Knowledge marketing and development in the new knowledge-based economy

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KNOWLEDGE MARKETING AND DEVELOPMENT IN THE NEW KNOWLEDGE- BASED ECONOMY

ABSTRACT

The purpose of this paper is to analyze and describe the relation between knowledge and development in the new knowledge-based economy and to deduct the socio-economic basics of the public marketing strategies in this context.

The particularity of this approach is due to the features of knowledge, seen as production factor, mixed public good or global public good, as well as their developments in the context of relationships between university and industry, the new role of public sector research or the new theory of endogenous growth.

The economic and social logic of this paper includes marketing among the tools to promote knowledge-based technology progress, imposing even juxtaposition between private or public marketing strategies.

The knowledge market develops in specific directions that are compatible and integrated in the development strategies of contemporary economies. Given this context, the quantitative analysis models are inspired by more general or even classical economic models that integrate technical progress, human capital or knowledge status.

The main topics discussed in this paper relate to: knowledge and arguments for knowledge marketing development, knowledge and knowledge market as objects of public marketing in contemporary economy, development models that incorporate the impact of knowledge marketing strategies and relevant empirical analysis in the context of the Romanian economy development. The growth methods are based on relevant bibliographic analysis, quantitative models and statistical evaluations, systemic analyses and summaries.

KEY WORDS

knowledge, knowledge market, global public goods.

INTRODUCTION

Knowledge marketing is a concept whose scope and content are not fully yet established. Simply juxtaposing marketing and knowledge is not enough to really understand what we actually call knowledge marketing. Analyzing the literature and the specialized studies (Stiglitz, 1999; Kotler and Lee, 2007; Brechingnac – Rouband, 2001; Matei and Dinu, 2010; Rosca, 2006; Blankenburg, 2000), as well as public or private business initiatives, we realize that, despite an insufficiently developed theoretical framework, we already have practical applications of promoting and using knowledge marketing. Just like knowledge management, the concept should be approached in the complex framework provided by the knowledge economy and, in broader terms, by knowledge-based society.

Understanding the role of knowledge in the knowledge economy – as production factor and mixed public good – or in the knowledge–based society – as fundamental tool and mechanism for their development – will lead to a better understanding of the knowledge marketing concept. The suggested approach has strong cross-disciplinary connotations, integrating skills specific to economists, IT specialists, engineers, mathematicians, as well as psychologists, sociologists etc.

The vague definition of knowledge, that remains a relative concept, adds extra difficulty. In fact, as the next chapters will show, the "economic" features of knowledge as public or private good are also hard to define. Knowledge as an economic product encompasses both the features of public goods regarding the fundamental knowledge or knowledge generated by public institutions and the features of private goods, with special reference to technological knowledge. A constant and continuous process of bi-directional diffusion takes place between the two features, in the sense that:

- technological knowledge gains public goods features as knowledge society advances and new knowledge elements emerge. What is now private knowledge becomes public tomorrow and private features are transferred towards other knowledge elements with higher degree of complexity, originality and novelty;
- fundamental knowledge, as new discoveries are added to it and new technologic processes are associated, it gains a higher private degree.

Consequently, we notice that, due to its economic features, the object of knowledge marketing will become, particularly, that part of knowledge that has market value, therefore that part that can have marketing tools associated to it, such as: price, distribution, promotion etc.

The particularity of knowledge marketing resides precisely in the specificity of the product called knowledge, as well as in the need of the knowledge market that "knowledge marketing acknowledges the need for more complex products or services, the customers receive more information, supporting them to understand the need, features and benefits of a certain solution (Luchianov, 2010, 1). Mahmood (2004) also notices and supports a certain similarity between "knowledge management" and "knowledge marketing" approach.

