MODELS OF INNOVATIVE DEVELOPMENT THROUGH SCIENCE

Gabriel I. Nastase, Ph.D, senior lecturer,
„Dimitrie Cantemir" Christian University

Dr. eng. Dan C. Badea,

Eng. Dragos Ionut G. Năstase,
Romanian Authority for Nuclear Activities

Abstract: *Innovation as a complex phenomenon concerned by its globalism, the assets and business units defined systems: marketing, product adoption, technology.*

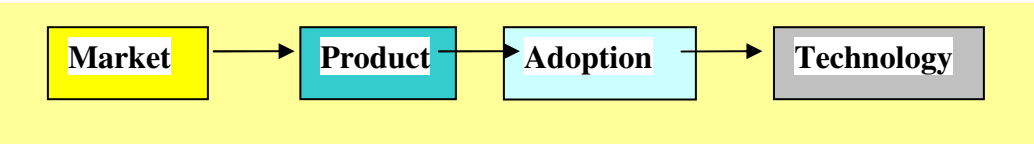
Technology transfer as part and parcel of the innovation is the key to materializing research and development results.

Keywords: *innovation, product adoption, technology, technology transfer, information systems assets and business systems.*

1. Innovation

1.1. Innovation in information systems assets

Innovative response primed by activating a creative power that is born the idea. Crucible favorite in this activation may be individual, as such, but may also be a formal or informal group in which there is a fertile climate for innovation. The idea always does a trigger signal, whose origin provides a criterion for classification of innovative responses: national origin group, which means internalization, or foreign origin, which shows exteriorization [1]. It is activated by a wide perspective on the triad of external conditions - market, technology, competition - and allow the orientation of R & D to design a product that can meet the environment, with a higher probability of success. In its completeness, innovation is looming, undeniably, by its globalism, which is expressed as change in total consisting of:



Since the original market, innovation is born in a crucible of "shock", between a need and one or more technologies. Shock can occur in various forms: a transfer, an association of ideas, a prediction, a coincidence, etc.. The need can be found, recognized as potential or imagined and designed as such. From this shock, where the favor by opening wider - sometimes the market, sometimes the technology in indoor or outdoor - the first seed-bearing reaction resulting innovative. Therefore, this nucleus appears as a result of chance, not only favors prepared minds (as expressed Pasteur). The behavior of dual-side opening states, thus the center of innovative act. Its field of action may be limited at present and can spread over large distances in space, to limit worldwide. It may also cover, detect, now, which announces the future, and encouraging expectations going in, before others, future conduct. Using the explicit dual evolutionary innovation vision of human existence is determined by need, you might say, mathematics, human

creativity, because the way human perception works is that of an information system self-organization [2]. Such systems require creativity and challenge.

In recent years, business has been "played" three major gaming: that of restructuring, reducing the cost and quality. What happens, however, when a competitor is as competent and "the cost-effectiveness, compared with one another? Clearly, we need creative thinking, innovation, so that one of the competitors to gain an advantage over the other. There assertion, that creativity belongs to the world "objects" and that, anyway, is a question of talent. In the paper "Serious Creativity" [2], Edward de Bono stated that this way of understanding creativity is exceeded. The reasons for not granted, so far, due regard creativity are:

■ First, who consider that any valid creative idea must always be logical perspective, if not so then there can see the validity of the idea and it would be just a "crazy idea". Also, if each applies creative idea would make sense in the future, then naturally it can be assumed that such ideas could be located by the logic from the start and thus creativity would not have been necessary. This is the main cultural issue which has not given serious attention to creativity. After evaluation of Edward de Bono, approximately 95% of the academic world has this view [2]. In a passive information system (external organized system) is correct to assume that an idea is logical in view, logic must be accessible from the start. But is not the same for an information system active (self-organized system), the asymmetry model means that an idea may be logical, even obvious in the future, but invisible for the first time logic. This may be visible only to those who are able to move the paradigm of organized systems outside the paradigm of self-organized systems.

■ Second, some believe in the importance of creativity and reality, but without being able to do anything about it. In this case, creativity is a mystical grace, which some people possess and others do not. In such a vision is a considerable confusion between artistic creativity (which often is non-creative) and ability to change concepts and perceptions. Here, the only thing that could be done would be to find creative and encourage people.

For those who believe that creative thinking skills can be improved by direct effort and attention, there are two difficulties:

- Inhibition (fear of making mistakes and fear of failure) which prevents risk taking creativity, there is the belief that removal of inhibition is sufficient for people to become creative, which meant that it would not be necessary "brainstorms" but only, "brain-sailing site.

- Creative thinking is treated as something "frivolous" and is devalued as something peripheral, that only "crazy people" used a [2], including the attribute of "serious" in addition to creativity wants to show, just that it should break the attribute "Crazy" (by Edward de Bono's phrase) which usually is attached to creativity.

There are some who believe that the systematic and deliberate instruments can lead to creativity, because any structure will limit the immediate freedom. There are, indeed, restrictive structures, but there are structures that issue (for example, a proper mathematical notation). Creative thinking (lateral thinking) can be regarded as a special type of operation information in addition to others such as: logic, computer simulation, etc.. Understanding the logic of creativity is to be targeted behavior, self-organizing information systems, they are forming systems and use patterns. After understanding the logic of creativity, the second level is that which relates to motivation, ie to the will of a person a break, a rupture of everyday pragmatism and to focus on certain points and then do some lateral thinking. It takes creativity and become free of temporal structures, which were introduced by a particular sequence of experience. So any self-organizing system is needed creativity, because creativity is not just a simple way to make things

better, without it, no one is able to use information and experience that are already ready for use and are enclosed in old structures, old patterns, old concepts and perceptions. Maintenance management is heavily oriented to "problem solving", but in a dynamic world, this type of management is not enough, it takes creative thinking, differentiation and marketing initiatives. The competition is not sufficient competition is to compete in the same race with competitors, where one behavior is largely determined by the behavior of competitors. Therefore, it is necessary to what might be called "Over / petition" that would "create your own race", or to create new "monopolies of value" [2]. Such an observation may have particular significance for understanding the paradigm of monopoly value, especially if we consider that Huberman show, in a vision closer of Nietzsche that innovation is achieved through creativity need to overcome social resistance [3]. Moreover, after the observations of psychologists, people resist, the tenacity is higher, exactly the point where the pressure change has peaked. Interpretation which makes sense because:

- Information can be (and is) power;
- Information provides the competitive climate.

These "monopolies of value" is based largely on integrated values. If a business initially was that of "products and services, then of" competition "now we can talk about the stage" integrated values. At this stage is great need for creativity. It is true that if we had perfect information in a particular situation, then thinking would no longer be necessary. But this chance is small and thinking we need to find meaning in information and not only in thought "analytical". Most scientists and business people believe that if only analyzed the data, then it will find new ideas. Unfortunately, this is not true, because the mind can only see what is ready to see. Data analysis allows selection of the repertoire of old ideas, that which is right. So, the analysis does not produce new ideas. If desired a new idea, there needs to be able to start the mind with creativity, a new idea, which is then compared with reality. A hypothesis is a "guess", a "speculation", or, as Novalis said, a "fishing net". The hypothesis provides a framework through which to look at information that the "google" [2]. The assumption would be to open opportunities, but often they close it, because it implies that assumptions should be reasonable and where there is no other alternative than changing paradigms of success. It requires, therefore, creative thinking, techniques and methods for changing paradigms and concepts. It is surprising, but good for understanding these concepts, which, long ago, the formula Gaston Bachelard, in Dialectic of modern scientific spirit [4]: "Decisive action is almost always confused with the use of reason in certainties memory ... monotonous turn rationalism from past to future spirit, from memory to attempt, from elementary to complex, from logical to supralogic, here are the indispensable tasks of spiritual revolution. But more surprising is that Gaston Bachelard, in his above mentioned, he quotes Dostoyevsky, who could write that "the reason known only what was able to learn". And yet, to think, how many things will be, first, to be freed? The purpose of this paradigm, Gaston Bachelard argued that human reason must play its function of turbulence and aggression [4]. It would, therefore, the foundation of that supraraționalism multiply opportunities for thinking and, in a visionary, Bachelard writes that "when the doctrine will be found, this supra-realism will be made in relation to supra-realism, for sensitivity and reason are both played their fluidity.

