship, in which we can't suppose every regularities like in another forms. In some forms of virtual firm we can't suppose the materialization of organization, in another the long-term or the fixed organizational structure. While it is a relative new form of organization of the company, in the time of this present financial crisis on the market it is necessary to have in mind the innovation activities of firm [1].

Most of firms are obliged to postpone their present plans for the development and the implementation of new products in consequence of the market situation or to restrict the activity of the research and development workers owing to the decreasing demand, to hire out their workers, to liquidate the workrooms and so on. Of course it doesn't mean that the innovation activities of firms are quite

impossible. More to the contrary. The financial crisis from another view can be a prevision of significant changes and of displacement in the present socioeconomic system. The constraint on the entrepreneurial subject and consequently on their innovation system can end in a higher efficiency and flexibility of exploitation of resources, of consumption, consumers behavior thereby increases efficiency of the whole economics.

Globally the present situation can be the first move to finding of new markets and opportunities.

In this paper there are evaluated factors influencing the innovation activities of virtual firm on the basis of selected metrics with the identifying of their importance and influence.

II. METHODOLOGY

A. Innovation

According to J. A. Schumpeter the innovation present „a discontinuous enforcement of a new combination of productive instruments“ [10], in the concrete the implementation of new products, the technological changes in production of going products, the assignment of new markets or new instrumental sources or the implementation of new organization.

Reasons of implementation of innovation to the present corporate procedures differentiates. According to P. F. Drucker [2] it is concerned innovation activities based on new knowledge, change of a position, demographic changes, an industrial and trade structure, a change of a system of production, conflict or unexpected success, failure or external event. There exist some types of innovation classified as 4P of innovation [3]:

- *The innovation of product* which realize a change of product or service, which was offered before now (for example a change of price, design, quality, adaptation of product to needs of customers and so on).
- *The innovation of procedure* which consists in change of a way in which are the products or services created or delivered.
- *The innovation for market position* (marketing innovation) or change of context, in which are some products or services placed on the market.
- *The innovation of paradigm* (organization innovation) in which is changed the elementary mental model generating a scope of corporate activity.

B. Virtual firm

The growing stress on a strengthening of competitive advantage complete with the worldwide globalization put pressure on existing enterprises to building-up the speed of development and production of new products or services. Information technologies and internet have a significant role in this area. In consequence of connection of the both factor, the push to the strengthening of competitive advantage and the pull of informational technologies there happens a creation of new organization structures. One of them is a virtual firm.

„The principle consists in that certain number of smaller organization come to an agreement of using of informational channels as a main communication medium.“ [1] It is a spontaneous creation of alliance among the members in order to put to use some market opportunity whereas the created net is defined as a cooperation of members, not as a physical entrepreneurial area. This alliances haven't a fixed structure and they change by purpose. Members are cooperating for some time, mostly for only a realization of one commission. The important characteristics of "virtuality" are the mobility of labour and the division of objectives to division, where the total work is diversified among the members of virtual firm, who works geographically separated and who administer with their key abilities or capabilities, and the outcome of these activities is a integration of outcomes of particular members. The quickness of connection this members depends on the use of informational and communicational technologies. In spite of the organization acts as one integer, member of the virtual firm are independent ones.

The term of virtual firm can be subdivided to the following groups [1]:

- *Techno-enterprise* – this virtual firm intensively use not only the new informational and the communicational technologies, but the technologies generally too to increase efficiency of their value string (for example building of logistical system of the firm).
- *Télé-enterprise* – this firm use a telework, in which the employees work with exploitation of informational and communicational technologies for example for their home, in clients' or suppliers', everywhere that is available the internet connection or telephone connection. It happens a widening of physical borders of the company.
- *Externalized organization* – the virtualization of this firm is due to the degree of externalization, so the quantity of activities which are in external specialized companies change (subcontractors). The key activities are realized internally. The external form is a company implementing all it's activities externally. This company is only a "coordinator" of particular activities.
- *Cyberorganization* – the object of the virtualization is in collection of orders and in coordination the supplies of products and services to clients through the internet. Cyberorganization is "a intermediary" between the producer and the final customer.
- Whereas it is a dematerialized form of enterprise, there happens the significant elimination of entry barrier of the sector.
- *Temporary net* – the organization is constructed from the group of companies connected in order to realization of the collective project. After the finishing of the project

this group is disbanded.