"As we think about Knowledge Management, we would do well to devote some thought to "Knowledge Marketing" as well. And when we do, we will realize that our marketing maven's trusty tactics come very handy! If we can create small, attractive nuggets of knowledge, that can easily be pushed out and absorbed, that wake curiosity and inspire our audience to learn more, then we will be on our way to being effective knowledge marketers. While doing so, we can

remind ourselves that Newton was inspired by an apple falling on his head, not an apple tree!" (Mahmood, 2004, 2)

The pragmatic approach appears in the above paragraph, confirming once again the reality that knowledge marketing promotion tools are active.

Turning knowledge marketing into a genuine means of product streamlining and profit increase is also the objective of the Knowledge Marketing (KM) platform developed by a group of specialists in sales, IT technologies and software. KM is focused on servicing retailers, publishers and nonprofits.

1. KNOWLEDGE AND THE NEW ECONOMY

When we say new economy, we obviously talk about knowledge-based economy or knowledge economy.

1.1. Knowledge economy

The key concepts of knowledge economy are knowledge and education, the latter in relation to "human capital". The initial substantiation of knowledge economy was introduced by Drucker (1967), then resumed by Drucker (1969). The term will be recognized as such only three decades later. Knowledge defined as a business product, as educational and innovative intellectual products and services can be exported for a high value return or as a productive asset.

Knowledge as "key resource in the new economy" (Giju et al., 2010) will represent, together with management and marketing, the mechanisms that substantiate the knowledge economy as being the concept that supports creation of knowledge by organizational employees and helps and encourages them to transfer and better utilize their knowledge that is in line with company/organization goals.

In this relatively new context, knowledge marketing represents a concept and a new discipline aimed at designing and implementing a system for efficiently identifying, capturing and promoting knowledge as a product of the new economy.

1.2. Knowledge. Concept and evaluation

Knowledge conceptualization dates back centuries ago and its boundaries are not well shaped yet. Defined in the 16th century as "knowledge is power in the present, knowledge is everything that people know and may also exist in organizational processes, products, services, facility and systems" (Giju et al., 2010, 19). Being renewable, knowledge enjoys a hierarchical structure consisting of: data, information, knowledge and wisdom.

Several papers of Nonaka (1994), Argote, McEvly and Reagans (2003), Hoffman (2004), Rosca (2006) etc. approach new dimensions of knowledge with special reference to organizations.

Using knowledge as a marketing object also implies outlining certain methods for its evaluation. Such methods have been developed in relation with the final purpose of various knowledge areas. With regard to knowledge marketing, we mention the evaluation methods exposed and ranked by Sveiby (2001) and (Giju et. al., 2010, 21 – 22).

1. *Market Capitalization Methods – MCM* are those methods used to calculate the difference between the market capitalization and the equity value of a company, as being the value of the company's intangible assets.
2. *Return on Assets Methods – ROA* are those methods used to establish the value of the intangible assets of a company based on the average return specific to that sector of activity. Thus, the company's average earnings before tax depend on the value of the company's tangible assets, thus establishing the ROA (return on assets), which is then compared to the average value for that sector of activity. The company profile determined by the intangible assets is estimated by multiplying the difference between the two ratios with the average value of the company's tangible assets. The current value of all these future earnings represents the value of the intangible assets it holds.
3. *Scorecard Estimation Methods (SC) and (Direct) Intellectual Capital Methods – (DIC).* Given that both groups of methods concern the evaluation of the intangible assets of a company or a public organization by identifying each component and ranking them, we shall approach them together because often times, they do not have very different boundaries. The first are often used to identify the qualitative performance factors and to calculate certain indicators for measuring them. These indicators are used more for medium and long-term management of the public or private organization, not for estimating the value of the intangible assets. The direct methods evaluate intangible assets directly, individually or as an aggregated coefficient.

Some of these methods are: Balanced ScoreCard (Kaplan y Norton), Skandia Navigator (Edvisson), Intelect (Euroforum), Intangible Assets Monitor (Sveiby), Technology Broker (Brooking), the MERITUM Project etc.

The knowledge society is the context where the knowledge economy and, consequently, the knowledge marketing, became known. Dinu (2006) expresses an interesting point of view.