Cultural methods have been developed excellent information processing, but not charging them. Production of "ingredients" for information processing is role perception. Perception of organizing the world in x and y, which are then treated mathematically. It gives us the observations and propositions that, then we process the logic. Also it gives us the words and word choice that we think about anything.

There was much about perception, because not understood [2]. It was always assumed that perception operates, and processing in a passive information system, organized externally. Only in recent decades have started understanding the behavior of

information systems, self-organized and self-organized neural networks. Only from now on conceptual models is to begin understanding the perception, humor and creativity. It has become increasingly clear that innovation occurs in the perceptual stage of thinking. Here is formed perceptions and concepts and here they must be changed. Thus, the perception is the central role in creative thinking and lateral thinking as thinking is closely related to perceptual, most ordinary thinking takes place in perceptual phase, most errors in thinking are inadequacies of perception rather than the mistake in the logic. Tradition and sentiment over logic has generated an uncomfortable feeling in relation to fluidity and "the possibilities of perception", seeking refuge in the certainty of truth seems "logical". The perception does not see the world as it is, but as we perceive, perception models being built by a particular temporal sequence of experience, we can stop seeing "future", for which we are endowed to them we choose. It creates a personal sphere of perception, within which everything is logical. This remark is reminiscent of St. Augustine on the disorder (chaos) created at the "charge" only a fragment of mosaic and act in the whole to order. Obviously, the result is chaos. The logic is correct, but if the perception is limited, then the result could be inappropriate. Resulting in different logical sphere behave differently, but each individual is behaving properly within its logic. Hence the need for widening the perception instruments creatively and even calling the "logic" of water - ideal substance in nature. "Logic" water is the logic of perception to the "logic" of the rock, which is the traditional logic of processing [2]. Rock has a permanent and stable form, and the water is adjusted, the "right" dish or circumstances. Perception depends on the context, experience, emotions, points of view, frame, etc. Like water, the perception is built in layers that are "up" to give an overall perception. A rock is static, the water is smooth and flowing. "Logic" rock dealing with "what", while "logic" of water and dealing with the perception "that could be". The rock has a shape, a well-shaped edge and the water is fluid edges, they relate to the logic of fuzzy perception. Perception search tries to find meaning and purpose of the present. It also seeks, as water, a stable state (in terms of neural network in the brain). To be creative, it is important to realize the fluidity of perception and the possibility of multiple perceptions, each valid. This is essential for creative thinking to replace "shall" to "may be". At the end of creative thinking, however, we need to get back to rock logic to present ideas that are solid, good value achieved and tested. But to get to them first logic requires fluidity of water and lateral thinking.

1.2. Innovation in enterprise system

Innovation is the specific instrument of entrepreneurship system [5]. The act that endow the system with a new capacity to create wealth. Innovation creates a means which use some of nature endowed with economic value. An example given by Peter F. Drucker [5], is particularly eloquent: "Until a century ago, no mineral oil that came out of the earth, nor bauxite - the ore from which aluminum is extracted - were not means. They were trouble: both were infertile land. Mold was a disaster, not a means. Bacteriology made desperate efforts to protect crops from contamination by bacteria this fungus, then in the 20s, a London doctor, Alexander Fleming realized that this was exactly <disaster> destroyer of bacteria they sought bacteriology and mold has become a valuable tool. The same is true for the economic and social sphere. There are resources that the economy than "purchasing power". But purchasing power is the creation of an innovative entrepreneur. Webster (quoted in [6]) defines innovation as "the ability to bring something new into existence. Others consider that innovation is a human process leading to a result new, useful (solves an existing problem and satisfy a need) and understandable (can be reproduced) [5, 6].

A very useful definition of innovation comes from the recent literature on social psychology. Following Amabile (quoted in [6]), a product or a response will be judged as innovative as they are up to us and consistent, useful, correct or valid purpose in question, and the aim is rather heuristic, only one algorithms. Algorithmic purposes are governed by fixed rules. The path to the solution is clear and well targeted. Algorithm must be developed from a home, which involves a new interaction between people, purpose and social environment.

But what are the characteristics of creative people? Anyone can be innovative? There were many considerations of the list of traits of creative people. After a nearly exhaustive literature review, Roe suggests the following list of traits of creative people [7]:

► Open the experiment.
► curiosity.
► ambiguity tolerance.
► The need and the assumption of autonomy.
► Will the calculated risk.
► Not subject standards and control group.
► Attention - seeing things in unusual ways.
► Accept and reconcile the apparent opposition.
► independence trial, mind and action.
► Self-confidence.
► Perseverance.

To this list, Raudsepp (quoted in [2]) adds the following features:

► sensitivity to the problems.
► Flexibility.
► Empathy sentimental.
► reasons.
► Ability to concentrate.
► selectivity.
► fluency - ability to generate many ideas.
► Originality.
► Open the subconscious phenomena.
► Freedom from fear of failure.
► thinking in pictures.

To respond to the question whether anyone can be innovative, concise manner is preferable to John. J. Kao expressed: “Logic without passion is sterile, while inspiration without analysis is often arbitrary or unreasonable” [6]. There are several stages of innovation. As shown in Table. 1, it starts with interest: it must be something compelling intrinsic problem

Table 1

Process innovation

STATE OF INNOVATION	ACTIVITY	STYLE PSYCHOLOGICAL
Interest	Research environment	Insight / Emotion
Preparation	Preparation expedition	Details / Schedule
Incubation	“Pigmentation things”	Insight
Lighting	Experience “Eureka”	Insight
Verification	Market research	Details / Rationality
Operation	Industrial magnate	Details / Rationality

Interest is followed by the preparation stage, are developed intellectual agenda, more greater even than it would someone who would go on a trip. Incubation is as ardent an intuitive and work on the problem. Illumination is as intuitive output in the full light of findings. Finally, the result must be verified and the operation stage, it must produce added value.

The attention given by various authors innovation when considering entrepreneurship, is determined by the intrinsic link between creativity and entrepreneurship. An entrepreneur can be defined as someone who is sensitive to the opportunities and has a sense of freedom in both personal sense and in the organizational sense, to act on the opportunity. Entrepreneurship has a connotation of implementing (doing). While innovation involves a vision of what is possible, the contractor will implement the vision set in, in a human vision that guides the work of groups of people. If the period of innovation suggests the implementation process by which creative inspiration lead to practical results, then human and organizational entrepreneurship is the process by which innovation occurs.

2. Technology transfer

2.1. Definitions and general mechanisms for technology transfer

Technology transfer involves a series of relationships, formal and informal type among research units - economic development and public and private sectors. The purpose of the transfer is to strengthen the economy in a territory, by accelerating the application of new technologies and resources needs and opportunities for private and public sectors. Technology transfer is the process by which knowledge, facilities or capabilities of existing publicly funded research and development, are used to meet the needs of public and private [8]. In principle, the results of successful technology transfer efforts, can show improvement products, efficient services, improve manufacturing processes, the development of new products for disposing of domestic and international markets. In essence, the technology transfer process involves three entities (Fig. 2.), Which were in a relationship of cooperation.

Fig. 2 - The process of technology transfer.

These entities participate, depending on each specific activity, technological change, one that involves:

- developing the basic concept (technological creativity).
- economically relevant experimentation on products and processes.
- Basic knowledge diffusion and their application.

Thus, technology transfer is seen in the most general sense, the transfer of research results in research and development units (universities, research institutes), in business firms or other parts of society [9]. The three entities involved in transfer of technology aimed at accelerating economic use of research results involving the transition from invention to innovation and dissemination of success on the market, creating added value.

Internationally, there is developing a wide network of organizations promoting competitiveness and technology transfer. These organizations have set up systems that

interface between research establishments and industrial companies. The best-known international organization of technology transfer, noted:

Federal Laboratory Consortium for Technology (FLC), Washington, USA.

