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POTENTIAL THEORY AND INNOVATION

DYNAMICS OF ENTERPRISE

Introduction

The main problem of contemporary business is to align the reproductive cycle of an enterprise and the innovative dynamism of production due to global competition. We must realize that the enterprise is the product of the activities of the entrepreneur (owner), the enterprise as a productive system creates (produces) products (goods and services). Thus, there is a natural conditionality of productive innovation system and its product.

If we use the classification of innovation of Professor Valenta (Mikoláš, 2011, page 146), we draw following conclusions. If the enterprise comes with qualitative product innovation of a sixth order (which is change, respectively emergence of a new generation of product) and possibly higher innovative order when it changes the functional and structural conception of the product (possibly changes the means of product concept as a whole, the principle of the technology or the even access to nature, etc.), then it is obvious that the productive system (enterprise) must also be a new generation.

Thus, a new generation of enterprise creates innovated product with new technologies and new work organization, etc. However the consequences of this dual qualitative innovation, i.e. entrance of a new generation product and the new generation of the productive system (enterprise) should be recognized.

The paper presents the latest theoretical knowledge of the author about the negative and positive effects of product innovation process on the dynamics of reproduction potential of enterprise. The paper builds on the research projects undertaken by the author in the Czech Republic¹ and Poland². Immediate devel-

¹ SP/2010167 Contemporary conception of competitive business potential of industrial enterprises (VSB-TU Ostrava), 402/08/H051 Optimization of multidisciplinary designing and modelling system of virtual manufacturing firms (VSB-TU Ostrava).

² Innovation in business – concepts, determinants and measurement (KPiZI, WE, EU Katowice).

ops the idea of the article Dynamics of development of the productive system³ and in particular the book Competitive potential of the industrial enterprise⁴.

1. Dynamics of an enterprise potential

Contemporary “organic” (holistic) concept of approach to enterprise and its development is based on the theory of the potential (Mikoláš, 2011). Total entrepreneurial potential (PC) is defined by sum of “effective (or purposeful) potential” (U) that is transferring to real effective effect (E), “expended potential” (VP) on attaining the real effect (E) and “stabilized potential” (SP) that is not transferring in to real effect (E) and mass of resources (M) that has disengaged from “expended potential” (VP). Thus, it is true, that $PC_0 = U_0 + VP_0 + SP_0$. Further can be stated that, $VP_0 = M_{(1)0}$, a $U_0 = E_{(1)0}$, where the subscript “(1)0” indicates the next moment “(1)” initial (basic) generation potential of “0” when the potential is converted into real effect ($E_{(1)0}$) and the mass resources employed ($M_{(1)0}$).

As well can be assumed that, $U > 0$, $VP > 0$ and $SP > 0$. The term potential is perceived as any disposition of entrepreneurial subject (system). Used terms are explained in publications by Z. Mikoláš (e. g. Mikoláš, 2011) in more detail.

If we generalize elementary principles of economic thought (Mikoláš, 2011, p. 55-61), we come to a relation $KPC_1 > \left[2 - \left(\frac{SP_0}{PC_0}\right)\right]$, where $KPC_1 = \frac{PC_1}{PC_0} > 1$.⁵

Likewise the growth of effective and total potential is assumed. This assumption can be derived from natural and socio-psychological existential principles – living organisms tend to reproduction and human knowledge uncovers new natural and social potential that can be useful for extended reproduction of human society (e.g. theory of industrial curves describes the growth of new knowledge with exponential functions).

Then it is possible to define further relations that follow up presented characteristic of the productive system potential development i.e., $KE_1 = \frac{KU_1}{KVP_1} > 1$, where KE_1 is the ratio of potential effective dynamics (effectiveness). Maintaining of productive system potential development dynamics is necessary condition, but not totally adequate. It is needed to define rational structure of partial components of the total potential. Two tendencies in economics are known – propensity to consume and propensity to safe. Analysis of given propensity to

³ J. Franek, Z. Mikoláš: Dynamics of Productive System Development. „Economics & Management” 2011, Vol. 7, s. 39-49.