Without claiming to go into much deeper approaches, the author states that human society is a knowledge society, knowledge about the mechanisms of using the exhaustible resources, namely the natural resources, by definition. "In general terms, the society has always been a knowledge society, but a society that pursued new knowledge meant to consume mother-nature exclusively. The real knowledge society – as an expression of the global society – tries to match the needs of human nature, that are increasingly significant and diverse, with those of mother-nature regeneration, proposing ways of consuming development of inexhaustible resources, first and foremost of the resource represented by the human intelligence, the knowledge, the propensity towards innovation, the entrepreneurial capacity, the creative associativeness etc." (Dinu, 2006, 10). In this context, we discover a paradigm of the knowledge marketing generated by the critical mass difference between the model and the reality. Dinu (2006, 11), speaking about the knowledge society, mentions the fact that "knowledge is now in fact pluri- and cross-disciplinary, ranging to paradigmatic mergers, scientific, intangible and virtual characteristics". The paradigm we discuss translates through a major difficulty in objectivizing and materializing the product called "knowledge".

2. KNOWLEDGE AS OBJECT OF PUBLIC MARKETING

2.1. Knowledge as a public good

Approaching knowledge as a public good resorts to the concept of public goods, with its non-excludability and non-rivalry features, used in the economic literature. In a general theoretical framework (Matei, 2003, 148 – 149), for public goods non-excludability means that the supplier or owner of a good cannot reserve its use exclusively to those willing to pay. The economic calculation on public goods, in general, and on knowledge as a public good, in particular, shows that selfish attitudes and strategies are dominant in this case, as knowledge consumers are not tempted to support to finance knowledge because they know they won't be excluded to use knowledge.

Non-rivalry or consumption indivisibility means that the available quantity of a good does not diminish for other consumers. Therefore, it is non-rival for other consumers, which means that the marginal cost for an additional user is null. Consequently, from the perspective of optimal allocation, no reasoning about the price or other marketing elements is justified.

This approach is often subject to criticism and contradictory debates. The field literature makes reference to copyright laws. However, even the copyright laws admit that knowledge is a public good. It concerns solely ideas, leaving them non-privatized, unregulated and public. The controversies come from the fact that "texts are not public goods, although the knowledge they contain remain a public good".

The features of knowledge as a public good have experienced developments in relation with the technological progress. As an example, all texts that express knowledge and are written on paper etc. are material objects with the rivalry feature.

The emergence of the digital era makes the respective texts to shift to the non-rivalry area. Given this new context, the discussion can continue about the digital equipment that also incurs some costs, thus affecting the non-rivalry features.

As for the non-excludability feature, this is also affected by the way knowledge is presented. Price barriers often lead to excludability in knowledge consumption as well.

Blankenburg (2000, 4) approaches knowledge as "a public – private good". According to the author, such an approach fits in the most recent models of the New Endogenous Growth Theory (NGT) that tries to shape research activities and innovation processes in economies with an advanced technology, more explicitly. The "public – private" phrase is not so simple because it makes reference to a more complex model that fits into the so-called evolutionist theories of innovation.

This complexity derives from the fact that, if the previously described features are mandatory in pure public goods, private goods do not have to meet neither one, nor the other.

Talking about the relations between public and private goods, Connolly and Munro (1999, 59) make a summarized scheme, suggestive for understanding the complexity of the evolution of non-excludability and non-rivalry features.

In order to transpose this scheme into the approach of knowledge as "public – private" good or mixed public good, Blankenburg (2000) approach must be extended, considering fundamental knowledge as pure public good and the technological knowledge used exclusively in industrial

processes as pure private good. Of course, this category is essentially didactic, with its abstractization degrees.

Figure 1 shows the categories of public goods whose object consists of knowledge.