■ Association of University Technology Managers (Autm), Norwalk, USA.

■ Competitive Technologies Inc.. (CTI), Fairfield, USA.

■ British Technology Group (BTG), London, England.

■ Technology Transfer Defense Evaluation Research Agency (DERA), Kenilworth, England.

■ Institute for Industrial Technology Transfer (Iittala), Champs sur Marne, France.

■ Center for Innovative Technology Transfer Bayern, Nurnberg, Germany

In the past 15 years have been established in the U.S. and Western Europe becoming more such organizations. Thus, the U.S. technology transfer organizations number increased from 100 in 1983 to 400 in 1991. In Germany, between 1983-1988, 70 organizations were set up technology transfer, and in France, the number of such organizations has reached 40. Gradually, after 1989, in the context of transition to market economy, such organizations have emerged in Central and Eastern Europe. The main functions of these organizations are intermediaries and stimulate technology transfer. By providing facilities and technology services, these organizations seek application of innovation, technology transfer and quality management to increase business competitiveness, and providing advice and assistance to research and development organizations to adapt to new demands of globalization. The specific objectives of technology transfer activities of organizations are:

a) Supporting the industrial enterprises to:

- Application of new technologies and modernizing existing ones;
- Improving the potential for cooperation with international partners;
- To attract grants and repayable, including risk capital funds;
- Improvement of quality management.

b) Support research and development organizations that:

- Be able to transfer the research results in economics;
- Can cooperate and assist businesses to implement new technologies and modernizing existing ones;
- Easier to adapt to globalization.

c) Supporting the national, regional and international, by:

- Conducting studies and research on science policy and strategy development;
- Attracting new participants in public programs, better information related to them;
- Attracting new sources of co-financing programs.

d) Raising awareness and awareness on the concepts of innovation, quality and technology transfer by:

- Developing and implementing educational programs on the concepts of innovation, quality and technology transfer;
- Measures to disseminate information in science, technology, innovation, including by means of information technology;
- Training / training of human resources involved;
- Methodological and logistical support activities for the benefit of doctoral students;
- Attracting young graduates to work specific programs;
- Promotion of the concepts of innovation, quality and technology transfer within firms and the public.

2.2. Transfer of technology through direct investment.

Research on the international transfer of technology have not developed yet a clear framework within which to carry out a full analysis [10]. Therefore, useful conclusions can be studying the structure of technology transfer through direct investment, made by developed countries to less developed regions. Transfer of technology from Japan to East Asia has evolved gradually, as Japanese firms to outsource production and developed successfully. In a National Institute of Science and Technology Policy of Japan [10] have examined the effects of direct investment in a group of countries comprising South Korea, Taiwan, Hong Kong, Singapore, Thailand and Malaysia. International business development has made technology transfer in a complex and difficult to deal with. Old research on international technology transfer have lost validity. Therefore, the study cited above raises the question of developing measurement methods and appropriate analysis trend towards borderless economy (globalization) and innovative competition. Known product cycle theory (of Raymond Vernon), a theory of technology transfer processes of production in different geographical areas, argues that technological invention occurs in rich countries (where there are high levels of pay) and that technology is transferred, in particularly in countries with low levels of pay, depending on technology maturity. The expansion of multinational companies has triggered a deviation from the product cycle theory, which argued that the fundamentals of production are transferred from developed countries half developed country, and of these, in developing countries, in correspondence with the technology. The speed with which new technologies are running is far greater now than any other earlier stage. Multiplication is found where the right production decisions are based less on technology and on wage levels and more on corporate strategy of manufacturing companies. Globalization of economy is the corporate strategy that induces a hitherto unprecedented scale. Globalization of the economy has gained new dimensions and relevance in the context of the merger as more and more transnational companies. This real economic phenomenon has increased by 50% in 1998 compared to 1997, the number of companies involved doubled compared to 1996 [11]. The phenomenon was much idendificat May by Martin Carnoy, professor of economics at Stanford University (USA), which showed that “large multinational companies continue to grow rapidly and to influence changes in the global economy. They also dominated trade between industrial countries and controlling international capital movements “[12].

Transition to the borderless economy has advanced to such an extent that companies have exceeded the product cycle theory and developed what is called the simultaneous structure of global production. This is a process that requires formation of a theory on the relationship between foreign investment and technology transfer [13]. The formation of this new theory, whether technology should be reconsidered, as stated many years ago, that time of transfer of technology should be rethought, since it appears rather as a “euphemism” as long as He refers to “something” that can be sold and, therefore, is a commodity that participate in the economic cycle [14, 15].

Returning to study on technology transfer of Japanese companies [10], it is useful to highlight the methods used. In this study analyzed the major color TV manufacturers and TV cameras, which have located assembly companies in East Asia. Criterion analysis of these producers was the transfer of technology and innovation. First, they examined various major components of the structure of color TVs and TV cameras, in connection with sources of supply. Based on such review, it was estimated that technology was transferred and where. This method clarifies the contextual circumstances of the transfer of technology to the company or between companies. Secondly, it considered the effect caused by technological progress on technology transfer. It was also investigated, innovative process for the manufacture of TV cameras. He made a qualitative analysis of the effect of each technological advance, which appeared in color TV production and TV

cameras, an effect which occurred on transfer of technology. Results and conclusions of this study are:

1) For color television, technology transfer from Japan to East Asia has progressed through direct investments of Japanese firms. There is a distinction, the components, the degree of technology transfer. If TV cameras, the progress of technology transfer was slower than for color televisions. In addition, technology transfer can be divided into technology transfer within the company (in company) and technology transfer outside the company (between). From this perspective, the second transfer of technology was practically negligible.

2) Purchase of parts and components are made by major Japanese manufacturers network in the country of origin and in East Asia. This phenomenon is explained by the fact that there are structural limits to technological development, which creates a handicap in developing East Asia production technology components and their implementation through local production.

3) Technological progress has occurred in parallel with the expansion of outsourced production, the acting on promoting technology transfer.

It was noted that a technology can be incorporated into a parts, components, in a car or a subset of equipment and that it can move. East Asia has adapted well to this movement. Integrated circuits in electronic applications are one example. In this case, leading technology is used in a “black box” and, the effect, today's technology becomes more difficult to transfer.

The results of this study highlight other issues, more general, which may be subject to analysis. Areas in which Japanese companies operating in East Asia are supplying have diversified. Electronic component manufacturing technology has advanced remarkably. If East Asian countries to better understand technology transfer, which must be analyzed is the end product, but production of major components. On the line this cooperation, Japan and East Asian countries have close economic and technological relations. Also, many countries show a keen interest in Japanese science and technology, requiring technology transfers to raise their technological level. But the perception of technology transfer vary considerably between Japan and East Asian countries. In Japan, in general, thinks that increasing foreign direct investment by the private sector has contributed to developing countries “container”. It is believed that by building factories, hiring local workers, providing education and training, Japanese companies have increased their productivity by investing in countries' container. Moreover, there attitudes in countries “container”, which expresses the idea that technology transfer is inadequate Japanese firms and that it must transfer higher-tech occupations and jobs for local workers, to the technological lead of countries development. Thus, technology transfer has become a political issue. Such a discussion can take place without a clear understanding of the status of technology transfer. One reason is that the term “technology transfer” is abstract and difficult to understand [10]. Theory “compatible technology” suggests that technology transfer to developing countries to open their technological advances. This theory is based on the idea that these countries face a range of problems in technology assimilation. This theory was inspired by the successive failures to placing factories in developing countries by developed countries, between 1960-1970. Theory “compatible technology” provides the best form of technology that developed countries can transfer to developing countries, is that local technical experts can manage. Interactive relationships between technological, cultural, institutional innovation and economic development can be studied to find the causes of success in countries that have had the experience of development and technology transfer. Such success stories are the complex socio-technological transformation of developing the U.S., Japan and Sweden and are analyzed in detail, the Ake Anderson, TR Lakshmanan

and Wei-Bin Zhang - a group of researchers from the Institute for the Future Study (Sweden) and the Center for Energy and Environmental Studies (USA) [16]. Inspired by the success of countries like USA, Japan and Sweden, many developing countries have tried in the last four decades, modern technology transfer experience. The experience of countries (South Korea, Taiwan, Singapore, etc..), Where there is moderate or high levels of recovery technology and high growth rates, confirming how complex the process of modernization through technology transfer even in conditions in which these countries enjoyed special support. The problems faced by these countries commitment to development through technology transfer experiment were basically the following:

- defining elements of successful development based on technology transfer;
- introduction of technology transfer conditions so as to ensure substantial growth;
- processes that trigger the transfer of technologies and / or change them according to local supply availability, prices and local social context;
- innovations that may arise during technology transfer;
- how the reasons for success and modernization of labor, the entrepreneurs and the general public;
- influence of tradition on the duration, speed and quality of technology transfer.