⁴ Z. Mikoláš, et al: Competitive Potential of the Industrial Enterprise. C.H. Beck, Praha 2011.

⁵ Where the subscript “1” indicates the next generation.

consume and save we can obtain principal and unique results that were published in the book composed by Mikoláš (2011)⁶:

$$\text{a) } KSC_0^* = \frac{SP_0}{PC_0} = 0,381966;$$

$$\text{b) } KUV_0^* = \frac{(U_0 \cdot VP_0)}{PC_0} = 1 - KSC_0^* = 0,618034.$$

The rational dynamics of two generations of productive system (enterprise) total potential in the „golden section“ is therefore defined with relation $KPC_1^{ZR} = 2 - KSC_0^* = 1 + KUV_0^* = 1,618034$ ⁷.

It should be further answer the question what impact has time economy innovative activities of enterprise on the rational dynamics of total potential?

2. Innovation dynamism and time economy

System innovation (development) is possible only, if there exist two contradictions, i.e. two following potentials, effects etc. Then it is based on assumption that $E = v * M$. Quantity „v“ is the speed of changes, i.e. change frequency, so called system innovation process dynamics brought by relevant mass of resources (M), (Mikoláš, 2011, p. 143-191). The general rules of system innovation process dynamics can be applied: $KE_1 = \frac{KU_1}{KVP_1} > 1$, then $KE_1 = \frac{v_1}{v_0} > 1$.

The optimum of the innovation process dynamics is given by relation (called „relative section“) $v_1/v_2 = \frac{1}{\sqrt{2}}$. The optimum ratio innovative dynamism (g) is called the „relative cut“.

From listed above it is obvious that contemporary entrepreneurial environment characteristics follow a trend for following innovation series ($i = 1, 2, 3, \dots$) that can be described by decreasing function $g_{(i)} = \left(\frac{1}{\sqrt{2}}\right)^i$ ⁸. Presented process is an expression of competitive struggle of entrepreneurial subjects in entrepreneurial environment⁹.

⁶ Mathematical proofs are presented in this monograph.

⁷ It is necessary to compare the maximum potential of both generations of the productive system (enterprise).

⁸ Upon the Theory of innovation and „Moore’s law“ we can argue in favour of the „relative section“ concept. Moore (co-founder of Intel) claims that the data density doubles approximately every 18 months (according to current definition of Moore’s Law) and costs fall twice. This is true for 40 years. From the „relative section“ point of view is possible that the data density by 9months increases by factor $\sqrt{2}$ and costs fall 1: $\sqrt{2}$ ratio. So the „Moore’s law“ is complementary with „relative section“ principle of production systems potential development.

⁹ For more detail see Mikolas (2011).

From this follows that the frequency of innovation increases, thus shortens the time innovation cycles. This has a considerable impact on the duration of the reproductive cycle of an enterprise. The reproductive cycle of a business' potential as a result of innovation achieves practically the theoretical maxima. This means that the "physical" loss potential (physical depreciation) decreases. But on the contrary, the growth of "relative" wear and tear, i.e. due to innovative competition shortens the interval unlocking business potential. Is therefore a growing discrepancy in the reproductive cycle of an enterprise "physical" and "relative" form?

3. Loss of potential due to the innovative dynamism

According to Mikoláš et al. (2011) $PC_1 = \left[2 - \frac{SP_0}{PC_0}\right] * PC_0$, i. e. $PC_1 = PC_0 + (v_0 + 1) * M_{(1)0}$, therefore the potential increment $dPC_{10} = PC_1 - PC_0 = (v_0 + 1) * M_{(1)0}$.