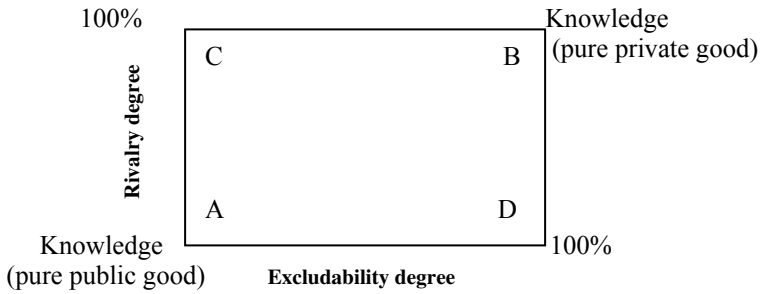

Figure 1 Knowledge as "public – private" good

(Adapted from Connolly and Munro, 1999, 59)

For better understanding figure 1, considering the variables degrees of excludability/rivalry, the points where they intersect will represent:

A. fundamental knowledge that expresses objective economic, social, technical rules etc;

B. knowledge used as basis of industrial and technological production, qualified as state secret, such as military knowledge etc;

C. knowledge achieved in projects obtained through competition or specialized assessment groups;

D. knowledge conveyed through scientific journals and publications, distributed in scientific societies with restricted access.

According to our previous references, Figure 1 suggests the introduction of the term knowledge as a mixed good that will be the knowledge whose consumption advantage is not limited to only one individual, and is not equally distributed to all the others. The reality around us usually makes reference to this type of knowledge.

2.2. Knowledge as a global public good

Stiglitz (1999, 308, 313) approaches the knowledge issue as a public good, stating that this "is not only a public good, but also a global or international public good", also admitting: "we should recognize that knowledge is central to successful development" (Stiglitz, 1999, 309). Moreover, the international community, through institutions like the World Bank, creates and disseminates a global public good – knowledge for development.

The presented features make reference to two concepts regarding global public goods and knowledge as a public good. It is well known that the term of public good uses the non-rivalry

and non-excludability features, in order to define and understand them (Matei, 2003, 148 – 150). In fact, we talked about these features and described them in the previous chapter.

The term of pure public good is abstract because, in reality, most goods are mixed public goods that integrate the specific features of private goods to a smaller or greater extent.

Actually, the fact that the benefits of certain public goods were limited was acknowledged quite shortly according to Samuelson theory (1954). A broader description of global public goods is also given by Kaul, Grunberg and Stern (1999. 2 – 19), and even public goods related to national defense or public order were limited geographically. Thus the local, national public goods etc. have emerged.

Unlike those goods, Stiglitz (1995) identifies the so-called global public goods: international economic stability, international security (political stability), the international environment, international humanitarian assistance and knowledge.

Talking exclusively about the global public good, that is knowledge, we must however insist on state policies regarding its protection. Although the non-rivalry features seem to be affected, at a first look, the national practices still outline the existence of licensing patents or other protective measures. Therefore, we can consider the marginal cost for the use as null, (nonrivalrous consumption) and the costs that are charged relate to the patent or the monopole. In order to balance such situations, the solution is to resort to restricting the patents, the monopole etc.

From the development perspective, knowledge protection causes a delay in the innovation rate, therefore in the development rate. The examples from the literature refer to the technologies and to the knowledge from the personal computers market etc. The related policies for keeping the development rate differ from one country to another, depending on their level of development.

2.3. Knowledge as a production factor

Going deeper in the discussion about knowledge in the context of the new economy we need to reveal a new aspect thereof with regard to the production factors. Over the past 500 years, Prusak (1997, viii) notices that "the factors of production were land, labour and capital goods, being neglected the role of knowledge as distinct production factor" (Repanovici, 2006, 184).

Similarly, Druker (1993, 45) appreciates that the "traditional production factors – land, labour and capital – did not vanish. But they became secondary. Knowledge becomes the only truly relevant resource today".

The debates about integrating knowledge as a production factor in the economic theories, mostly those about economic growth, are still present in the field literature. In this respect, Tang (2005) proposes "a unified theory of economic growth". The author's assumptions consider that, when we try to understand economic growth:

- knowledge should be understood as the total sum for our understanding of society and nature, rather than technological knowledge alone;
- knowledge should be treated as a genuine independent production factor, rather than an exogenous residual in the production function (Tang, 2005, 1).