- *Virtual team* – it is a group of people working together in different geographical areas towards form example the integration of expert knowledge, saving of the time and costs or sharing identities.

C. Determination of factors

IDINMOSU

During the definition of factors influencing the entrepreneurial activity of a firm, concretely a innovation activity I issued from a model of Zdeněk Mikoláš called IDINMOSU (see Picture 2.1) [6]. This model judge a influence of soft factors over the competitive advantage of a firm.

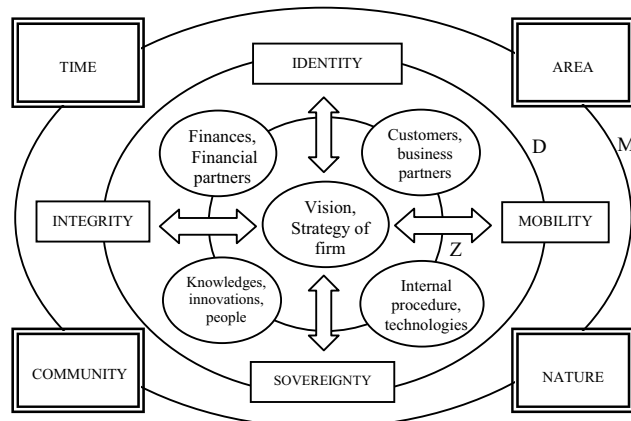


Fig. 1 Model IDINMOSU [6]

As it is evidenced by the picture, the model is allocated to three parts. The first of them (group „Z“) is created by basic components of competitive advantage inside the firm. It concerns a human (in which are innovations), financial, procedural and business potential. These factors rise as a outcome of transformation of external sources, so a nature, a community, a time and a area (group „M“) while the complying with the strategy and the vision. In sequence of these two areas complete with the action of new trends in entrepreneurship (for example globalization) is created the third area (group „D“) which consists identity, integrity, sovereignty and mobility of a firm.

Cause-and-effect diagram

The diagram created with Kaoru Ishikawa, known as a Ishikawa diagram or Fishbone diagram too, is instrumental to determination of causes and effects, on which we are able to base a relevant conclusions. The process of evaluation is in progress from discussion about a selected problem, over the definition of effects to mapping links among the main problems (fillet of the fish). With the exploitation of principles of brainstorming there is realized a list of causes relating to defined effects. [8], [9].

D. Metrics and evaluation of selected factors

The term „metrics“ is used in connection with an evaluation and a measurement of efficiency not only the enterprise as one complex, but it's partial parts too. It is true that definitions of this term are different. According to the ISO classification it is a concrete defined method for measuring and defining of the measurement range [13]. In compliance with another point of view it is concerned „determined financial or non-financial indicator or criterion

of evaluation which is used to evaluate a level of efficiency of some concrete area of business outputs proceeding and it's efficient support with IS/IT instruments" [12]. In accordance with the object of measurement we can structured this metrics to the hard and the soft.

The hard metrics are objectively and easily measurable indicators and they pursue for example a development of corporate objectives or corporate activities, they are available without additional costs and at most we can transfer them to the financial explication. Besides the indicators there are characteristics determining a desired limits or upper (bottom) boundaries consider to be hard metrics. If there is found a limit variance, it is a desired status variance.

By the force of soft metrics we can measure or evaluate a level of informational support particular processes or areas in the framework of the firm in a way of audit. These metrics are conceived in agreement with the purpose of their using (for example to evaluation the measure of reaching of internal aims in given area, to achieving of potential effects from innovation).

After the determining of metrics it is necessary to define the criteria of evaluation. In the area of innovation evaluation we can divide this criteria to 3 parts [12]:

- *Managerial criteria* – this pursue for example whether is the project in a agreement with the strategic concept (SWOT analysis, PEST analysis, BSC, are instrumentals for the evaluation), whether it ensure a competitive advantage (for example Porter analyses, Market segments analysis), whether the project meets legislative requirements and so on.
- *Technical-organizational criteria* – functionality, securing of data, information and know-how, a level of technical/system solving, probability of successful finishing of the project, ...
- *Financial criteria* – cost saving, recording a profit, cash-flow of the investment,...