From this follows that the "relative" and "golden section", when there are in an ideal situation, are represented by the following results:

- a) $KE_1^{RR} = v_1 : v_0 = \sqrt{2}$ for the relative relationship $M_{(1)0} = M_{(2)1}^{RR}$ ¹⁰
- b) $KVP_1^{ZR} = M_{(2)1}^{ZR} : M_{(1)0} = 1,340423255$ ¹¹, thus the actual expended mass of resources in the "golden section" donates a mass of resources expended in "relative section" by 34,04%.

It is worth to mention, that reproduction cycles are for various industries different. In mining industries (crude oil, iron ore, coal, etc.) there are cycles or reproduction in hundreds of years, in agriculture, forestry or in water utilisation the principle developmental changes occur in tenths of years. In metallurgy, engineering, etc. there are cycles about 10 to 20 or more years long. In electronics (semiconductor) industry we can speak about years.

Described relations and conditions of "relative" and "golden" sections are realized by change of economical and non-economical potentials. For example at first, strategic investment influences its environment positively not only economically or ecologically (often at the beginning there are some temporary negatives, such as ecological loads by its construction or by its testing run or entering the market is loss making, etc.), but positive changes occur in employment, improvement in regional environment, traffic infrastructure, etc. From the produc-

¹⁰ The superscript RR denotes condition in the relative cut (ratio, section).

¹¹ The superscript ZR indicates the status of the golden cut (ratio, section).

tive system point of view, those are rational and effective non-economical outcomes (effects)! According to “obsolete” economic concepts and beliefs it is an externality and therefore the economical profits are diminished due to lost opportunities! This contradiction of “obsolete” and in this presented paper “new paradigms of economical approach” is what I want to draw attention.

Before the research innovation dynamics and development of productive systems is a challenging task to find the solution of two opposing tendencies. New scientific knowledge results in the maximization of physical lifetime of production, technology, prolonging human life, exploitation of natural resources, etc. On the other hand, the frequency of theoretical knowledge increases and innovation cycles are shortened. There is a relative shortening of the time of life innovation. This means that the products, technologies, materials, etc. quickly get older. Enterprises solve this dilemma in the following ways: they that not build buildings, but rent them, they do not purchase the machine, but acquire the leasing, they displace part of the production as outsourcing, they do not employ workers, but rent them through employment agencies, etc. Manufacturers even deliberately reduce the physical life of the products to be adequate relative wear due to shortening innovation time.

Currently there arises considerable socio-ethical problem. What a man as workforce? New technologies displace human workforce from the productive process. This means that demands for workforce increases. The young generation lacks practical skills, therefore in many countries up to 50% of people under thirty years old is unemployed. On the other hand, demands on the physical and mental flexibility to employees increases. Therefore, people older than 45 years old are losing permanent employment in companies with a high degree of automation and robotics. Now is an absurd situation. The young man will live to about 80 years old, but will be often productively usable only 15 years. Thus around 65 years will be unproductive. Traditional economic system, including classical capitalism needed a new workforce for its growth. As follows from the previous text, a new reproductive cycle of the productive system requires ideally increasing masses of resources by 34%. The paradox is in the fact that mass of productive forces of people (in the so-called new economy) decreases and is substituted by other sources (e.g. in terms of revolutionary changes in technology, raw materials, organization of systems, the advent of virtual reality, etc.). This situation opens up fundamental questions of further development of the productive system, society, and thus more viable forms of capitalism or any other social order.

Previous claims only represent a trend to reach rationality of growth (evolution) of the productive systems (enterprises). Common affairs oscillate around subjective or objective causes along quantities, conditions and trends listed above. Tendencies to negentropy (order) and entropy (spontaneity) are changing. Understanding of these spontaneous order principles (“natural laws”) by managers (i.e. economists and other competent individuals) increases the hope that productive systems and other real business complexes will avoid extreme crisis situations (that we are witnessing at the end of the first decade of the 21. century).