A summary of how economic theory deals and incorporates with various issues related to knowledge is presented in Table 1.

Table 1. Economic theories and knowledge

Neo-classical theory	• basic research produces a public good: information; • the information is easily transmissible; • commercial benefits are uncertain due to the distance between the fundamental science and the industrial production; • the fixed production costs of the information are much higher than the information transfer costs; • state intervention is recommended for funding basic research.
Information economy (extension of the neo-classical theories)	• states the existence of informational imperfections both in the market and in state structures; • it is weakened the state ability to "pick the winner" to support basic research; • imperfect competition seems natural because of information asymmetries; • is necessary to avoid "negative spillovers" between private companies, by monopolizing access to information.
Evolutionary economy	• the main concept is knowledge; • knowledge is not a good / a merchandise; • knowledge is found in learning processes and organizational structures and is not easily transferable; • knowledge depends on the quality of social interaction and communication lines which involves cooperation between different sources of knowledge; • positive feedback effects of cooperation are at the center of innovation.
New Endogenous Growth Theory (NGT)	• is based on the dynamic nature of the knowledge economy which leads to a different characterization of knowledge; • knowledge appears as a accumulation factor and a self-reproduction one; • growth is interpreted in terms of knowledge externality; • knowledge is both a production factor and "public – private".

Source: Authors (Data and information processed from Blankenburg (2000))

2.4. Market knowledge

Similar to other markets, the knowledge market is a mechanism for sharing resources of knowledge. Based on the characteristics of knowledge as a "public - private" good, the literature has developed two major views on how the knowledge market can operate.

- One view uses a legal construct of intellectual property to make knowledge a typical scarce resource, so the traditional commodity market mechanism can be applied directly to distribute it.

- An alternative model is based on treating knowledge as a public good and hence encouraging free sharing of knowledge.

As usual there is no consensus among researchers and users on one or other of the views. Whatever their choices may be, we emphasise some issues which support the existence of a market for knowledge.

- The existence of demand and supply of knowledge.

  Demand and supply of knowledge as pure public good is difficult to measure, in exchange, for private knowledge there are distinct mechanisms, with highly developed technological support, which determine demand and supply.

  It should be noted that the relationship demand - supply for the latter situation is outdated, demand being paramount, most times. Also on both sides of the binom demand – supply, there is competition.

- The mechanisms that regulate the functioning of the knowledge market are complex, being most often substantiated on international rules, practices and mechanisms of protection.

If for other markets we may speak about a market balance, in case of market knowledge, there are specific features resulting from the characteristics just mentioned above.

Lisbon Strategy (2000) provides a knowledge market perspective, the laying the foundations of the knowledge economy, harmonising the production of knowledge with market demand by building a European Research Area (ERA).

This area will be, in fact, a common research market - within which the competition - is "the main principle of research" and "researcher - an entrepreneur. Under the new public management principles, entrepreneurial organization is introduced.

On knowledge market a fundamental role is played by universities and research institutions as vectors of knowledge production.

Blankenburg (2000) examines also the role of "public – private partnership" on the knowledge market. Integrating the market, the market principles in the context of new endogenous growth theories (NGT) shortcomings of the standard market and innovation policies are highlighted. However, as mentioned above, there are uncertainties regarding the conceptualization of knowledge as a production factor and as a (public - private) good.

Following this idea, it is worth to add the need to clarify whether the knowledge must be understood as a material production factor or incorporated into the capital accumulation process (Blankenburg, 2000, 2).

In the context of the Lisbon Strategy implementation and promotion of public - private partnership in the knowledge economy, we are witnessing a revival of the relations between university and industry.

One argument refers to establishment of a European area of education and lifelong learning, situating the universities in competition, as they should adopt and turn into training providers focusing on "employability" of future graduates and providing a "useful knowledge market" as "human capital".

3. MODELS OF ENDOGENOUS GROWTH IN THE KNOWLEDGE ECONOMY.

3.1.General aspects

The literature offers a variety of models that provide a conclusive picture on the contribution of various production factors in view to achieve outstanding results in development.