If East Asian countries, they have rapidly expanded their assembly industries through technology transfer organizations. Also, determine the trend of these countries to develop their own industries through association with firms from Japan and USA. Later, some of these countries has an increased role for the development of their technology, which has contributed to technology transfer organizations, which played an important role in strengthening domestic industries.

2.3. Technological substitution model

Various researchers have proposed innovation in the dissemination of technological substitution models (MST), to study aspects of the temporal dependence of the release process of innovation. For purposes of this research [17], through the dissemination of innovation (PDI) is defined process by which a technological innovation or a new technological product is communicated through certain channels over time (and possibly space) among members of a social system. These models have found wide use in studying the dynamics of innovation in industry, medicine, energy, telecommunications and agriculture. Such models were, after [17], provided by Floyd, Bass, Fisher-pry, Sharif-Kabir, Easingwood, Kumar and others.

All these models have broad MTS:

$$\frac{1}{c}\frac{df}{dt} = \Phi(f) \qquad (1)$$

in which: f (t)- the proportion of prospective adopter who adopted the innovation by time t.

Function Φ (f) has the following properties:

- Φ (f) is a continuous function in the range $[0,1]$;
- $\Phi(f) \geq 0$,in the range $[0,1]$;
- $\Phi(0) \geq 0, \Phi(1) = 0$;
- $\Phi'(f) > 0$, when f> f *;
- $\Phi'(f) < 0$, when f <f *;

$f_o < f^* < 1$, where f_o is the value of f at time t = 0;

- The solution equation (1) gives a convex curve f-t when fo <f <f *, which has an inflection point at f = f * and a concave curve when f * <f <1;
- f-t is shaped curve “S” and has an asymptote at f = 1;

- $\lim_{t\to\infty} f(t) = 1$.

MTS various models differ mainly based on three important features:
- Number of parameters and field values;
- Symmetrical or asymmetrical behavior in relation to the point of inflection;
- Location of inflection point.

The Bass [18] proposed the equation (1) as:

$$\frac{1}{c}\frac{df}{dt} = \frac{(p+qf)}{(p-qf)}(1-f)\ ,\ p \geq 0\ , q > 0 \qquad (2)$$

where: p / q is the relative role of innovators and role simulators or internal or external influences.

The parameter c is introduced for correction of time scale used, its values vary depending on the time of forecasting and analysis.

The point of inflection of the curve occurs when:

$$f = f^* = \frac{1}{2} - \frac{1}{2}\frac{p}{q} \qquad (3)$$

For each curve of this model, $f^* \leq \frac{1}{2}$. Equality $\left(f^* = \frac{1}{2}\right)$ leads to Fisher-PRY model [18], respectively:

$$\frac{1}{c}\frac{df}{dt} = f(1-f) \qquad (4)$$

Also, the Sharif-Kabir model [19] is the equation:

$$\frac{1}{c}\frac{df}{dt} = \frac{f(1-f)^2}{1-(1-\sigma)f}\ ,\ 0 \leq \sigma \leq 1 \qquad (5)$$

In this case $\frac{1}{3} < f^* < \frac{1}{2}$.

When $f^* = \frac{1}{3}$, the equation coincides with that of the Floyd [20]:

$$\frac{1}{c}\frac{df}{dt} = f(1-f)^2 \qquad (6)$$

Although there are many such models of diffusion of innovation, many of them can not function optimally in some cases [21].

One such case is the system in transition, as stated made by Andersson [22], under the influence of two categories of factors:
- Factors with strong impact;
- Factors with little impact.

The three systems of human activity organize activities in areas related functional: while economic systems (Figure 3) are associated with the production and use of welfare, social and political systems are focused on institutions and on control structures in society.

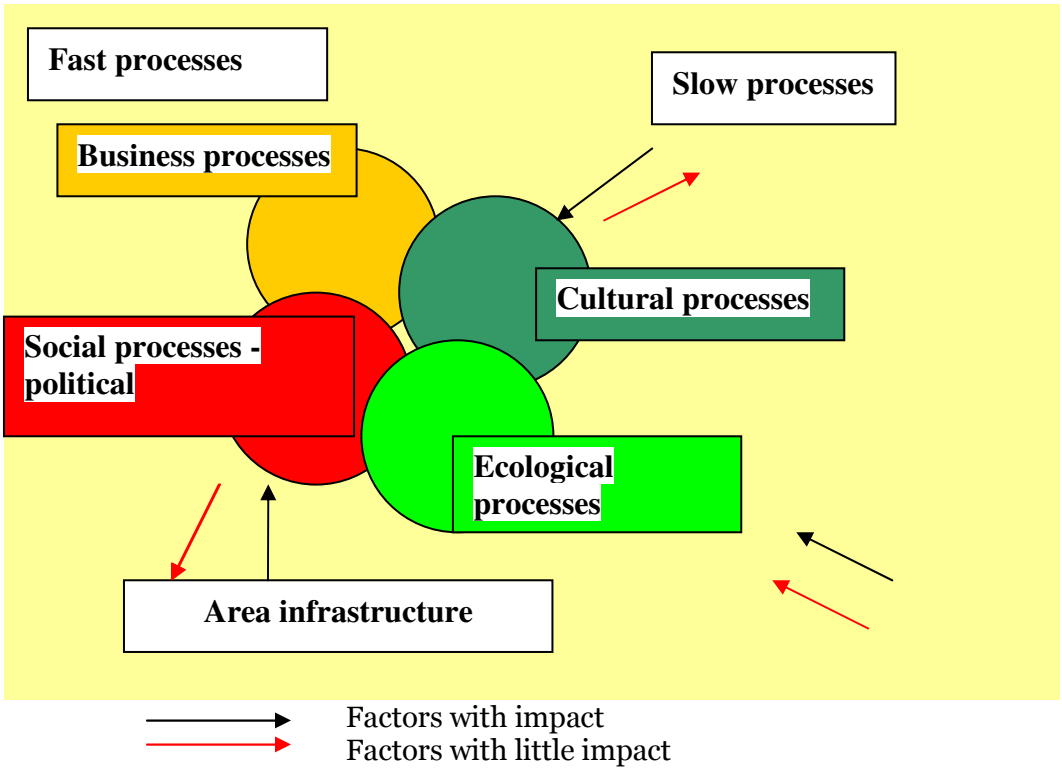


Fig. 3 - human activity systems

Cultural systems are designed creation, maintenance and changing meanings or meanings and values in society

Each of these systems is characterized by the structure and behavior, the framework and actions. The limit of these systems is not a type "shell membrane, but rather the type of construction behavior, which constrain the behavior of component systems for the purposes of system goal corresponding action.

If elements of an economic system, social or cultural may be arranged in different sets of "composite" or behavior, the various conditions to limit (eg, different cultural preferences or social structures, institutions, etc..), However, can not be a single configuration of human systems for different countries.

Technology systems and infrastructure development creates more differentiated entities socio-economic and cultural.

Technology is the new instrumental knowledge put into service several purposes: upgrading of products, production processes, innovations in finance, marketing, business, services, institutions and governance.

All these innovations offer a major potential change in the quantity and quality of economic opportunities. Initial condition to capture this potential is the creation of new infrastructure materials related to the restructuring of non-material infrastructures.