The recognized factors will be consequently filed into the table and by everyone will be defined if it is a hard or a soft metrics with the determination of possible instruments for the quantification of this factor and with the aim which should be achieved. To every of factor will be assigned an influence within the scope of managerial, technical-organizational and financial criteria.

III. RESULTS

A. Analyse of factors influencing the innovative activity of virtual firm

During the analysing of factors influencing the innovative activities of virtual firm we can result from the model IDINMOSU[6]. The most important factors can be transformed and consequently evaluated by the force of Ishikawa diagram (Fishbone diagram) [8], [9] to seven main areas of cause (Sources, Legislation and government policy, Time, Internal potentials and Entrepreneurial mentality) and particular subareas. From the view of virtual firm there are following components as the most important factors influencing the feasibility of innovation of virtual firm.

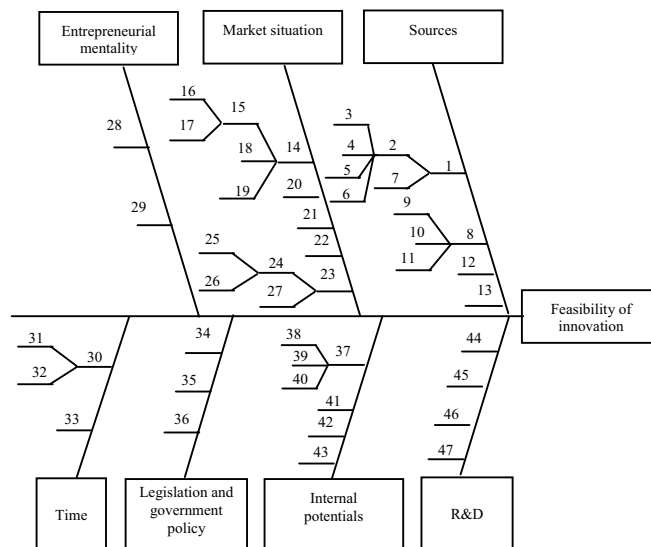


Fig. 2 Ishikawa diagram¹

From the area of *Sources* are significant the financial resources (1), concretely origins of this resources (2), whether it is a loan form the bank (3), a cofinancing with another firm (4), a support from for example Structural fund of EU (5) or whether the firm use own financial resources (6). The impeaching of a availability of this sources (7) is significant too. The next subarea are human resources (8) which consists at first a educational level of workers and managers (9), physical infrastructure of potential worker (10) important for planning of innovation activities realization and human resources intensity and last but not least considering of their availability (11), not only workers' willingness ensuring but the costingness and the possible motivation of this sources too. Among the sources we can subsume materials and raw materials (12) of technologies (13) too.

The feasibility of innovation depends on the *Situation on a market* (23) in which wants this firm to introduce the innovation too. The considerable role plays a dimension (24) of the market, whether the firm focuses on a domestic market (25) or a global market (26), event. if it's an open market (27). Very important is a competition (14), the existing competitive firms (their number (15), structure – domestic (16) or global (17) firms and level of competitive advantage (19) of competitors) and the potential competitors (18) too.

We can't leave out of consideration an influence of business partners (20), a menace of locum-tenseness (21) and a non-success risks of innovation (22).

In the area of *Entrepreneurial mentality* it is a national country culture (29) and traditions of the firm (28).

Among the main areas it is necessary to insert an area of *Research and development* too, especially in a light of the possible level of innovation (44) (it results from

¹ Own processing of this paper's author in accordance with the sources [6], [8] and [9].

the technical possibilities of the firm), availability of innovations in the given field of business (45), abilities of firm to transform the gained outcomes of research and development to the practical business (46), and the informational systems (47) which has the firm (necessary to getting data for R&D and for communication).

Some measure of interaction have the *Internal potentials* of firm like identity (37) (idea (38), design (39), ritual (40)), integrity (41), sovereignty (42) and mobility (43) of a firm too, while it depends on the form of virtual firm. If it is only a temporary form of alliance in order to realize a short-time purpose there isn't accentuated a prestige, image and a knowledge of the firm. From the long-time view point are these four subareas a keynotes for realization and for "taking roots" of product on the market.

Last but not least there are a *Legislation and government policy* mainly in light of formal complexity and administration (34) necessary for realization of innovative activities, a range of tax burden (35) and a complexity of tax system (36). From the time point of view we can interested in a time needed for assuring information (30) (for example about used technologies (32), about markets (31) to which wants the firm expand) and in a length of innovation cycle (33).