Knowledge, in its various meanings, contributes directly or indirectly, to obtain such development. Blankenburg (2000) presents and comments in details various models identifying the main sources of endogenous growth: inputs/sources reproducible, externalities of knowledge and entrepreneurial efforts.
The first generation of NGT models, so-called 'AK models' express the logic that relates knowledge-based growth to state intervention (Blankenburg, 2000, 15).
In some models, such as Arrow's, the technical progress represents a secondary product of other activities. In the same context, Romer's model focuses on non-rivalry and partial exclusion of knowledge as a public good. The result is determined nonlinear versus the accumulated stock of public knowledge and private knowledge of the current stock.
Lucas's model takes into account the investment in human capital, which as a first step, will have a negative effect, but on long-term will accelerate the production. Detailed analysis is done in conjunction with other models: Solow, Jones, Aghion and Howitt, etc.

3.2. A new explanatory model of substitution of production factors in the knowledge economy

The models below are the second generation of NGT allowing substitution of production factors, such as the one between knowledge and work.

Therefore, we find new approaches towards production factors substitution aiming to state economic models that describe, closer to reality, different economic processes specific to the present days.

In this context Arow, Chenery, Minhas and Solow(1961), Klump and Grandville (2000), Karagianis, Palivos and Papageorgiou (2004), Lovell (1973), Sato and Hoffman (1968), Zaman and Goschin (2007) et al. focus especially on work and capital production factors, the actual approaches incorporating technological progress and knowledge evolutions that, on the one hand determine "the growth of factors consumption" and, on the other hand, caused "the growth of complex highly qualified work" and "the growth of highly qualified work consumption and the poorly qualified work saving/replacement" completed with "the capital consumption at high technological level "(Zaman and Goschin, 2007, 3-4).

These tendencies generate significant changes in substitution elasticity of different production factors depending on the one hand on the level of social-economical development and, on the other, on factors such as market globalization, connectivity and interdependences and interoperability growth in world economy as a result of information and communication technology extension, new managerial approaches and best practices generalizations and market emergence growth etc.

Nowadays (Zestos (1996), Klump et al. (2005), Karagianis et al. (2004)) the production factors substitution is analyzed from its direct nature point of view-referring to one factors type

replacement with other factors, or its indirect one – several production factors replacement with other factors with different functions but complementary to productive processes.

Crisis periods emphasize the connection between substitution processes of production factors and technological progress and knowledge. The objectivity of such a connection is being currently offered by the restrictive characteristic of natural resources, by the necessity to fight pollution at local and global level and, in general, the "global problems" effects on humankind. The financial crises add to these determinations other elements decreasing the financial resources.

The need for sustainability growth under economic, social and environmental aspects and in general for the growth/conservation of production and consumption models efficiency or eco-efficiency overlaps with objectives commonly reachable in most of the strategies for financial crisis effects reduction.

Nevertheless, indirect substitution that is specific for financial crisis times is equivalent with saving in order to maintain and/or to consolidate economic equilibriums. At the present time the most important substitution between capital and work refers to knowledge expressed by introducing information and communication technology (ICT). According to Zaman and Goschin (2007) knowledge and ICT becomes a real capital with modernization significance, "restructuring factors of a significant part of traditional work capital in all social departments as a result of positive externalities created especially in costs reduction domain"(Zaman and Goschin, 2007, 4-5).

The continuous growth of workforce qualification, the production "dematerialization" or the corporate management extension in public sector represent as many restructuring and sustaining factors as production factors substitutions.

Arrow et al. (1961), Miller (2008), Sato (1967), Morishima (1967), Matei (2008) show theoretical and methodological instruments for macroeconomic analysis of production factors substitution and Cobb-Douglas production functions with their variants CES (Constant Elasticity of Substitution) and VES (Variable Elasticity of Substitution).