Such materials or non-material infrastructure, available to certain critical levels, helps to make the conversion from one economic system to another (Figure 4).

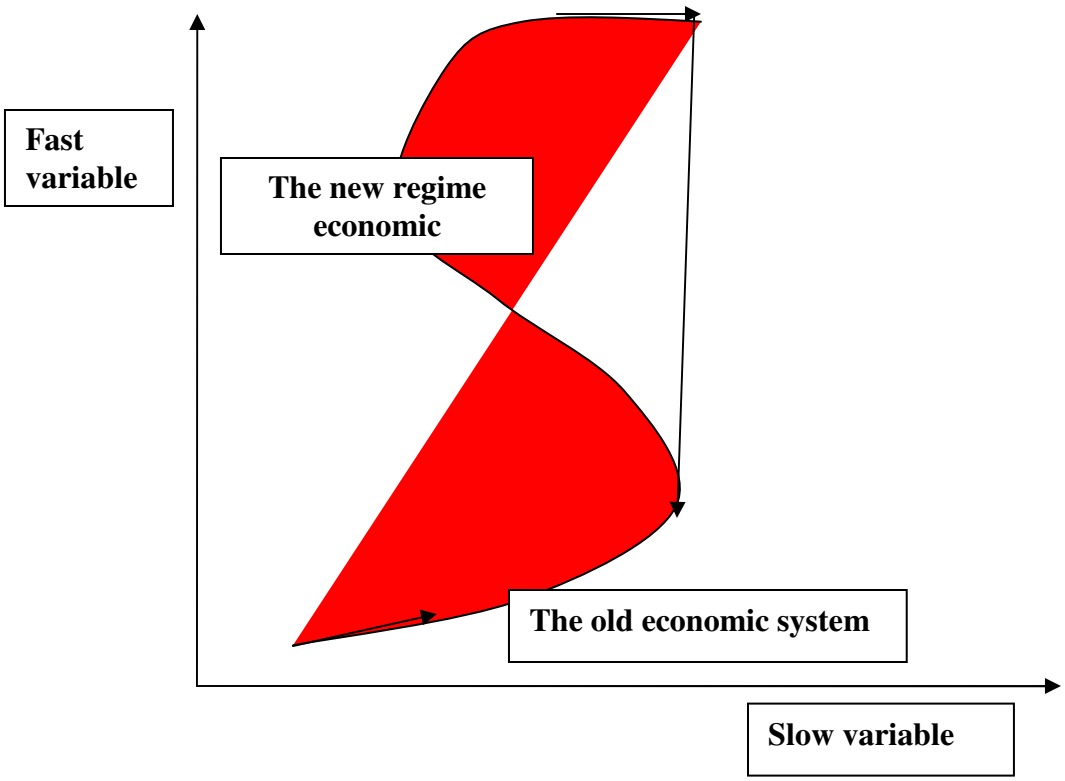


Fig. 4 - Conversion of the economic system

After a variable rate of growth (slow) infrastructure, the system remains stable, then at a critical point turns, nonlinear and chaotic, the transition to the new regime.

Figure 5 presents some concepts of synergistic responses. In some ways, small changes in stimulations or instrument (infrastructure) leads to the broad side effects.

Successful development requires the identification of synergistic opportunities to those contained in those levels, the combination of slow variables (such as infrastructure) and synergic coordination of rapid variables.

It emphasized the idea that interest levels and combination of variables that regime change is associated with areas of physical and non-material, which changes with the context of economic opportunities.

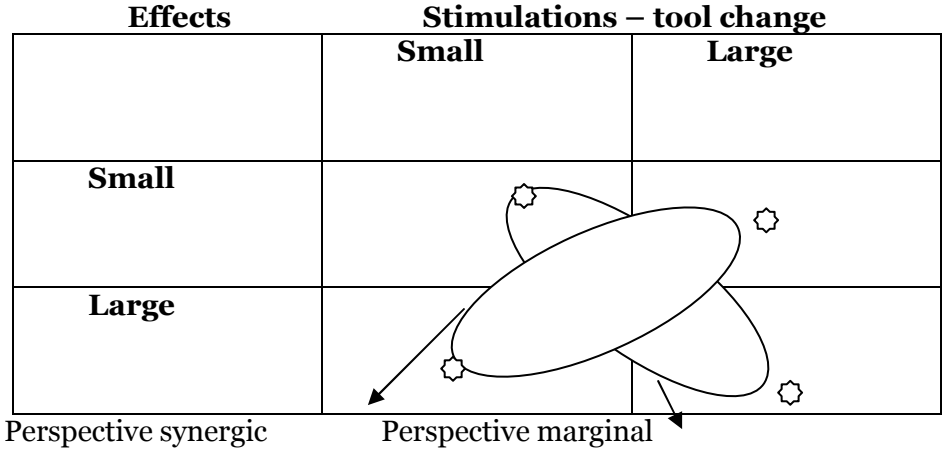


Fig. 5 - synergistic effects of change

More generally, the history of success as a record of social learning, it can be concluded that long-term development includes the formation of the desired environmental or behavioral design (rather than the traditional reactive environment guided by the social system behavior). Understanding and creating a new synergic synergies and coordination of complex systems is a process of evolutionary and social learning experiments.

Intense debate on economic dynamics, refers to variable speed adjustment. It can clarify the different economic systems (Keynesian) neo-classical Schumpeterian Marxist) depending on speed adjustment variables as prices, capital, resources, institutions, knowledge, innovation and creativity.

It can be considered a dynamic economic system described by the equation:

$$\frac{dx_{ij}}{dt} = s^i F_i(x) \qquad (7)$$

where:

$s < 1$ - parameter adjustment classification of variable speed;

x_{ij} - variables describing the dynamic system state. These variables are real parameters as input / output (money, prices, interest etc.).

Function F_i describes interactive relations between variables. Whether there are external factors in the system, $F_i(x)$, can be written $F_i(x,t)$.

Place the parameter of speed, to distinguish differences in speed of different variables such as geographic, ideals, institutions, which may change slowly. There are other variables, such as consumer choice, which is changing very rapidly. Obviously, the rate of change of a variable is dependent, for example, the cultural dowry. However, long term, such a strict sense, adjustment speeds depend on endogenous variables. For example, the Chinese have adapted to Western culture historian at a rate much lower than Japanese, at least the last two centuries.

2.4. The process of disseminating innovative entrepreneurship

One of the modern approaches of modeling the process of disseminating innovative entrepreneurship is based on the collective dynamic electivity (EDC) [23].

Four types of major factors involved in the dynamic process of innovation diffusion:

- beneficiaries of innovations;
- Entrepreneurs;
- The set of alternatives;
- Active environment.

The spread of innovations within the system of firms and industries - creating and implementing innovations and spatio-temporal spread of innovation among individual beneficiaries of new products - incorporating features of the innovations of ecological competition.

Following the competitive exclusion of inefficient innovations alternative disseminate innovations among individual beneficiaries of new products based on a process of EDC, these take into account future earnings and incorporating inter-reaction and learning, which weakens the bonds of the old mentality.

In addition, external environmental reaction actively restrict innovative choice behavior of individuals, the composition of skills demand and changes in component supply companies and industries, resulting in additional redistribution of alternative innovations. An active medium diluted ACTIONS extreme competitive exclusion of innovation and generate socio-economic niche, they play a role in the formation of "incubators" of new innovative alternatives and ensuring conservation of existing ones. Thus, "creative discontinuities" are supported by the action of an external intervention system, as government support of regional development, the implementation of national economic policy, fiscal decentralization and institutional, etc..

General Action "creative discontinuity is equivalent to competitive exclusion, which precedes the stable coexistence of two or more species with identical needs and who live in the same ecological niche where there is a limitation of resources.