B. Evaluation

For the better idea I suppose a virtual firm which has a long-time purpose to stay on the market, so it isn't a temporary alliance but it is a techno-enterprise making a use of informational and communicational technologies and generally technologies in order to increase the efficiency of its' value string.

Determination of metrics

The next move is a formation of selected factors to the table and a determining of examples of hard or soft metrics for their monitoring and quantification.

The hard metrics identifying the quantitative level of determined factor can be for example a financial analysis for evaluation of financial situation of the firm, grain size analysis for determination of time intensity of selected problem, numbers of workers separated in line with a level of education important for prediction of human resources infrastructure, market segment share analysis needed for an analysis of the own market position and the market position of competitors too, and so on.

The soft evaluating a level of informational support of particular processes can be for example SWOT analysis evaluating Strengths, Weaknesses, Opportunities and Threats resulting from its' environment, PEST analysis dealing with the Political, Economical, Social and Technological factors or the monitoring of competitors' companies progress.

TABLE I
EXAMPLES OF METRICS FOR FACTOR N QUANTIFICATION²

Factor	Nr	Metrics	Monitoring instrument	Characteristics	Aim		
Sources	Loan from bank	3	hard	ability to pay, liquidation time of requisition	Evaluation of clients' bonity	max	
	cofinancing	4	soft	trustfulness, existence of partner		max	
	(1) support	5	hard	compliance of conditions, feasibility study		max	
	own financial sources	6	hard	financial analysis		max	
	availability of sources	7	soft	grant conditions, time of requisition		min	
	educational level	9	hard	number of workers by categories		max	
	(8) physical infrastructure of potential workers	10	hard	number of workers by categories		max	
	availability of HR	11	hard	employment agency		max	
	materials and raw material sources	12	hard	availability and price of materials – limits, budgets		min	
	technologies	13	hard	rate of money in new technologies to revenue from sales		max	
	Market situation	number of domestic firms	16	hard	market share	% share of total market share of the line	min
		competition number of global firms	17	hard	market share	% share of total market share of the line	min
		potential competitors	18	soft	market research		min
level of competitive advantage of competitors		19	hard	"lost customers"	Number of customers, who left, judgement of paper contracts	min.	
business partners		20	soft	market analysis		max	
menace of locum tenseness		21	soft	market research, pursue of competitors'		min	
Non-success risks		22	hard	progress risk analyze		min	
domestic market		25	soft	geographical market analysis			
(24) global market		26	soft	geographical market analysis			
open market		27	hard	foreign trade analysis	number of contracts	max	
Entrepreneurial mentality	traditions national country	28	soft	market share			
	culture	29	soft	market share			
	time for assuring information about market	31	hard	grain size analysis	activities, relationship, time intensity	min	
	time for assuring information about technologies	32	hard	grain size analysis	activities, relationship, time intensity	min	
Legislation	length of innovation cycle	33		progress prediction		min	
	formal complexity and administration	34	hard	given by law		min	
	range of tax burden	35	hard	given by law		min	
	complexity of tax system	36	hard	given by law		min	
	idea	38	soft	SWOT analysis, PEST analysis		max	
	Internal potentials	identity				Evaluation of success and memorized of present products	
design		39	soft	public opinion research		max	
ritual integrity		40	soft			max	
sovereignty		41	soft	cooperation level		max	
evaluation of independence		42	soft	evaluation of independence		max	
Research and Development	change reaction elasticity	43	soft	change reaction elasticity		max	
	possible level of innovation	44	hard	number of patents or licences		max	
	availability of innovation	45	soft	market research, PEST analysis		max	
	Ability to transform the gained outcomes of R&D to business	46	hard	number of new products	number of new or innovated products	max	
	Informational systems	47	hard	informational system quality assessment	variance monitoring in time	min	

² Own processing of this paper's author resulting from Fig.2 and datas from research project The optimization of multidisciplinary projection and simulation of production system of virtual firm (in accordance with research team Dita Kotásková and Zuzana Wozniaková).

Determining of criteria

The criteria of factor influence over the innovation activity were chosen in following segmentation.