As known, the production functions are nonlinear expression of production factors capital and work that by using the same instruments (EC, 2009, 24-25) analyzes the productivity gap sources between the EU and USA. Getting inspired from Moore's (2008) papers, the mentioned report considers the following Cobb-Douglas production function:

$$Y = A\left(EAQ_L\right)^{\alpha} K^{1-\alpha}$$

where represents GDP, E is employment in persons, H is average hours worked, Q_L is the indicator of the quality of the labour input, K is capital input, A is total factor productivity and α, 1- α is the production elasticity of labour, respectively capital. This laborious study's conclusions identify, among others, as the cause of growth rate disparity between the EU and USA (by approximately 0.8% lower than the 1995-2006 period): demographic aspects, a lower work productivity growth, fewer work hours although the initial work education improved more in the UE. Production functions show production (output) maxim contribution that can be obtained starting from a series of production factors (input) and allow to define and to measure some economic effects related to factors' yield and to possible substitution between: scale elasticity, factors elasticity, substitution elasticity or, if the case, technology progress rate. We shall focus in our analysis on CES and Cobb-Douglas production factors.

According to Andrei and Bourbonnais (2008, 180-184) nonlinear model represented by CES is different based on:

$$Y_t = \gamma^{-\theta}\left[\delta k_t^{-\theta} + (1-\delta)L_t^{-\theta}\right]^{-\mu} e^{\Sigma t} \qquad 3.1$$

where:

- Y_t – the variable that modifies the outputs from the system
- K_t – fix capital, L_t – human capital
- γ, δ, μ, θ – models' parameters
- ε_t – residual variable with N repartition $(0, \sigma_\Sigma^2)$

CES model parameters significances are:

- $\gamma > 0$ – the parameter of production process efficiency
- $\delta \varepsilon (0, 1)$ – is known as the parameter of production process distribution
- $\mu > 0$ – scale parameter for the process
- $\theta \geq -1$ – parameter for the two process factors substitution

Two proprieties are relevant for the CES function:

- production factors substitution elasticity is determined by θ substitution parameter, the relation being :

$$e = \frac{1}{1+\theta} \qquad 3.2$$

Usually, the elasticity of a production factors substitution ratio grater than one means a greater probability of their optimal combination. On the contrary, a less than one ratio shows an inequality of efficient compensation variety of production factors, as a consequence of absorption delay or incapacity and investments in technological progress.

- scale performance is determined through μ parameter. The scale performance of production factors represents the sum of production factors performance, each performance being equal to the ratio between factors' marginal productivity and mean productivity.

If $\mu \varepsilon (0,1)$ production function has a descending scale performance. If $\mu > 1$ we have an ascending function of scale performance. For $\mu = 1$ the scale performance is constant.
Cobb-Douglas production function is a particular CES case. The expression of Cobb-Douglas function is:

$$Y_t = AK_t^{\alpha} L_t^{\beta} e^{\Sigma t} \qquad 3.3$$

Y_t , k_t, γ_t have the significance mentioned earlier and A, α, β represent the real parameters in ε_t , the residual variable.
To be more precise, α will represent productivity partial elasticity related to fix capital e_K. And β – productivity of partial elasticity related to human capital $e_{L.}$
Scale elasticity equals the sum of two partial elasticity cases.

$$e = e_k + e_L \qquad 3.4$$

If e < 1, the productive process increases the outputs in a lower proportion than the increase of production factors. If e > 1 the productive process generates a greater increase of outputs than in the case of production factors. In the case of competition markets, the elasticity is greater than one ratio.

Therefore, substitution or scale elasticity measures the percentage change in factors proportion due to the change in the change of technical substitution marginal rate. Substitution elasticity shows the proportional variance of quantitative ratio of resulted factors from the proportional variation of marginal rate of technical substitution of one factor related to another. In other words, represents "an ease measure of the variable factor to be substituted by another" (Hicks, 1932, 117).

In the described context, the determination of CES or Cobb-Douglas production factors may offer information concerning the aggregation flexibility of the two important production factors, human capital and capital and the capacity to overtake and portray the inclusion level of knowledge as the main resource for efficiency.