3. Competitive products and process of collective electivității

3.1. Diffusion of innovative alternatives

Can be considered a complete set of "n" innovative alternatives, a multi-dimensional space R of space-time parameters and socio-economic parameters relevant elective, characteristic attributes of components supply / demand of innovation diffusion. Elective probability vectors are:

$$y(r) = [y_1(r), y_2(r), ..., y_n(r)] \qquad (8)$$

$$\sum_{i=1}^{n} y_i(r) = 1; \quad 0 \le y_i(r) \le 1 \qquad (9)$$

Let "s" a certain direction in space R, then the relative change of the probability elective

y (r), direction "s" is:

$$\frac{\partial y_i(r)}{\partial s} \Big/ y_i(r) = \frac{\partial \ln y_i(r)}{\partial s}, \; i = 1,2, \ldots n \qquad (10)$$

where ($\partial / \partial s$) is derived in an arbitrary direction of the space R.

Home hypothesis innovative alternatives described diffusion as a result of elective behavior of "social man", is the existence of "collective consciousness": change relative marginal likelihood innovative electivity (PEI) depend on the probability distribution of innovative alternatives between adopted, ie on all vector components of the probability distribution y (r).

This means, in terms of analytical, dynamic time-space continuum that can be represented as a system of partial differential equations for a direction "s":

$$\frac{\partial \ln y_i(r)}{\partial s} = f_{si}\left[r, y_i(r)\right] \text{ ,i = 1,2 ,..., n} \qquad (11)$$

$$\sum_{i=1}^{n} y_i(r) = 1 \qquad (12)$$

Conditions for the integration of the system (equations 15 and 16) are:

$$\frac{\partial^2 \ln y_i(s)}{\partial p \partial s} = \frac{\partial^2 \ln y_i(r)}{\partial s \partial p} \qquad (13)$$

for each two-way arbitrary "p" and "s" in the parameter space R.

This means that:

$$\frac{\partial f_{s1}[r, y(r)]}{\partial p} = \frac{\partial f_{p1}[r, y(r)]}{\partial s} \qquad (14)$$

As is well known in the theory of functions of several variables, for each "i" is a scalar potential Vi (r) such that:

$$\frac{\partial V_i(r)}{\partial s} = f_{si}\left[r, y(r)\right] \qquad (15)$$

Such system (Ec 15) assumes the form:

$$\frac{\partial \ln y_i(r)}{\partial s} = \frac{\partial V_i(r)}{\partial s} \qquad (16)$$

In [32] it is shown that the system (16) is equivalent to:

$$\frac{\partial y_i(r)}{\partial s} = \sum_j y_i y_j \frac{\partial}{\partial s}\left[V_i(r) - V_j(r)\right] \qquad (17)$$

System (ec.17) is elective behavior of "social man" in explicit form, the product is likely $y_i y_j$ contacts (directly or indirectly) of adopter "i" and "j" of innovation. Term measures the impact of these contacts on the relative change of the relative likelihood of adoption of innovation "and", the effectiveness of these contacts.

In addition, growth or decline in the proportion of adopter innovation is considered the "social man" as a change in the utility of this innovation.

Hence the expression:

$$\left(\partial / \partial s\right)\left[V(r)_i - V_r(r)\right]$$

can be interpreted as the marginal utility of dynamic transition from innovative alternative "j" to "i" and, accordingly $\left[\partial V_i(r) / \partial s\right]$, can be interpreted as the marginal utility of alternative dynamic innovative "i" representing expectate future earnings, by changing or by changing socio-economic attributes of alternative innovative "i".

Explicit solution of the system (ec.17) has the form:

$$Y_i(r) = \frac{y_i(0)\exp[V_i(r) - V_i(0)]}{\sum_j y_j(0)\exp[V_j(r) - V[0]_j]} \qquad (18)$$

Formula (18) provides additional support for the interpretation of scalar potential utility of Vj as innovative alternatives, which are actually mental assessment of future earnings resulting from adoption. In addition, it is possible to introduce an additional interpretation of scalar potential in terms of socio-economic systems of production and stimulating innovative alternatives.

It can accept notations:

$$a_{is}(r) = \frac{\partial V_i(r)}{\partial s} \; ; \; a_{ijs} = a_{is}(r) - a_{js}(r) = \frac{\partial}{\partial s}\left[V_i(r) - V_j(r)\right] \qquad (19)$$

Then system (ec.17) assumes the form:

$$\frac{\partial y_i(r)}{\partial s} = y_i(r)\sum_j a_{ijs}(r) y_j(r) \qquad (20)$$

$$\sum_i y_i(r) = 1$$

in which $a_{ijs}(r)$ is the marginal influence (in direction 's') choice of innovation “and” the adoption of innovation “j” and, thus, expressed as the current proportion of contacts between adopted innovation “and” and “j”, to foster the transition from innovation “and” to “j”. The matrix of inter-reaction is anti-symmetric:

$$a_{ijs} + a_{jis} = 0 \qquad (21)$$

Anti- symmetric be interpreted in such a way that one can say that each pair of innovation “i” and “j” participating in zero-sum game antagonistic a_{ijs} interaction coefficient, which is the hope of gain resulting from the transfer of innovation “j” the innovation “i”.

3.2. Temporal diffusion of innovation

Concerns earlier [24] shows that there were attempts to disseminate information to find similarities between ST and other phenomena, such as the spread of epidemics, the exponential growth of population, etc..

In [24] presented a mathematical modeling approach to the problem of information dissemination, from the physical diffusion and from Fourier's law:

$Q = - \lambda gradu$ (22)

where: λ - conductivity

u - temperature.

These models have some drawbacks regarding the interpretation of results because the experimental curves obtained are significant deviations from the theoretical curves.

Taking the time variable parameter in a modern approach [25], consider the "n" competitive innovation characterized every time "t" by the probability distribution of the adopter of innovations:

$w_1 (t), w_2 (t), \ldots w_n (t), 0 < w_i (t) < 1$ (23)

Also be:

$s_1, s_2, \ldots, s_n$, and $0 \le s_i \le 1$; $i = 1, 2, \ldots, n$ (24)

$$\sum_{i=1}^{n} s_i = 1$$

portions of the recesses of adoption, arising from territorial interventions. Consider s0 - the portion of susceptible population, such that: $0 < s_0 < 1$.

In addition, either:

$dV_1 (t) / dt = a_1$; $dV_2 (t) / dt = a_2, \ldots, dV_n (t) / dt = a_n$, set the marginal utility of each innovation time.

One can write an equation multinomial:

$$\frac{d}{dt} \ln(wi - si) = \frac{1}{s_0} \sum_{j=1}^{n} (ai - aj)(wj - sj) \quad (25)$$

$$\sum_{j} wj = 1$$

The transition from the entire population of an area to sample the adoptive population likely is done with processing:

$W_i(t)=s_i+s_o y_i(t)$; $y_i(t)=[w_i(t)-s_i]/s_o$ (26)

leading to generalized multinomial equation:

(27)

Vector form of the system (ec. 27) is:

$$\frac{d \ln y}{dt} = A_y \quad (28)$$

where:

$$y = \begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ . \\ y_n \end{bmatrix}$$

and the adopter is the probability distribution of different innovations within a susceptible population.

Antisymmetric matrix is:

$$A=||ai-aj||=\begin{bmatrix} 0 & a_1-a_2 & \cdots & a_1-a_n \\ a_2-a_1 & 0 & \cdots & \\ \vdots & & & \vdots \\ a_n-a_1 & & \cdots & 0 \end{bmatrix} \qquad (29)$$

which is co-influence of various innovations resulting in competitive behavior.

Transformations (ec. 26) have the following vector form:

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix} = \begin{bmatrix} s_0+s_1 & s_1 & \cdots & s_1 \\ s_2 & s_0+s_2 & \cdots & s_2 \\ \vdots & \vdots & & \vdots \\ s_n & s_n & \cdots & s_0+s_n \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} = M_y \qquad (30)$$

which to convert the system (27) to system (25). In the latter case, the matrix M is active environmental action.