The managerial criteria target the effect on company strategy, quality standards, creation of value of firm, competitive advantage and intercompany standards. The technical-organizational criteria view the influence over product functionality, product safety, price and project finalization. Among the financial evaluative criteria are company costs, profit formation and time of investment recovery.

The impact of particular factors on given criteria can be recorded in the next table.

TABLE II
DETERMINATION OF FACTOR INFLUENCE OVER CHOSEN CRITERIA³

Criteria	Managerial criteria	Technical-organizational criteria	Financial criteria						
	company strategy quality standards creation of value competitive advantage intercompany standards	product safety product safety price project finalization	company costs profit formation time of investment recovery	Σ					
Factors									
Sources	(3)	3 1 1 2 2	9	0 0 3 2	5	3 1 3	7	21	
	(4)	3 1 1 2 2	9	0 0 2 2	4	2 1 3	6	19	
	(5)	3 1 0 2 1	7	1 1 1 2	5	1 1 3	5	17	
	(6)	3 1 1 2 3	10	0 0 1 2	3	1 1 3	5	18	
	(7)	3 3 2 3 2	13	1 1 3 3	8	3 1 1	5	26	
	(9)	3 3 2 3 1	12	3 3 2 3	11	3 2 1	6	29	
	(8)	3 2 1 2 1	9	0 0 1 3	4	1 1 0	2	15	
	(10)	3 3 2 2 1	11	0 0 2 3	5	3 2 1	6	22	
	(11)	3 1 2 3 2	11	2 2 3 3	10	3 3 2	8	29	
	(12)	3 3 2 3 2	13	3 3 2 3	11	3 3 1	7	31	
	(16)	3 1 2 3 0	9	0 0 3 1	4	2 3 2	7	20	
	(17)	2 1 2 3 0	8	0 0 3 1	4	3 3 2	8	20	
	(18)	2 0 1 2 0	5	0 0 2 1	3	2 1 1	4	12	
Market situation	(19)	3 2 3 3 0	11	0 0 2 1	3	2 2 2	6	20	
	(20)	2 2 2 2 1	9	3 3 3 3	12	3 3 3	9	30	
	(21)	2 0 2 3 0	7	0 0 3 2	5	1 3 3	7	19	
	(22)	3 2 2 3 2	12	0 0 3 3	6	3 3 3	9	27	
	(25)	3 1 1 3 1	9	1 1 2 1	5	2 3 1	6	20	
	(24)	3 2 1 3 3	12	2 2 3 1	8	2 3 1	6	26	
	(26)	3 2 3 3 1	12	0 0 2 0	2	2 2 1	5	19	
	(27)	2 0 1 2 0	5	0 0 0 1	1	0 1 0	1	7	
	Entrepreneurial mentality	(28)	2 1 1 1 0	5	0 0 0 1	1	0 1 0	1	7
		(29)	2 0 0 2 1	5	0 0 1 3	4	2 0 1	3	12
(30)		2 0 0 2 1	5	0 0 1 3	4	2 0 1	3	12	
(31)		2 1 2 3 1	9	0 0 1 2	3	2 2 3	7	19	
Time	(32)	1 3 0 0 2	6	0 0 1 2	3	3 0 0	3	12	
	(33)	1 0 0 0 2	3	0 0 2 0	2	3 3 2	8	13	
	(34)	1 3 1 1 1	7	0 0 0 2	2	2 2 2	6	15	
	(35)	1 3 1 1 1	7	0 0 0 2	2	2 2 2	6	15	
Legislation	(36)	3 2 3 3 1	12	0 1 1 2	4	1 2 0	3	19	
	(37)	2 0 1 3 1	7	0 0 3 0	3	3 2 0	5	15	
	(38)	3 1 2 3 0	9	0 0 1 0	1	2 2 0	4	14	
	(39)	3 2 3 3 1	12	1 0 0 3	4	1 1 1	3	19	
	(40)	3 3 2 2 2	12	1 0 2 3	6	1 1 1	3	21	
	(41)	3 2 3 3 3	14	1 0 3 1	5	3 3 1	7	26	
	(42)	2 3 2 2 1	10	2 2 2 0	6	2 2 2	6	22	
	(43)	3 3 2 2 1	11	0 0 1 2	3	2 2 0	4	18	
Internal potentials	(44)	3 2 2 3 2	12	2 2 2 1	7	3 3 0	6	25	
	(45)	2 1 3 3 1	10	0 0 1 3	4	2 2 0	4	18	
	(46)								
	(47)								

Every factor under the given criterion we can classified from 0 to 3 on the basis of judgement in accordance with the influence in this segmentation:

- 0 – no or insignificant influence,
- 1 – small or indispensable influence,
- 2 – significant influence,

³ Own processing of this paper's author.