3.3 An empirical analysis

Empirical research estimates, in Romania's case, the Cobb-Douglas production functions model using as statistic data:

- GDP as a measure of output
- Gross fix capital formation (GFCF) as an expression of fix capital production factors.
- Employed population (EMPL) for human capital production factor

The statistic data are presented in Annex 1. Making use of the mentioned data series for parameters estimation, we turned into account:

- Trans-log representation for CES function
- Linearization through logarithm function for Cobb-Douglas function.

Therefore, the result is:

$$GDP^{0.25} = \left(4 \cdot 10^{-6}\right)^{0.25} \left[1.305 GFCF^{0.25} - 0.305 EMPL^{0.25}\right]^{-2.014} \times e^{0.307} \qquad 3.5$$

$$R^2 = 0.961, F = 64.650$$

$$GDP = 8.07\left(GFCF\right)^{0.775} \cdot \left(EMPL\right)^{0.367} \cdot e^{0.338} \qquad 3.6$$

$$R^2 = 0.957, F = 92.414$$

where substitution elasticity becomes:

- For CES, e=1.33
- For Cobb-Douglas model, e=1.142

In both situations the scale performance is ascending and the differences resulted from the relative number of utilized statistical data. After calculating CS and CA indicators we can conclude that Cobb-Douglass model offers more likely results than CES model.

Conclusions

a) References to the proposed model

The proposed model introduces the substitution of production factors as adequate opportunity for consideration of knowledge as a production factor.

Substitution is indirect because knowledge can substitute for both capital by incorporating it, as well as labour, in human capital terms.

In fact, knowledge is also an interim mechanism that can support "direct and indirect substitutions between entropic capital (economic, national, physical, institutional, human, financial, intellectual, social, etc.) and natural one (Zaman and Goschin, 2007, 4).
Substitution of the production factors through knowledge has different intensities depending on the economic and social sustainability. Current trends are covered by a strong intensity of substitution through knowledge, thus resulting in a more rational use of natural resources and value-added.
In this context, we can estimate that currently, the most important substitution between production factors relate to knowledge, with particular reference to information and communication technologies, computers, etc.
Klump (2005) presents an interesting analysis of the level and intensity of the substitution of the production factors. Knowledge appears in Klump's analysis (2005) as an intermediate production factor, complementary with the quasi-majority of the basic production factors.

b) The background of the knowledge marketing strategies

The proposed analysis enables the substantiation of knowledge marketing strategies as:

- the model and empirical analysis describe the growth prospects and assess the pace and level of that growth;
- the analysis of substitution intensity and, in general, of the whole mechanism of substitution, provides a fertile ground for economic and social diagnosis and forecasts of:
  - significance of the magnitude of the substitution dynamics and structure, especially, the elasticity of substitution level based on economic and social development studies;
  - the particularities of the growth process on short, medium and long term;
  - revealing the characteristics and the potential for sustainable economic growth by incorporating knowledge as a matrix of development in options of increase / decrease of the consumption of labour and capital, variability of the production factors prices, etc.
  - estimating the potential of efficiency through knowledge effectively in a globalized world.

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Annex 1

Table – Production factors and GDP evolution during 1990 – 2009

Year	GDP (100 mil EUR)	EMPL (Population outputs) (thousand pers.)	GFCF (Gross capital formation) (1000 mil EUR)
1990	44.5	12025	1.557
1991	39	11965	1.065
1992	35	11604	1.182
1993	36	11159	1.280
1994	37	11099	1.544
1995	40	10522	1.652
1996	41	10402	1.745
1997	39	10005	1.775
1998	37	9776	1.674
1999	33	9343	1.593
2000	40	9572	1.680
2001	45	9500	1.851
2002	48	9235	2.004
2003	53	9223	2.174
2004	61	9158	2.413
2005	80	9147	2.720
2006	98	9313	4.606
2007	121	9353	9.438
2008	130	9369	6.370
2009	121	9115	5.850

Source: Matei and Matei, 2010