It is possible to show that:

$\det M=s_o^{n-1}$ (31)

and

$$M^{-1} = \frac{1}{s_0}\begin{bmatrix} 1-s_1 & -s_1 & \cdots & -s_1 \\ -s_2 & 1-s_2 & \cdots & -s_2 \\ \vdots & \vdots & & \vdots \\ -s_n & -s_n & \cdots & 1-s_n \end{bmatrix} \qquad (32)$$

Therefore, the vector form of the system (25) is:

$(d/dt) \ln M^{-1} w=AM^{-1} w$ (33)

The system of differential equations (25) has the explicit analytical solution:

$$Wi = si + \frac{s_0}{1 + \sum_{j \neq i} \frac{w_j(0) - s_j}{w_i(0) - s_i} e^{(a_j - a_i)t}} \qquad (34)$$

i = 1, 2, ..., n.

For the susceptible population, the explicit solution of the system (27) has the form:

$$Y_i(t) = y_i(0)e^{a_i t} \Big/ \sum_j y_i(0)e^{a_j t} \qquad i = 1, 2, \ldots n \qquad (35)$$

solution represents a multinomial logistic growth.

Each cycle competitive (type Schumpeterian) incorporates three types of behavior for innovative alternatives:

i) the relative decline of the old alternative, since the distribution among likely stabilized and gradually decrease to the recesses of conservation or extinction.

ii) increase relative pulse of the latest and effective innovations from niche incubation and gradually spreading throughout the susceptible population, by competing with other alternatives.

iii) growth-curve type light pulses decrease innovation "Satellite", initially with an increase in the population susceptible to the decline of old alternative moment and possibly losing compete more effectively with other innovations.

Finally, the end of this cycle is completed a new distribution stabilized innovations among population likely. The next cycle starts with the gradual emergence of new pulse of innovation, which overcome the existing barriers and compete with old and new innovative alternatives.

Thus, each cycle includes various short and medium term cycles, and a succession of several growth-cycles which generate long-term decline.

This qualitative description can support the analytical, as shown below.

Consider, first, if the marginal utility of non-temporal coincidences. With the change in notation, assume that:

$a_1 < a_2 < \ldots < a_n$ (36)

Qualitative structure of the innovation competition may be presented with quality matrix

$$\text{sign } A = ||\text{sign}(a_i - a_j)|| = \begin{bmatrix} 0 & + & + & \cdots & + & + \\ - & 0 & + & \cdots & + & + \\ - & - & 0 & \cdots & + & + \\ \vdots & \vdots & \vdots & & \vdots & \vdots \\ - & - & - & \cdots & - & 0 \end{bmatrix} \qquad (37)$$

$$\text{where: ign}(a_i - a_j) = \begin{cases} + & a_i > a_j \\ 0 & a_i = a_j \\ - & a_i < a_j \end{cases} \qquad (38)$$

Using the property: $\lim e^{at} = \begin{cases} +\infty & a > 0 \\ 0 & a < 0 \end{cases}$ when $t \to \infty$

obtain from equation (34):

$\lim w_1(t) = s_1 + s_o$ (when $t \to \infty$) (39)

$\lim w_i(t) = s_i$(when $t \to \infty$), $i = 1, 2,...n$), i = 1, 2, ... n (40)

Reversing the meaning of change of time:

$\lim w_n(t) = s_n + s_o$ (when $t \to -\infty$) (41)

$\lim w_i(t) = s_i$ (when t $\to -\infty$), i = 1, 2, ... n-1 (42)

In vector form, we can write:

$$\lim w(t) = \begin{bmatrix} s_1 + s_0 \\ s_2 \\ \vdots \\ s_n \end{bmatrix} \text{ (when t} \to \infty) \quad (43)$$

$$\lim w(t) = \begin{bmatrix} s_1 \\ s_2 \\ \vdots \\ s_n + s_0 \end{bmatrix} \text{ (when t} \to -\infty) \quad (44)$$

Thus, positive and negative columns of the matrix sign to achieve initial and final distributions of probabilities adoption, innovation diffusion process. These distributions are the first and last column of the matrix of redistribution M.

Qualitative description of innovative diffusion process can be completed with the analysis of signs (signs) derivatives (dw_i/dt). First of all, the system (25) implies:

$dw_1(t)/dt > 0$; $dw_n/dt < 0$ (45)

This means that the probability of choosing w_1 (t) the most effective innovations, the maximum marginal utility a1 time increases monotonously, first innovation starts from its niche incubators s_1 and spreads among people susceptible to the $S_1 + S_o$. The probability of choosing w_n (t) the weakest of the "n"-the innovative alternative decreases monotonously, old leaves people susceptible innovative alternative, from the $s_n + s_o$ and stops at the s_n niche conservation.

Behavior innovations "satellite" can be described as: system (25) and equation solution [see (34)] give for each i = 2, 3, ..., n-1 the following expression of the derivative:

$$\frac{dw_i}{dt} = \frac{w_i - s_i}{\sum_j [w_j(0) - s_j]\exp(a_j t)} \sum_{r=1}^{n} (a_i - a_r)[w_r(0) - s_r]\exp(a_r t) \quad (46)$$

Therefore, the sign of the derivative depends on the sign of the expression:

$$\frac{dw_i}{dt} = \frac{w_i - s_i}{\sum_j [w_j(0) - s_j]\exp(a_j t)} \sum_{r=1}^{n} (a_i - a_r)[w_r(0) - s_r]\exp(a_r t) \qquad (47)$$

Expression (47) changes its sign t_i^{max} point, which is the solution of nonlinear algebraic equation:

$$\sum_{r=1}^{i-1} (a_r - a_i)[w_r(0) - s_r]\exp(a_r t_i^{\max}) = \sum_{r=i+1}^{n} (a_i - a_r)[w_r(0) - s_r]\exp(a_r t_i^{\max}) \quad (48)$$

t_i^{max} values, i = 2, 3, ..., n-1 are points up for w_i (t), so the probability of choosing w_i (t) of each satellite innovation increases monotonously in the interval (- ∞, t_i^{max}) and decreases monotone in (t_i^{max}, + ∞).

The most effective innovations, spreading on the niche efforts enterprise adoption, bringing up their relative weight as a curve in the shape of “S”, a gradual exclusion of alternatives have been adopted or satellite. When it reaches maximum capacity expansion of effective innovation, ie when all the population likely adopted a differentiation between units adopted / been adopted stabilizes and type Schumpeter cycle is complete.

In the long term, this stability is vulnerable because one nine innovative alternative to the expected “Nice to incubators”, is sufficiently mature to overcome existing barriers.

The next cycle begins, ie a new group of innovations becomes more efficient, he takes their relative increase after a curve shaped “S”, accompanied by a decline ratio (the shape of the curve “S”) of old satellite alternatives and alternatives which conserved only within the recesses of their adoption.

4. Information and awareness in the process of socio-industrial

The most important factor in social and industrial development is international communication. A culture can learn from one another by imitation, innovation, or both processes. In modern times there is no culture which have become highly civilized and industrialized without communication with other cultures.

Human capital of a culture can be increased interaction other cultures. A problem that should be investigated is to determine the influences on economic development, where the two nations have identical capital and a stable population, but their attitudes in terms of improving human capital are different [25].

4.1. The basic model of development through knowledge

Consider two nations, 1 and 2. They manufacture the same product, using capital and labor as inputs.

Whether the country's capital “and” when “t”: K_i (t). Assume constant “quality” of capital over time. This assumption neglects the influence of research on machine design.

Assume also that the populations in each country does not change (no migration of population between the two countries).

The population of a country “i” is P_i. To describe the population quality human capital index is introduced qualification z_i(t) of the nation's population “i”. It is determined by the average level of education, knowledge, skills and other aspects of human quality. Using index qualification can be defined skilled workforce of the nation “i” z_i(t) P_i.

Economic efficiency is determined mainly by z_i(t) Pi and less than P_i. This product shows that economic development is determined by the quantity and quality characteristics of human beings.

Production nation “i” is given by:

$Y_i = F_i (K_i, z_i P_i)$. (49)

For the explicit form of equation (49) in [25] Cobb-Douglas relationship is recommended:

$F_i = \nu_i K_i^{\alpha} (z_i P_i)^{1-\alpha}$ (50)

where $\nu_i > 0$ (for i = 1,2), $0 < \alpha < 1$.