3 – capital influence.

After evaluation we summarize the achieved values in the framework of particular criteria and consequently overall. The factors which reached the maximum of marks are allowed to be the most significant.

IV. DISCUSSION

The results show that the most considerable factors which influence the innovation activities of virtual firm are *technologies* (13) which owns the firm. They have the significant effect mainly on company strategy. There is very important to plan how to reach the set goals of firm with actual technologies, or which it is necessary to acquire. Technologies are the significant factors for criteria of certification of quality standards, the product quality and safety, the probability of innovation project finalization, the company costs, the profit formation and the competitive advantage in itself.

The sizable effect on the realization of innovation activities have *business partners* (20) too. Either as suppliers influencing the company costs and the profit formation with their prices, or customers appointing demands of the product functionality and safety or the price. The business partners work upon the time of investment recovery through the volume of earning so the customers' willingness to buy innovated product like this too. They significantly influence the competitive advantage, creation of company value and the strategy which should be adapted just to customers demands and suppliers offers.

Among another markedly effecting factors belong firstly *availability of financial resources* (7), mainly in area of managerial criteria where is planed the investment and where the absence of this sources could significantly menace its' realization. The *educational level and skills of workers and managers of firm* (9) are reflected mainly in managerial criteria area during the strategy creation, ability to build up and keep the market position able to compete and during implementation of quality standards. The *sources of material and raw material* (12) are important factor in area of the strategy and the competitive advantage, the product price, the costs and profit formation where they are the key element in creation of bottom selling price borderline and production rentability, and in area of project finalization where without enough quantity of material and raw material it wouldn't be possible to ensure the continuous production.

The *ability to transform the gained outcomes of research and development to the practical business* (46) and the *mobility* (43) are significant too.

V. CONCLUSION

Although the virtual firm is a relatively new form of enterprise, we can't marginalize the area of innovations here. This paper accentuates factors influencing the realization of innovation activities of virtual firm.

In the first step there were determined seven general areas which were consequently specified to particular factors. To every factor there were identified whether it is a hard of soft metric and with which method we can measure this factor. At the last phases there were determined influences of particular factors on the basis of selected criteria. The most remarkable preclusive problem was the absence or the insufficient quality of technology, the availability of

financial sources, the interest of business partners (the innovation would lost its' reason if the customers prefer the present product or the substitutes in against the innovated products), the educational level and skills of workers and managers of firm, the material and raw material sources, the mobility and the ability to transform the gained outcomes of research and development to the practical business. Although many entrepreneurs displace the innovation aloof from their interest in time of global financial crisis, it is necessary to search in innovations a source of new opportunities to strengthen own competitive advantage.

The innovation activities of topical entrepreneurship reach a more complication, thereby a new dimension too in consequence of "virtualization" and creation of new forms of corporate organization. As mentioned Fig. 1 and 2 in [7] it is necessary for topical enterprises to interconnect all their potentials (in accordance with The Developmental Spiral of an Intelligent Firm) and to create a new level of business, so an intelligent firm on the basis of positive synergic effect. There are connected the separate functional segments of its intelligence through like Informative, Technological, Innovative, Financial, Marketing, Organizational, Social, Ecological and another segments [7].

It doesn't reach only to interconnecting of potentials inside the firm, but as mentioned Chap. II/A. to creation of virtual firms functioning on a principle of sharing of potentials of smaller firms during following of a collective purpose and creating of business networks.

Firms interconnect and consequently change „ nature and human's skills“ too, see Magic Pyramid of Network Entrepreneurship. [5].

But during the analyzing of possibilities and planning of innovation activities must the entrepreneurial keep in mind that the potential value of firm is like an "iceberg" [4] where only 10 percent of factors sticking out of the water are visible, but the remaining part (90 percent), the intellectual capital structure, would often be neglected and it is true that they can influence the innovation activity not only of the virtual firm but of the business generally all the more.

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