4. Changing the paradigm of innovative business

To sum up the previous pieces of knowledge from the paper, we draw a conclusion that rationality of productive system’s (enterprises) transformation effectiveness passes through several key moments. But this productive system development is not isolated, there has to be at least two competing systems to produce synergic effect from the “unity and struggle of antitheses”, e.g. two generations of productive systems. An enterprise network is created, where they “compete in the frame of their cooperation” (e.g. the second generation descends the first one, but at the same time it competes with the latter and negates it) and simultaneously “cooperate in the frame of their competition” (otherwise there would not produce synergic effect and spontaneous order of competing enterprises).

Herewith it is necessary to perceive that the particular industries, regions, enterprises, etc. have different lengths of reproduction cycles, are in different stages of their existence, etc. It is necessary to examine dilemmas of the genesis and extinction of the organic world, find the dialectic of organic, inorganic and artificial nature in coexistence with the human society. “Relative and golden sections” occur in various objects and processes in different moments in time and even though they are related and implicate each other. It is crucial to recognize and compare incongruous and non-homogeneous phenomena. We must emphasize the eclectic and syncretistic approach in the science methodology, social science in particular. In finding of harmony in diversities, unity in contrasts, quality in quantity, the beginning of the novel in the destruction of the old, the effect in potential, macro economical world in microeconomics and vice versa, etc., is the foundation of the new insight, that should be brought into economics, management theory or business.

Finally the contribution I would like to express a number of considerations about the new paradigms of innovation dynamics of production systems:

1. Paradigm 1: There is a deliberate acceleration of physical wear of (shortening their lifetime) products to the limit relative (“moral”) wear. There is an illusory innovation and transfer of costs from the manufacturer to the customer as a result of artificial (unnecessary) consumption growth. Production creates consumers and consumer society in a negative sense.

2. Paradigm 2: Diffusion activities and functions of the company into the global space and other productive systems, the synergy effects of innovative entrepreneurship. This creates networks of enterprises and factories working together on joint production of the product or the provision of common services. The one real enterprise is now being replaced by virtual (network subsystems productive scattered out of one location linked most recent information and communication technologies). There is a transfer of risk and cost of the main (pilot) company on the satellite / diffuse / suppliers and cooperating entities. This creates a specific radius of innovation, effects and risks from the core to the edge of the entire productive system.

3. Paradigm 3: Long-term profit maximization enforces of inflation, i.e. the impairment of financial sources of future periods – thus fictitiously removed operation of the law of the falling rate of profit, but at the same time are actually repressed (devalued) the positive effects of innovation.

Economic, managerial and entrepreneurial science and contemporary practice must immediately solve dilemmas old and new paradigms which cause chaotic and confusing situation in the economy.

Conclusion

Strong innovative business carries substantial dilemma of contemporary capitalism – with the growth of the results from innovation productivity and efficiency of production and services increases. Therefore economy needs less people as producers and as consumers more people – consequently there is a asymmetry and selection of business sector. On the one hand, there is a relatively small group of highly productive global corporations and the rest of the other side relatively unproductive local businesses. Dramatic increase of unemployment among young people and seniors, state budget deficits and the collapse of social solidarity generations, families and members of the region and state are the results.

Originally the market economy in the past has been an effective tool for forming a democratic society. At present, the world is privatized small groups of people. A small group of presidents of transnational corporations have more

economic and political power than the representation of most states. Global innovation process brings at the same time the negative innovation, and the creation of a market society in which the standard human values are replaced with the economic ones. Totally worrying example of buying a democracy, the latest marketing innovations (including neuro-marketing) lead to the privatization of the election (or the financial or emotional buying votes).

So in conclusion I recall finding prof. Frantisek Valenta, which has been presented around 1960. In addition to positive innovations generated negative innovation destroying functional systems.

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POTENTIAL THEORY AND INNOVATION DYNAMICS OF ENTERPRISE

Summary

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¹² Mikoláš, Z., et al: Competitive Potential of the Industrial Enterprise. C.H. Beck, Praha 2011.