We can write:

$F_i = a_i K_i^{\alpha} z_i^{1-\alpha}$ (51)

where $a_i = \nu_i P_i^{1-\alpha} > 0$.

Parameter α is identical for the two nations. Accordingly, if two countries have the same level of knowledge and the same capital, their production per unit of time is the same, if ν_1 and ν_2 parameters are identical. In a sense, these parameters describe the effectiveness of institutions and organizations in an economy, while the term $K_i^{\alpha}(z_i P_i)^{1-\alpha}$ describes the ability of "design" of production.

According to information, capital accumulation equation is:

$dK_i/dt = s_i F_i - \delta_i K_i$ (52)

where δ_i = inflation rate

s_i = rate of profit.

Suppose that the two countries concerned (i = 1, 2) δ_i is constant: $\delta_1 = \delta_2 = \delta$.

Parameter s_i is considered a crucial parameter history, while arguments showing that the profit rate is stable only in the short term [24].

If we start from a realistic assumption, then:

$1 - S_i = G_i(Y_i - SiPi)$ (53)

where $1 - s_i$ = rate of consumption

s_i = the biological survival

Y_i = output available for direct consumption.

If $Y_i < s_i p_i$, then people will die or existing capital will be consumed for survival. If there is no danger of starvation in an economy, it is natural that $Y_i > s_i p_i$. G_i is strongly dependent on institutions and cultural characteristics of the economy taken into analysis. When $(Y_i - Sipi)$ is not too high, people tend to consume what occurs. If taken in the analysis, Gi is very high. Of course, if used policy of "forced return", then Gi can be lowered, even if $(Yi - S_i p_i)$ is very small. On the other hand, when $(Yi - S_i p_i)$ becomes very large, it seems reasonable to assume that G_i is relatively stable for a specified period (not too long). But this assumption is dependent on the historical path of economic development and other characteristics of society.

Equation (52) describes growth without international interactions and without the possibility of improving human quality. If human quality constant, the system is the same as neoclassical growth model unisectorial standard, if the population increases by a fixed internal rate.

In this case, the country's economic dynamics "i" is given by:

$dK_i/dt = b_i K_i^{\alpha} - \delta_i Ki$ (54)

where: $b_i = s_i a_i z_i^{1-\alpha}$ is a positive constant.

The system described by equation (61) has a unique equilibrium is globally stable. It can be concluded that if there is active connections and possible changes in international human quality, the global economy will be stable. However, such a system is very simple, it can be considered as an appropriate description of isolated agricultural society, where generations continue to live in conditions of minor improvements in human quality. Moreover, capital accumulation is very slow. It should be mentioned that neglecting the possibility of using the theory of Malthus on population.

Isolated economy equilibrium model is given by:

$K_i = z_i (s_i \nu_i P_i^{\alpha} / \delta_i)^{1/1-\alpha}$ (55)

So capital is directly proportional to human quality, efficiency of the organization and people, but conversely proportional with inflation.

Taking into question the possible dynamic change human quality, we know that there are several ways of impaired quality. Of these, four could examine the primary aspects of learning. They are:

- Division of Labor:
- Imitation;
- Learning by "doing";
- Learning by "education".

Even Smith [27] and others have recognized the importance economics division of labor in economic efficiency of human activity. In the work cited, Smith wrote that "The biggest improvements of the productive powers of labor, most of the abilities, skill and trial that it is anywhere directed or applied, seem to be effects of division of labor.

Imitation is also an important way of increasing human quality. Different companies, regions and nations have their own characteristics. What they made East Asian countries in economic growth due process of imitation and adaptation.

People can improve human capital through experimentation. "Learning by doing" is particularly important for those activities that require special skills. But this factor plays a much diminished role in modern economic development, because many human activities are replaced by automatic machines.

In modern industrialized society, education is the most important way to improve human quality, but education costs. Current workforce is reduced, being allocated to the education sector. Also, people need to decrease power consumption to increase knowledge. Education of a nation is determined by many factors.

The country is governed by politicians who are interested only in short-term objectives, can hardly allocate its resources to education, because its effects on social development are achieved in the long term. Percentage of GDP is allocated to education is not only dependent on financial resources of the nation, but is dependent and the extent to which the nation recognizes the significance of education in the long term development.

The problem under-educated population trend to produce less educated future generations is not only related to economic headquarters, but in connection with the whole civilization of the nation.

Based on the above can be expressed mathematically possible dynamic human quality:

$$dz_i/dt = H_i(Y_i,z_i) + I_i(P_1,z_1,P_2, z_2) - r_i z_i \quad (56)$$

where r_i = rate of depreciation of human quality in the country "i";

$H_i(Y_i,z_i)$ = function of self-improvement of the country "i" (without any external);

I_i = International Learning office.

For simplicity, H_i can be written:

$$H_i = c_i Y_i (1+h_i z_i), \; i = 1, 2 \quad (57)$$

where ci and hi are positive constants.

There are many opportunities for international connections in the learning process. May be different models of learning and, therefore, it is appropriate to suggest a possible model and examine the behavior of.

Suppose that I_i (i = 1, 2) is dependent only days and P_i. In a sense, this means that effective international communication is more dependent on human quality than material conditions in the present conditions of modernity. In practice, it can be affected by production or capital accumulation. Increased production favors capital infrastructure facilities like communication networks, public services, transport systems

etc.. In addition, a nation can learn from each other, through the acquisition of machinery and technology transfer. For simplicity, all will be ignored.

International cooperation can occur multiple influences. If cooperation is the elemental that appears between the two countries, one against another, may be in various magazine.

4.2. Case study: Both countries are performing learning

Consider the case of two countries that have similar learning functions, but could not improve human quality of standing isolated from one another.

In both countries there are people performance, but not good innovators.

Learning function takes the following forms:

$I_1 = m_1(z_2/z_1)^u$, $I_2 = m_2(z_1/z_2)^v$ (58)

where m_1, m_2, u and v are positive constants.

It was noted that when population is less qualified, the country try to learn from each other. But, the human quality of a nation becomes higher than the other, it decreases the processing speed of human capital. My parameters, u and v describe the efficiency of these connections.

System dynamics is given by:

$dK_i/dt = s_iF_i-\delta_iK_i$, $i = 1, 2$

$dz_1/dt = m_1(z_2/z_1)^u - r_1z_1$

$dz_2/dt = m_2(z_1/z_2)^v - r_2z_2$ (59)

It was noted that our system the material conditions of the modern world, as production and capital, no influence on improvement of human capital but human capital has a direct effect on them. Therefore, the effects of international connections is expressed, rather, by sharing ideas, than the material change. There is a unique equilibrium, given by:

$K_1^* = d_1z_1^*$; $z_1^* = (m_1/r_1)^{(1+v)w} (m_2/r_2)^{uw}$ (60)

$K_2^* = d_2z_2^*$; $z_2^* = (m_1/r_1)^{vw} (m_2/r_2)^{(1+v)w}$

where: $d_i = (a_is_i/\delta_i)^{1/(1-\beta)}$, $i = 1, 2$; $w = 1/(1+u+v)$.

On balance, there is a linear relationship between capital and human capital. That is, an increase in human capital provide capital growth, production and consumption.

Parameter significance is that m_i value more than it reflects the country's greater capacity to absorb the ideas of other countries. By increasing this parameter will benefit both countries in terms of knowledge, capital, production and consumption. Since m_i is strongly dependent on institutions, it may be noted that in the long term, an improvement of political system a country will affect the other country through learning effects.

A system in which human capital can be strengthened through international cooperation is a system with a single solution equilibrium, equilibrium is stable. This equilibrium is stable until new innovations or new ways of interaction.

And in other cases you can find similar mathematical relationships, which can interpret.

Not to present these relations, it is interesting to highlight various features of the hypostasis of cooperation between two countries.

When one country is capable of self-improvement and learning The other, to create an unstable system, on account of self-improvement capacity.

When a country is good imitator, and the other is creative and capable of learning, the stability of the system depends on effective cooperation and creative ability and learning.

In a more general analysis, in addition to these factors should be taken into account and others, such as the effects of trade on development, brain-draining site and population migration, etc..

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